John M. Connor

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Global Price Fixing

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For my loving son Timo

Preface

I have devoted myself to studying the economic organization of industries for thirty years. It has been my good fortune to work at places that tolerated my gadfly approach to research. So long as I produced a few publications each year and wooed a few graduate students to share those interests, I was free to sample a smorgasbord of economic delights: why firms diversify, the competitive role of advertising, strategies for selling in overseas markets, measuring market power, and many others. Although firmly anchored in the eclectic analytical framework of industrial economics and focused on the food system, I traversed a wide field at will.

A decade ago I had pretty much convinced myself that naked price fixing was not a high priority for scholarship. True, collusion was rife in a few industries, such as bid-rigging among suppliers of fluid milk to school districts in isolated rural districts. Ripping off milk money from school children is reprehensible enough, but the size of the economic losses from localized price fixing paled besides other sources of imperfect competition. Moreover, there were no great policy debates about the wisdom or methods of enforcing the price-fixing prohibitions in the Nation's antitrust laws. The more exciting areas of research for the field were behaviors placed under the rubric of "non-cooperative" or tacit collusion. These were more subtle forms of conduct that were the subjects of research on the frontier of the discipline's expanding frontier of knowledge, and they were more policy-relevant. No, I had decided, naked horizontal price fixing was largely a thing of the past, well under control by the century-old Sherman Act.

My attitude on the importance of cartels in the food and agriculture system did a *volte-face* in 1996. Like hundreds of thousands of other readers of the *Wall Street Journal*, I read with increasing fascination the legal travails of what was one of the nation's most admired agribusiness firms, the Archer Daniels Midland Company. When ADM and two other makers of lysine proposed settling with lysine buyers, the amount they offered seemed to me woefully inadequate, so I wrote a letter to a *Journal* writer expressing that opinion. That letter was never published, but serendipitously it became the instrument of my personal entrée into the burgeoning field of forensic economics.

Beginning with the federal class-action antitrust case in lysine, I have served as an expert in several cases that alleged global price fixing. I

have worked behind the scenes to write expert reports on cartels in the markets for lysine, citric acid, vitamins, sorbates, smokeless tobacco, corn sweeteners, methionine, ready-mix cement, and dynamic random access memory devices. These cases gave me access to internal company documents, most of which are confidential and protected by court seal. While those cases may have affected some of my views, in this book I support my arguments solely from public documents.

The longer I followed the news on the exposure and prosecution of these global cartels, the more convinced I became of their historical importance. Unlike the historical instances of localized price fixing in the U.S. food industries with which I was familiar, these cartels were different. They were huge, complex, geographically extensive, culturally pluralistic, illustrative of a major technological shift, and objects of heavy sanctions by antitrust enforcers. Perhaps equally important, the vast publicity generated by government indictments and civil litigation provided a paper trail about price fixing that was unsurpassed in the history of trusts, monopoly, and cartels. What might have been viewed as simply another sordid example of corporate crime and personal venality began to evolve in quite another direction. As my notes, clippings and e-files on the new cartels began to mount, I became consumed with the desire of tell their stories, first in a series of talks at professional conferences, later in refereed journal articles, and then in the first edition of *Global Price Fixing (2001).*

Immersion in these cases gave me a valuable cross-cartel perspective. There were a large number of similarities to the schemes, though the differences were also instructive. I decided to limit the scope of this book primarily to three of the largest, precedent-setting global cartels: lysine, citric acid, and vitamins. These were the best documented cartels in the public record, and indeed as a group very likely the best documented price-fixing cases ever from the economic perspective. The economic details that have emerged into the public record permit a degree of precision of measurement of the cartels' sizes and impacts that is unequaled. At this writing, new global cartels continue to be investigated, prosecuted, and litigated. Many others go undetected.

Much has happened in the field of cartels since the first edition was written in 2000. The greater part of the vitamins story has been released. The DOJ's Corporate Leniency has been a smashing global success. At least a dozen other countries have adopted leniency policies that are quite similar, and all of them are proving to be highly productive in discovering secret cartels. At least 300 international cartels have been discovered by authorities since 1990 and almost half of them since 2000. With all this new material, the field of cartel studies is blooming. International cartels have touched most people, though often they are unaware of it (see Box).

Professional economists may find my writing style somewhat unconventional at times. The chapters that follow display much of the cool, rational, and dispassionate style that is the norm. Yet, interwoven with more orthodox legal-economic discourse are narratives of the events surrounding the formation, operation, and legal prosecutions of these global cartels. Narrative is rarely employed in scientific writing in the social sciences. My purposes are to make the material more accessible to lay audiences, to relieve tedium that can come from bloodless economic writing, and to add to the readers' understanding of personal motives and corporate strategies. In my view, narrative can add a richness of psychological detail that lends credibility and explanatory power to putatively rational decision making. The stories told here are meant to illustrate the explanatory power of economic models of real world phenomena. While economic abstractions and jargon are kept to a minimum, there are some.

It is not uncommon for medical scientists to devote their bodies in quests to test experimental compounds, but giving one's body to achieve a social-science objective may be unprecedented. In an ironic twist of events I, an author of several articles on the evils of international cartels, became a guinea pig in a medical experiment prompted by the discovery of an international cartel.

In December 2004, I volunteered for a clinical trial at a local hospital. A small Italian manufacturer sponsored the trials. The researchers were interested in evaluating the effectiveness of a new radiological contrast agent based on gadolinium compounds for MRIs (magnetic resonance images). MRIs have become a popular technique for diagnosing heart disease. A reason for the test was that a former contrast agent was being made by only one company in the world, making supply conditions perilous. When I researched Medline, several articles published in the 1960s and 1970s refer to salts of Methylglucamine as the "standard ionic contrast agent" for cardiologists to use in angiography (a diagnostic imaging procedure).

In 2002, the EU had fined two manufacturers of Methylglucamine for a global price-fixing conspiracy in the 1990s. (One of them since dropped out of the market, making the remaining firm a monopolist). It appears that gadolinium compounds are being tested to assist the Italian firm to enter the formerly cartelized market for imaging contrast media. For me, 30 minutes of stress in an MRI machine was worth it.

I hope that the episodes narrated in this book will strike the readers as more than a historical footnote. It is intended to be more than a voyeuristic examination of criminal behavior, profit-seeking gone awry, and the tragic destruction of managerial careers and corporate reputations. It will become, I hope, a permanent reminder of the constant vigilance that must be exercised by a modern nation's legal system to restrain and correct the behaviors of companies that wield power in their markets.

Zionsville, Indiana
August 2006
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* Dear Reader: Detailed economic data presented in the Appendix Tables of the 1st edition of this book can be found at the following Web site: www.springer.com. Look for the title *Global Price Fixing* with the ISBN 3-540-34217-6 and you will find a button marked "Appendix Tables".

Acknowledgements

Many of my students and colleagues helped me write this book by tolerating my role as raconteur about these global cartels with at least feigned interest. Indeed, the first time that I put some thoughts on global cartels to paper was in a Departmental Seminar at Purdue University in March 1997. The enthusiasm of that audience helped persuade me that there was a need for this book.

I especially wish to thank a wide circle of professional friends for reading and commenting on early drafts of various chapters of this book or the academic articles incorporated in them. This circle includes: Kenneth Adams, Jay Akridge, Harry Ayers, Michael Boehlje, Yuliya Bolotova, Donald M. Brown, Darren Bush, Terry Calvani, Peter Carstensen, Mitchell Chitwood, Ronald Cotterill, James DeCoursey, Nicolas de Roos, Robert M. Durante, Catherine Durham, James Eales, Simon Evenett, Paul Farris, Bert Foer, Luke Froeb, Vivek Ghosh, Robert Lande, Jeffrey Hyde, John Kwoka, Maggie Levenstein, James B. Lieber, James MacDonald, Steve Martin, William Masters, Doug Miller, Francis Moro, Adair Morse, Willard F. Mueller, Brian Posewitz, Jonathan Rubin, Lee Schrader, William G. Shepherd, Maarten Pieter Schinkel, Johan Stennek, C. Robert Taylor, Gregory Werden, Lawrence J. White, Ed Whitelaw, Wouter P. J. Wils, Thomas Wilson, Karl Zimmer, and several anonymous reviewers of academic journals. Also due for thanks are the many fine economists who helped me sharpen my analyses on the existence and size of the cartel injuries through an adversarial relationship. The latter group includes Frederick Warren-Boulton, Charles Chicchetti, Kenneth Elzinga, Fred S. McChesney, Jeffrey A. Dubin, and various journal editors and reviewers. Finally, the other advisors of the American Antitrust Institutes for allowing me to engage in the liveliest antitrust discussion group on the planet.

Several members of my Department's staff contributed to the preparation of this book's manuscript. Leslie Stetler is the always animated and skillful desktop publisher of this book, along with her colleagues Angelica Holt and Pamela Leap. Debby Weber, David Ubilava, Jeffrey Zimmerman, and Gustav Helmers also assisted in the preparation of the manuscript.

Finally, I would like to express my appreciation to Purdue University for its material support during 1997-2006.

Contents

Chapter 1: Introduction

This book recounts how a modest number of highly placed managers in prominent multinational companies built and ran three global cartels, a way of doing business that had rarely been seen for half a century. For periods ranging from three to 11 years, these enterprises raised prices and reaped extraordinary profits. Although highly lucrative for the participants in these cartels, the tragic reality is that financial fortunes were created for the few at the expense of the many. The cartels' effectiveness rested on the exploitation of their customers and their customers' customers who traded in markets that were twisted out of their natural shapes. These clandestine conspiracies operated with impunity, but through a combination of serendipity, cupidity, and routine police work they were discovered, investigated, and punished by several of the world's antitrust agencies. The sanctions imposed set historical precedents for severity. In the aftermath of prosecutorial victories lay shattered corporate reputations, broken careers, and a glimmer of hope that the next generation business leaders might learn from the mistakes of the past.

Purpose and Scope

The goal of this book is to describe and analyze in depth the origins, operation, and impacts of global cartels in the markets for lysine, citric acid, and vitamins. These products are organic chemicals purchased in bulk by tens of thousands of food, feed, and pharmaceutical manufactures. They are essential and unique ingredients in thousands of products purchased by nearly every household in the world. In each case, the products are made in industries that are dominated by a very small number of multinational producers. Whether made by complex biotechnologies or sophisticated chemical synthesis, the production processes somewhat insulated the established manufactures from competition outside the cartel. In other words, the lysine, citric acid, and vitamins industries are classic oligopolies protected by substantial barriers to entry that are eminently positioned to exploit their customers by exercising market power.

Market power can be wielded in ways both legal and illegal. This book documents that the leading suppliers in the lysine, citric acid, vitamins, and other industries chose the path of illegality. How the conspirators organized their scheme is a major preoccupation of this volume. In each case, top executives of the major producers formed conspiracies around 1990 that resulted in elevated prices and restrained industry output. There is some evidence that the three cartels were linked at inception, the financial success of the first cartel helping to inspire the establishment of the others. In scores of meetings held in supposedly safe havens (and rarely in the United States), the cartels' managers shared their companies' deepest secrets in order to build trust and arrive at mutually beneficial agreements over prices and output. Spats broke out from time to time, but the threat of self-enforced punishment mechanisms and the lure of profits brought them back together. Knowing that they were breaking the law, they used fake identities, phony agendas, code words, and other spooky techniques to hide the true nature of their joint venture.

Yet, despite the cover-ups and denials, they were caught. In what is widely seen a great victory for antitrust enforcement, the participants of these cartels were prosecuted by the Antitrust Division of the U.S. Department of Justice (DOJ) during 1996-2000, hounded in the courts by thousands of aggrieved customers, and forced to disgorge much of their monopoly profits. This book traces how U.S. antitrust prosecutions rippled outward to the world's major industrial countries. In Canada, Mexico, Europe, Asia, and Latin America, antitrust authorities tried to duplicate the well-publicized prosecutions of the DOJ. In many cases, antitrust officials realized the inadequacy of their laws, procedures, or sanctions to cope with huge global dimensions presented by such cartels. In several jurisdictions reforms are underway that will grant government prosecutors new investigative tools and enhanced powers to punish price-fixing behavior more effectively.

These prosecutions resulted in an abundance of information about cartel behavior and effects the likes of which have not been seen for many decades. These data offer an extraordinary opportunity to measure the market effects of collusion: prices, quantities, and injuries to customers. Moreover, this book investigates and assesses how harsh were sanctions imposed by courts and commissions around the world. This exercise permits an appraisal of the effectiveness of the antitrust laws to deter cartel recidivism.

Importance of the Cases

Economists have long lamented the paucity of information on price-fixing conspiracies in general and global conspiracies in particular. One would like to have information on the size of the markets affected and of the economic injuries caused by cartel's operations. To gauge the size of the injuries to buyers, the price effects are critical. However, in general, most criminal antitrust cases require no testimony on economic effects, most civil cases never make it to trial, and the forensic economic analyses prepared for such cases are kept sealed by court orders. "Comprehensive studies of the effects of cartels upon prices are not available" (Edwards 1976:12). This book fills this gap by supplying fairly precise estimates of the effects of global cartels on prices, production, and profits.

Besides the quantitative analysis of the economic impact of cartels, this study is important for several other reasons. First, although the focus is on three specific cartels, they are typical in many ways of hundreds of other international cartel cases prosecuted in the last decade or so. Lysine, citric acid, and vitamins were on the leading edge of a worldwide epidemic of global price fixing not seen since the 1940s. These cases illuminate with crystalline clarity the motives for global cartel formation and the methods of cartel operation. Second, these case studies highlight that the size of the industries involved in cartelization and the severity of the injuries caused has reached unprecedented levels. Third, the cases examined herein demonstrate an important shift in antitrust enforcement policy toward greater attention to global cartels and how prosecutors have developed new methods of investigation, novel types of sanctions, and overcome legal barriers to prosecution. Effective prosecution has in turn led to a continuation of broad-based political support for competition laws and a rare example of a global harmonization in economic policy.

A Renaissance in Global Enforcement

Antitrust was not an issue in the 1992 U.S. presidential election campaign, yet President Clinton made appointments in the Justice Department that ensured a more assertive posture in antitrust enforcement than was seen in the 1980s (Balto 1999).[1] Late in the Clinton administration in particular it became apparent that the DOJ was unafraid to launch dozens of high-profile cases in the price fixing, merger, and monopoly areas. However, commentators of all stripes have noted that attention to global cartels was a

1 A little known fact is that when Bill Clinton first returned to his native state of Arkansas in the early 1970s, he taught law at the University of Arkansas. His first teaching assignment was a course in antitrust law (Balto 1999).

hallmark of the late Clinton administration. In an article highlighting seven major antitrust achievements in the late 1990s, David Balto states: "In its greatest single antitrust achievement, the Clinton administration has dramatically refocused criminal enforcement . . . to international cartels" (*ibid.* p. 25). Writing just a few months after the ADM convictions at the Chicago trial, a leading member of the antitrust bar predicted that:

> "The most significant and enduring antitrust enforcement initiative of this era will be the aggressive criminal enforcement of international cartels by the antitrust division." (Klawiter 1998:201).

Among the factors driving this change in policy emphasis, argued Klawiter, were success in prosecutions, improved procedures for gathering evidence outside the United States, and greater international cooperation among antitrust agencies.

Journalists tended to mention a confluence of personal and political factors to explain the Antitrust Division's "renewed vigor" in prosecuting global cartels:

> "The aggressive posture has been driven by a mix of political opportunism, frustration with past missteps, attractive inducements to whistle-blowers, and other factors." (*Los Angeles Times* May 22,1999:A1).

Among the other factors mentioned were the DOJ's efforts to recover from a stinging defeat in the *Industrial Diamonds* case in 1994, bipartisan support for antitrust in the U.S. Congress, and the recognized phenomenon that presidential administrations display less caution about offending business constituencies when re-election is not a concern.

These comments by outside observers were echoed by speeches given by DOJ officials. As early as 1995, the Division head stated that: "The Antitrust Division is . . . substantially expanding investigations and cases with significant international aspects" (Bingaman 1995). The annual reports of the Division and subsequent speeches by its top officials confirm that a substantial reallocation of resources tools place toward global price-fixing matters in 1994 and 1995 (Spratling 1999). In a speech given before competition-law officials from around the world gathered to consider anti-cartel enforcement, Assistant Attorney General for Antitrust Joel Klein noted that from 1950 to 1995

> ". . . [O]ur international cartel cases became few and far between . . . simply because we didn't have any evidence

> that international cartels continued to be a problem. That has all changed." (Klein 1999:3).

The mere fact that officials from 30 antitrust agencies had assembled at such a conference ". . . reflects the dawn of a new era in antitrust enforcement against international cartels" (*ibid.*). It was indeed a watershed event, because it led to the establishment of a novel supra-national organization called the International Competition Network. The ICN has become a vibrant springboard for the harmonization of anticartel enforcement among antitrust authorities of more than 100 countries.

A symbol of the sea change in enforcement priorities is the fact that the DOJ's Antitrust Division did not bother to distinguish purely domestic matters from international ones until 1998. Since then, armed with a precise if rather broad definition of "international", the Division has noted the remarkable globalization of its activities on several occasions. A striking statistic concerns the proportion of corporate or individual defendants that were indicated for criminal price-fixing violations by the DOJ. Prior to 1995, less than 1% was foreign-based corporations or foreign residents, but since 1998 the proportion has risen to a startling 40 to 70% of such indictments (figure 1.1).

Another quantitative indicator is the fines secured by the DOJ for price-fixing violations, virtually all as a result of corporate guilty pleas. Joel Klein, chief of the Antitrust Division at the time, said that the $900-million-plus in fines in fiscal year 1999 is more than the entire history of U.S. antitrust enforcement (Klein 1999). Prior to 1994, the largest such fine was $2 million. From 1994 to 1999, record fines were obtained in nearly every year, and the 1999 record was still unsurpassed in 2006 (figure 1.2). In 1994 the record price-fixing fine grew out of purely *domestic* cartels, but all the subsequent record fines were from members of *global* cartels.

In this book "global" carries a special meaning. "International" cartels are those with corporate participants from two or more countries; such organizations often are international in a geographic sense as well. However, some cartels that are international in membership operate within one country or antitrust jurisdiction. Global cartels, on the other hand, are defined as conspiracies that bridge two or more continents. Thus, global cartels are far-flung international conspiracies. They are relatively new and especially pernicious forms of business enterprise.

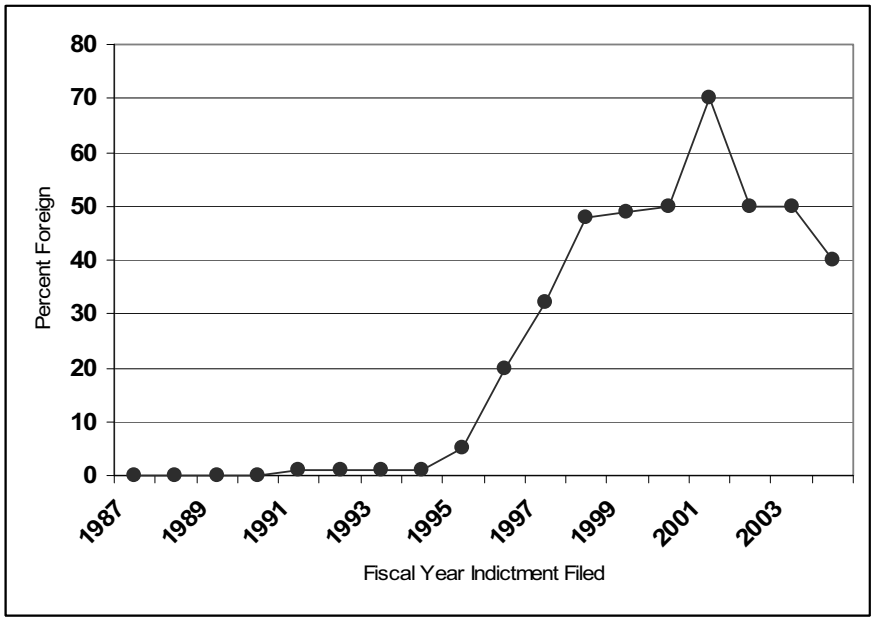

Figure 1.1 Proportion of Corporate Defendants in U.S. Criminal Cartel Cases that Were Foreign, 1987-1999

Sources: ICPAC (2000), DOJ (2004), Hammond (2005)

The DOJ is not alone in targeting foreign firms for price fixing. Canada's Competition Bureau and the European Commission's DG-COMP have likewise investigated and fined predominantly firms headquartered outside their respective jurisdictions. Mario Monti, the EU's competition law commissioner, made fervent speeches about the necessity of tough anticartel enforcement. He called global cartels "cancers on the open market economy" (*The Guardian* September 19, 2000). A 1999 survey of legal experts in antitrust law found clear evidence that competition-law prosecutors from around the world were "imbued with anticartel fever" (*Business Crimes Law Report* January 2000). Besides evidence from Canada and the EU, at least 20 other antitrust authorities have fined international cartels since 1990 (Connor and Helmers 2006).

A study of all private international cartels discovered during 1990 to 2005 finds that 197 cartels had been sanctioned by antitrust authorities around the world and that about 80 more were being formally investigated in 2005 (*ibid.)*. Of the 197, four had been warned and the rest forced to pay monetary penalties. Measured in 2005 dollars the monetary fines and

settlements known to have been paid by the sanctioned cartels through the end of 2005 totaled $16.2 billion.

Indictments and prosecutions of global cartels are likely to continue at a rapid pace during the first decade of the new millennium. In the early 2000s the Antitrust Division had more than 50 grand juries in session investigating possible *international* criminal antitrust violations (Hammond 2005). The biggest issue of international antitrust enforcement in the 1960s – the extraterritorial reach of U.S. law – has faded to unimportance. Extraterritorial prosecutions are now practically a customary rule of international law (Waller 2000).

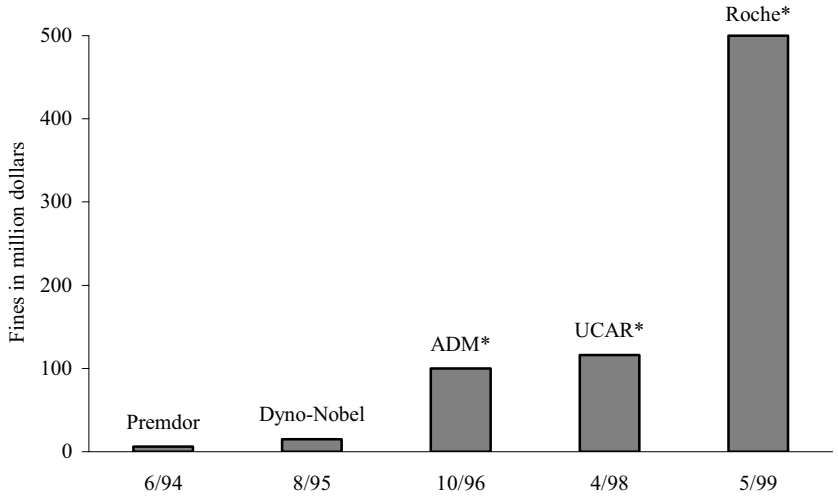

Figure 1.2 Record U.S. Criminal Antitrust Fines for Corporations, 1994-1999.

Sources: Bell and Laskin, Connor (2000).
* = Members of a global cartel

Affected Sales and Injuries Are Huge

"Affected sales" is the term used to describe the total revenues in a market during a price-fixing conspiracy. From a sample of all discovered private international cartels discovered since 1990, affected sales in real 2005 dollars is known to total 1.4 *trillion*; for all of the nearly 300 cartels, it is likely that affected sale topped $2 trillion (Connor and Helmers 2006).

Those sales are distributed across North America (39%), Europe (39%), and the rest of the world (23%). The reason that sales are so heavily concentrated in two continents is simply because the world's most active antitrust authorities are in Canada, Western Europe, and the United States.

There is an accumulating body of knowledge showing that cartels are more injurious than formerly believed. In the early 1980s the United States established sentencing guidelines for cartels; the best informed economists and prosecutors of the day built those guidelines on the assumption that the cartel average overcharge was 10% (Connor and Lande 2005). However, a comprehensive survey of virtually every publication on the subject, found quantitative information on more than 1000 price effects by private cartels. That study concludes that the median cartel mark-up is 25.0% and that 79% of all cartel episodes achieve overcharges above 10% (*ibid.* pp. 543-545). Moreover, international cartels have historically generated overcharges 75% higher than purely domestic schemes.

Looking at data on only contemporary international cartels, price effects seem undiminished. A sample of 284 private international cartels discovered since 1990 results in median estimated overcharges of 26% (Connor and Helmers 2006). Combining this mean with projected sales results in global injuries of more than $500 billion (in real 2005 dollars). This study finds that the mean overcharges of *global* cartels were about 30%.

A major objective of the present work is to provide accurate estimate of the economic costs imposed on market participants by global cartels. As explained in chapter 2, the most widely accepted measure of price fixing harm is the *overcharge* to customers of a cartel during the period when prices were elevated above their non-conspiracy levels. The customer overcharge is a conservative measure of economic injury because it does not count the efficiency losses caused by the distorted prices.[2]

In the United States, the 1992-1995 lysine overcharges amounted to $80 million, or 17% of affected market sales (see Chapter 9). The citric acid cartel overcharged U.S. customers between $150 and $300 million, or 14 to 21% of sales (Chapter 6). However, the largest of the global cartels were those manufacturing bulk vitamin products (Chapter 12). Estimates of the overcharges to U.S. buyers vary from $1.1 billion on sales of $5.5 billion (a 20% rate) to $3.0 billion on $8.4 billion in sales (36%).[3] Taken altogether the vitamins cartels were probably the most destructive global

2 The dead-weight static loss is caused by underproduction and is typically five to ten% of the value of the monopoly overcharge. Some U.S. court circuits accept the dead-weight loss as a compensable harm. In addition, cartels may generate dynamic losses.

3 A case filed by scores of the largest U.S. retailers against the Visa and MasterCard syndicates in 1997 claims monopolization damages of $8.1 billion (Wilke 1999). When adjusted for inflation, the heavy electrical equipment cases of 1960 affected a greater value of sales but may have had smaller overcharges. These cases were domestic ones.

conspiracies of all time, with world wide customers overcharged by $4 to $9 billion.[4]

New Antitrust Enforcement Tools

The 1990s saw a number of significant improvements in law enforcement methods first applied in the global cartel cases that are the focus of this book. Innovations were seen during the investigation, negotiation, litigation, and sentencing phases of prosecution. Of course, luck played a role in the eventual prosecutorial victories, but the new methods and stiffer sanctions appear to have raised the effectiveness of government antitrust enforcement. In addition, changes in federal and state class-action procedures and larger settlements for opt-out firms have increased private damage penalties in the United States. Finally, anticartel practices of several overseas competition law agencies have become clarified, and a movement toward greater use of civil suits is also evident. The upshot of all these changes is a significant increase in the potential liability facing participants in global cartels. Consequently, there is some expectation that the elevated enforcement competencies of the 1990s will instill greater deterrence for global price fixing in the 2000s.

Among the major improvements in global price-fixing investigation procedures is the introduction of automatic amnesty for the first qualified corporate whistle-blower. Under certain publicized conditions, the first company to come forward with reliable information about a conspiracy in restraint of trade is guaranteed full forgiveness of government fines. Later arrivals to cooperation with prosecutors are given smaller reductions. Many other countries have instituted similar plans. Since the late 1990s, the U.S. DOJ has been getting two tips per month from companies seeking amnesty. Another innovative program that stimulates cooperation from individual cartel participants who may be facing felony convictions stems from a memorandum of understanding between the DOJ and the Immigration and Naturalization Service. This agreement allows the DOJ to offer a foreign resident guaranteed future movement across U.S. borders, when normally convicted felons lose that right. A widening zone of countries with extradition treaties for criminal price fixers is making it harder for cartel participants to escape the consequences of their conspiracies.

The FBI and its sister agencies abroad have begun to use the full panoply of weapons in their intimidating arsenal: large-scale “raids” on

[4] One of the reasons for the discrepancy is the treatment of the vitamin animal premix market. A few of the conspirators sold both pure bulk vitamins and a value added mixed product. Conspiracies existed in both types of markets.

offices and homes, telephone taps, body wires, and offers of amnesty for informers. The lysine case clearly demonstrated the importance of one more investigative technique that had never been used prior to 1993 for price-fixing allegations, recording conspiracy meetings on tapes. In a jury system operating in the television age, nothing is more persuasive than capturing the words, facial expressions, and body language of conspirators in action for replay on a monitor in court.

While the business community may abhor the development, the appearance of what are sometimes called "social reform" law firms has in all likelihood made life more difficult for cartel participants. These firms bring class-action suits in a broad array of perceived injustices that are not being addressed by the congress or regulatory agencies. The actions are made possible by subsidizing high-risk cases from the retained legal fees of more conventional class-action suits.

New Insights into the Machinery of Cartels

The outbreak of global cartelization after nearly fifty years of dormancy may be compared to biological contagion. Price fixing behavior on a global scale had erupted in the decades before World War I and again prior to World War II. U.S. prosecutions in the late 1940s seemed to douse the fires of conspiracy for two decades or more, but in the late 1980s global cartels sprung into action. The conspiracies also resemble contagion in the sense that within some firms with multiple lines of business, once one product line was proving the profitability of price fixing, it infected another line of business.

The global cartels that were discovered and prosecuted after 1995 share several features (Spratling 1999, Griffin 2000). These cartels were formed and operated by the company's top executives who typically had decades of seniority. Initially, only two or three officers were involved in the planning and execution of the conspiracies, but eventually each company would contribute at least ten men to a cartel's maintenance.[5] The conspirators "without exemption" were ". . . fully aware that they [were] violating the law in the United States and elsewhere" (Spratling 1999:9) and showed in their conversations ". . . contempt and utter disregard . . . for antitrust enforcement" and for their customer-victims (Griffin 2000:5). Even seasoned antitrust lawyers were shocked by the crudeness of the lysine conspirators' conversations: "People literally could not believe how direct and brazen it all was" (*USA Today* July 10, 2000). Yet, the conspirators evidenced a special fear of what they perceived to be tougher U.S. antitrust

5 I use the word "men" intentionally in its strict gender sense. Among the more than 200 individuals named so far, only one is identifiably female.

enforcement. "Defendants in several recent cases have revealed that the cartels changed their practices and began avoiding contracts in the United States at all costs . . ." (Spratling 1999:10). Cartels frequently utilized industry trade associations as covers for their illegal meetings, prepared false agendas and false minutes, and took many other steps to hide their conspiracies.

Although assisted by electronic methods of communications, nearly all the cartels required quarterly face-to-face meetings to revise their agreements and check on progress toward their goals. In nearly all cases, list prices (target prices, floor prices, or ranges) were set with great precision, and transaction prices inevitably responded within days or weeks. While strictly speaking unnecessary, ". . . most cartels recognize that price-fixing schemes are more effective if the cartel also allocates sales volume among the firms" (Spratling 1999:11). With volume agreements in place, price wars and other self-destructive disciplinary tactics were generally avoided. Cheating was also discouraged by internal compensation plans, division of pooled profits, audits by third parties, or simple bullying by dominant members.

Epidemics end when the susceptible hosts disappear or when growing conditions turn unfavorable. Although a few of the corporate members of the global cartels discovered in the late 1990s have left their industries voluntarily, the financial sanctions imposed on them were not poisonous enough to kill them off. The individual conspirators taken out of circulation by prison sentences can hardly dent the supply of potential price fixers.

Although only time will tell, it is likely that the severe sentences meted out to both corporate and individual conspirators will dampen if not extinguish the enthusiasm for overt price fixing. The antitrust regulatory atmosphere is clearly more frigid in all the major industrialized countries than was the case in the 1980s. Unfortunately, the financial penalties are insufficient. The fact that there are hundreds of corporate price fixers that became repeat offenders. Corporate antitrust compliance programs have the potential for leveraging the deterrence effect of harsh sentences, yet it appears that these lessons are lost in the space of a decade or two as a new generation of corporate leaders take the helm and institutional memories are lost. What may be needed is something akin to a genetic mutation for many corporations: corporate governance structures and values that reward ethical behavior.

Global Cartel Connections

Cartels often are discovered in clusters with firms that participate in overlapping conspiracies. There is considerable evidence to suggest that the effectiveness of the vitamin cartels inspired the formation of the citric acid cartel a year later. Moreover, there is irrefutable evidence that it was ADM's satisfaction with its citric acid scheme that incited an ADM officer to start the lysine cartel less than a year after citric acid was under way. Not only is there enough information on which cartel spread the infection that caused cartel fever elsewhere, but also there is a fair degree of certainty about which companies and which persons were the carriers.

The causal chain of events linking the three global cartels is sketched in Figure 1.3. The time line begins with Hoffmann-La Roche and BASF getting together in late 1989 to begin colluding on the prices of vitamins A and E. Soon thereafter the head of Roche's Vitamins and Fine Chemicals Division wrote an internal memorandum suggesting that Roche's experience with these two vitamins is so satisfactory that cartels should be explored for other products in his division.

In early 1991 Roche's senior marketing manager for citric acid received an unexpected visit from top officers of the world's newest manufacturer of citric acid, ADM. The timing could not have been better. Roche was primed to accept the emissaries' overtures to form a global cartel for citric acid. Within two months, the four largest global suppliers of citric acid came to a durable agreement to raise prices worldwide. One of the two ADM officers was Terrance Wilson, and he almost immediately began the search for cartel material among other ADM products. Lysine was the one that had the most promise.[6] In April 1992, Wilson took ADM's head of lysine operations Mark Whitacre to Tokyo to meet with the largest suppliers of lysine. A third cartel was launched in June of that year.

Sources

This book relies on a broad selection of primary and secondary sources of information. Among the primary sources are the transcript of the trial that convicted three lysine cartel conspirators *(U.S. vs. Michael Andreas et al.)*; scores of legal briefs, plea agreements, memoranda, affidavits, and court

6 It is known that Wilson explored establishing a cartel in lactic acid, a food acidulant similar to citric acid. Other products believed to have cartelized by ADM include monosodium glutamate (MSG), three corn sweeteners, and sodium gluconate. Methionine is another possibility.

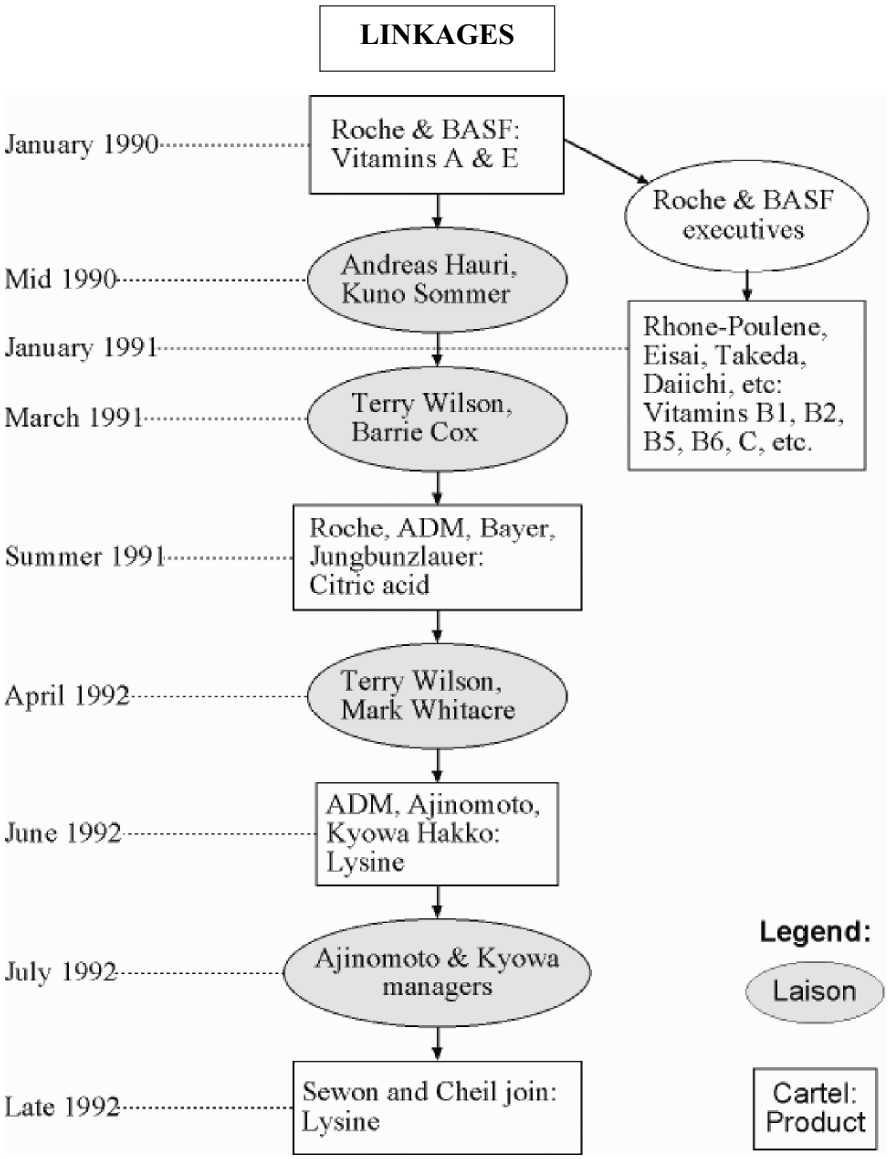

Figure 1.3 Personal and Corporate Connections among Three Cartels

orders and opinions; copies of original documents submitted as exhibits for trials or obtained under pre-trial discovery processes; speeches, decisions, and other documents released by antitrust agencies; and corporate web

pages and investor reports. Two books (Lieber 2000, Eichenwald 2000) shed light on the U.S. investigation and conviction of the lysine and citric acid conspiracies; they quote from direct interviews, audio tapes, video tapes, and FBI interview forms. Among the secondary sources are magazine and newspaper articles, papers by economists, and law-review articles.[7]

This work tries to enlighten readers about the complex interplay among personal motivations, economic forces, and the legal environment. While amply illustrated with quantitative information, formal statistical or mathematical analysis is eschewed in the interests of readability. Some of the conclusions formed have been influenced by my role as a forensic economist, but not, I believe, at the expense of rigorous economic reasoning nor in breach of my layman's understanding of legal principles.[8] At times a straightforward narrative of the events surrounding a cartel or legal process was chosen as the most appropriate method of exposition.

Organization

The eighteen chapters that follow fall into three groups. Chapters 2 and 3 provide background on the economic theory and legal principals relevant to understanding cartels. Both are fairly non-technical treatments of the subjects. Readers with more than a passing knowledge of price analysis and welfare theory can easily skip Chapter 2. Chapter 3 is a broad survey of U.S. and non-U.S. competition law, enforcement procedures, and sanctions applied to anticartel enforcement.

Chapters 4 to 12 present three thorough cartel case studies: citric acid (Chapters 4-6), lysine (Chapters 7-9), and vitamins (Chapters 10-12). In each case, the initial chapter lays out the demand and supply characteristics of the product market; the second chapter narrates the major events in the life of the cartel; and the third chapter collects what can be learned

7 Most sources used are listed in the References section at the end of this book, but to avoid unnecessary clutter other factual sources employed in this book can be found in the author's working papers, such as Connor (2003, 2006b) and the chronological appendices of Connor (2000) [http://agecon.lib.umn.edu/index.html]. The latter working paper cites more than 1000 sources, arranged in several chronologies and indexed.

8 In the spirit of full disclosure, readers should know that I have served as an expert for U.S. and Canadian plaintiffs in civil antitrust matters that involved the following products: lysine, citric acid, bulk vitamins, methionine, sodium gluconate, and corn sweeteners. I also served as a testifying expert for prosecutors in one criminal case involving an amino acid. Confidential information received in the course of these projects is protected by court orders and by promises to clients. However, some information from publicly available sources taken from reports originally prepared for clients has found its way into this work, and some of my previous analyses have tempered conclusions expressed in this book.

about the economic impacts of the cartel on prices, profits, trade, and customers.

Three following chapters concentrate on the legal fallout from the exposure of the three cartels. Chapter 13 narrates the U.S. Department of Justice's criminal cases against the international cartels, ending with an assessment of the effectiveness of the prosecutions. Chapter 14 follows similar developments by competition-law units in Canada, the European Union, and elsewhere outside the United States. Finally, Chapter 15 covers the civil suits filed against members of the three cartels, most of which were filed by U.S. buyers.

Chapter 16 addresses some of the questions about the adequacy of legal resources that are available to fight or defend cartels, both government and private organizations – the forensic law industry so to speak. The final chapter attempts to identify major themes that appear throughout the book and to provide a summary of the ultimate impact of the global-cartel pandemic.

Chapter 2: The Economics of Price Fixing

This chapter offers a non-technical economic explanation of the causes and effects of price fixing, beginning with a description of how prices are formed in competitive markets and in the presence of a monopoly. These two analytical models of how prices and output evolve in markets are too unrealistic to fit natural markets, yet their contrasting results are useful because they bracket the price/quantity outcomes in real markets. That is, perfect competition and pure monopoly are the extreme points on a continuum of market environments, and the performance of real-world markets tends to be "in between" the two extremes.

These "in between" markets have a small number of sellers or buyers. Small numbers raise the possibility of strategic behavior among sellers, of which price fixing is one type. Price fixing is more than just fixing prices, so an enumeration behaviors that constitute a broader notion of price fixing is provided. This is followed by an explanation of the economic factors that affect the formation and success of cartels. The chapter ends with a brief empirical analysis of the economic harm imposed on market participants by effective cartels and a brief historical survey of global cartels.

Basic Concepts

Pure Competition and Monopoly

Until the 1930s most students of economics were taught only two diametrically opposed abstract models of how markets worked. The perfectly competitive market model describes a world in which there is a large number of buyers and sellers, all of them well informed about prices and product quality and trading perfectly homogeneous goods according to uniform trading rules. Goods are homogeneous when buyers are unwilling to pay more for one seller's product compared to any others. A key assumption in this model is that if the numbers of buyers or sellers become too few, there is nothing preventing more of them from jumping into the market almost immediately to take advantage of trading profits. Similarly, in the face of

negative profits, participants could quickly and costlessly exit the market by selling their assets to large numbers of willing buyers. Another assumption is that trading occurs in a double oral auction in which the participants could observe the price of every transaction. While this ideally competitive market is an abstract construct of economic theorists, some real world markets in agricultural products or stock trading come pretty close to matching its characteristics. Even though few natural markets are perfectly competitive, the model is important because it is a benchmark for comparing the performance of all other markets.

The behavior of sellers in perfectly competitive markets is also rather unrealistic. Firms in perfectly competitive markets lead pretty dull lives because they are pure price-takers. After checking out the market price, a seller sets the firm's output at the profit-maximizing level, which is the same level at which all other identical firms set their output. Individual firms pay no attention to overall market demand.[1] The seller then observes input prices and purchases an optimal mix of labor, capital, and other inputs from markets that are also perfectly competitive; all sellers choose the same mix of inputs because they all have adopted the same low-cost technology of production. All the sellers earn zero economic profits (which will be a positive rate of return on investment, adjusted for market risk, on the company's financial records). Perfectly competitive firms are unconcerned about creating loyal customers because they can always sell all that they can make at the market price.

The other model is pure monopoly. In this case, a single firm supplies the entire market for a well-defined product. The monopolist sets the market price on the assumption that entry into its industry is blockaded, perhaps because the firm has unique access to an essential input or production technology or perhaps because it owns patent or trademark that makes its product inimitable. A monopolized good may be homogeneous in the sense that it is simple or comes in only one grade or variety. On the other hand, the many buyers of the monopolist's product perceive that there are no satisfactory substitutes available for purchase; in this sense the monopolist's product is like a unique brand that has no rivals – it is the most differentiated of products. Like the perfectly competitive market, there are few examples of pure monopolies in natural markets, and the few that exist tend to be publicly regulated.

Behavior by monopolists is quite different from perfectly competitive firms, though it too has an air of unreality about it. The monopolist sees the demand for its product as identical with market demand because

[1] Nor is there a role for a trade association to stimulate market demand or to create product standards in a perfectly competitive market. However, if government intervenes in the market, such associations may have a lobbying role.

buyers believe there is no substitute for the monopolist's product. Market supply equates with the output under the control of the monopolist. There is no market price separate from what the monopolist decides to charge; that is, the monopolist is a price-maker not a price-taker. The profit-maximizing price set by a monopolist will depend only on its costs of production and the shape of the market demand curve. The monopoly price will be positively related to the height of production costs and inversely related to elasticity of demand.[2] The most important implication of the monopoly model concerns its effect on market performance.

Welfare analysis demonstrates that perfect competition results in the greatest quantity of production at the lowest possible price, which is highly beneficial to consumers. Monopoly, on the other hand, restricts output to some level below the competitive level, resulting in a loss in consumption and production. This is termed the dead-weight loss. Moreover, the supra-competitive price charged by a monopoly results in the transfer of income from buyers to the owners of the monopoly. While a loss to consumers who still buy at the elevated price, not all of the transfer is a loss to society.[3] A monopolist may set a single price, but the size of the transfer can be increased if the monopolist is able to divide demand into distinct groups that are then charged distinct prices; such price discrimination may be on the basis of size of purchases, buyers' income, or each group's sensitivity to price.

Oligopoly

Firms in perfectly competitive markets cannot manipulate demand and have no power over price. Perfectly competitive behavior is anonymous. There is no benefit in getting to know one's input suppliers or competing sellers because there is no hope of developing a common strategy that would pay. The free-entry condition alone ensures the unprofitability of collective action.

The possibility of group activity aimed at raising profits through purely private actions is much greater in an *oligopoly,* that is, an industry

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2 If *P* is price, *MC* is the marginal costs of production and distribution, and η is the elasticity of market demand, then the optimal monopoly price is: $P_m = MC/(1- 1/\eta)$. When η is a small negative number, demand is inelastic. Holding costs constant, the smaller η is, the larger is the optimal price. In a perfectly competitive market η is perceived to be infinite; thus P = MC.

3 To the extent that the transfer (monopoly profits) is used by the seller to bolster or maintain its monopoly power, this is also a social loss.

with a few sellers.[4] In essence, when a group of sellers becomes small enough to control a sufficiently large share of sales in the market, the group comes to realize the possibility of collective action that can raise the group's total profits. Similarly, when numbers of sellers are few, they begin to appreciate the fact that their independent decisions over price or output can hurt the profits of their industry rivals.

In the 1930s, progress in cartel theory was aided by the discovery and development of simple, static oligopoly models. Thinking about cartels was also greatly influenced by legal-economic case studies of the tobacco, steel, aluminum, and other industries with well documented cartel prosecutions. The great early industrial-organization economist Edwin Chamberlin (1933) called this "mutual dependence recognized." That is, oligopolists infer that their business actions (price changes, output adjustments, plant investments, and the like) *will* affect the profits of their rivals, and vice-versa.[5] Typically, oligopolists form strategic plans that take into account what their industry rivals will do in response to a notable business action. Strategic thinking of this type is folly in a perfectly competitive industry because the actions of one firm can only have an infinitesimally small impact on industry supply or product price.

Chamberlin (1933) envisioned that monopolistic conduct would spontaneously replace cutthroat competition when the number of firms slipped below some critical threshold. Cartel agreements may involve such sudden shifts toward noncompetitive behavior, though it is more likely to be a shift from conscious parallelism a greater degree of cooperation. Modern oligopoly theory teaches that collusive behavior in general will result in prices significantly lower than pure monopoly prices (Werden 2004). However, dynamic games that best represent cartels also predict prices that are higher than noncooperative conduct.

Economists call the formation of market plans that take into account expected reactions of rivals *conjectures.* Strategic behavior falls into two one of two broad classes, cooperative and noncooperative. *Cooperative* or *overtly collusive* behavior requires a conscious agreement between rivals (established firms already selling into the same market) or between an actual and potential rival. "Conspiracies" in the legal sense are types of strategic behavior that economists class as cooperative. Overtly collusive groups are *cartels* (see box).

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4 "Oligopoly" was coined by Sir Thomas Moore in his book *Utopia* published in Latin in 1516. The term was revived in the first book on the economics of oligopoly, Edwin Chamberlin's *Theory of Monopolistic Competition* (1933). By the 1950s business newspapers began to contain articles using the word *(Oxford English Dictionary).*

5 Formal models of duopoly or oligopoly date back to Cournot (1838) and Bertrand (1883), but like Chamberlin (1929) these presume independent or tacitly collusive behavior.

Noncooperative behavior (also called *tacit collusion* or *conscious parallelism)* involves conjectures that are formed independently by firms. That is, firms develop hypotheses about rivals' strategic behavior without any direct "spoken" communication with those rivals. Typically, noncooperative conjectures are formed by observing a rival's reactions to historical changes in market conditions or to independent actions of the conjecture-making firm. A classic example of tacit collusion is price followership by firms that take note of public price announcements of leading firms. Conscious parallelism can evolve through "unspoken" communication (Werden 2004).

Cartel

A cartel is an association of two or more legally independent firms that explicitly agree to coordinate their prices or output for the purpose of increasing their collective profits. The members of a cartel must knowingly and intentionally conspire to raise (lower) the price of the product that they sell (buy) above (below) the price that natural market forces would cause in the absence of the cartel's actions. Affecting price will cause the quantity of product sold in the market to contract, but some cartels reinforce the price distortion by agreements to reduce output, sales, or industry capacity. Cartels can sign contracts or use various subtle techniques to communicate, monitor, and enforce agreements. Those conspiracies that engage in overt agreements about market price or quantity are called "naked" or hard-core cartels.

The word cartel come into English in the 16th century from the Old Italian word *cartello,* which meant a note or letter of defiance, a preliminary step in the etiquette of dueling. This sense of the word is now obsolete. A second meaning of cartel that slipped into the language a little later (and is still in use) is a written agreement between opposing armies for the exchange of prisoners. This meaning was extended by German writers in the 1880s to describe a government coalition that brought together normally antagonistic political parties. Shortly thereafter the word *kartell* was applied to a combination of two or more business rivals for the purpose of regulating prices or output of an industry. The word cartel was first used in English in this business sense in three British publications in 1902 to refer to what were formerly called "producers syndicates" or "trusts' (*Oxford English Dictionary*).

Cartel Theory

A cartel is organized for the purpose of maximizing the joint profits of its members.[6] If completely effective in meeting this goal, the oligopolists that

6 While there is a general presumption on the goal of profit maximization, there is some evidence that many private cartels operating in the 1930s may have had price stabilization as a principal or additional objective (Suslow 2001). In a sample of 34 cartel episodes, 59% raised prices and 56% stabilized prices; only 9% failed at both.

are parties to the agreement will enjoy collective profits almost equal to those of a monopoly in the same industry. A cartel may be viewed as a temporary and usually partial merger among rival sellers for the purpose of generating monopoly profits. For various reasons -- the costs of colluding, the inability of a cartel to insure uniform compliance with the agreement, and uncertainty about market conditions -- most cartels fall short of generating full monopoly profits.

The "Chicago School" of industrial economies mounted a number of serious challenges to the orthodoxy of the mainstream in the 1970s. However in the area of cartel analysis, there were few substantive differences between the two schools of thought. The principal difference was the importance of government regulations in supporting cartel behavior. The Chicago School tended to give great weight to regulations as an explanation for the formation and duration of private cartels. While the critical role of governments is clear in "public" cartels like OPEC, mainstream economists tend to dismiss the importance of regulatory bodies in maintaining private cartels organized by corporations.

The first formal theory of cartel behavior is that of George Stigler (1964). According to this model, cartels will be formed if the net present discounted value of the economic expected total profits made during the collusive period exceed profits that would have accrued during the same period in the absence of collusion (Friedman 1977, Dick 1998). The collusive profits exclude any added costs of monitoring and enforcing the cartel. Benchmark profits will be zero if the alternative to collusion is perfect competition, but often the but-for scenario is tacit collusion that would generate positive economic profits. Green and Porter (1984) put Stigler's model in the form of game theory.[7]

Osborne (1976) presents an elegant model of private cartels that boils down the decisions facing cartel members to five. First, to *form* a cartel the potential participants must locate the "contract surface;" that is, they must find which mutually satisfactory combinations of company outputs will result in profitable equilibria. Second, they must choose a precise rule for sharing sales. Then, in order to *sustain* the agreement, the cartel has to develop methods to detect cheating and to punish cheating from the quota agreement. If these third and fourth steps are successful, in order to *endure* the cartel must predict the likelihood of entry into the industry and adopt a

[7] McCutcheon (1999) has developed a cartel theory based on the interest group theory of government regulation (see also Bork 1978, Posner 2001). Her model depends on the application of quite small penalties to explain why cartels are formed, yet penalties that are large enough to encourage renegotiation of a cartel agreement after a price war. This model would seem to have been made obsolete by the high price-fixing penalties documented in this book.

strategy to prevent the growth of external competition. When prices rise the threat of entry may come from fringe suppliers or from substitute products.

To elaborate somewhat, the initial formation of a cartel will depend on the predicted collusive profits, predicted costs of managing the cartel, and predicted "but-for profits" (profits in the absence of overt collusion). Because potential cartel participants generally can be expected to ascertain easily their costs of production and distribution, the major items that need to be predicted are the collusive price, the duration of the agreement, the chances of being caught and prosecuted, and the economic costs of future price-fixing penalties.[8] There are likely to be uncertainties and differences of opinion among the potential conspirators on each of these four major factors; the greater the uncertainty and differences, the less likely the cartel will be formed.

The expected collusive price may be one of the easier items upon which agreement can be made. An approximate notion of the elasticity of market demand and knowledge about substitutes at anticipated cartel-enhanced price levels will usually suffice. The fact that most cartels are established by sales or marketing managers probably ensures that the conspirators will have the necessary expertise about customer behavior. If the expected cost of discovery and punishment are low enough, then predictions about durability will have little influence on cartel formation because even the short run collusive profits will be positive and high enough to justify launching a cartel. Prior to the mid-1990s, the size of government fines and civil settlements for price fixing *were* small in the major industrialized countries (see Chapter 3 below, Posner 1976). Now corporate price-fixing penalties are much larger, but *personal* penalties are either completely absent (as in the European Union) or treated under the law as civil misdemeanors in all but a few jurisdictions. Finally, the expected costs of collusion are low because the subjective probability of detection is low, as surveys of antitrust lawyers in the United States and Europe verify (Feinberg 1985).

If a cartel agreement is successful in raising market price, individual firms in the cartel can make even more profit by "cheating," that is, selling some of their output at prices below the agreed-upon price. Cartel members incur costs in monitoring the sales activities of co-conspirators. Moreover, one or more of the participants must be prepared to discipline deviants once they are detected.

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[8] Costs of production and distribution are usually readily knowable because production will contract to levels observed in the recent past. Management costs of collusion are trivial except for price wars and personal and corporate legal penalties. Most cartels appear content to use the pre-cartel prices or profit rates as the but-for scenario.

Modern cartels are usually clandestine. In the absence of reliable reporting of market transactions *within* the cartel, cheaters may be able to hide their chiseling from their co-conspirators.[9] Cartels operate secretly not only to avoid detection from antitrust authorities but also to hide the effects of collusion from their victims (Porter 2005). As a result, cartels will usually attempt to detect cheating indirectly from ambiguous or probabilistic information (Dick 1998). Stigler's model suggests that evidence on cartel cheating can be inferred from the behavior of customers. Evidence of cheating can be inferred from a participant's failure to attract an equal share of first-time buyers, a failure to retain its historical share of loyal customers, and by a decline in the market shares of non-cheaters in the cartel. This last signal would require reliable and frequent reports of members' market shares and a good notion of total market consumption. No cartel can expect to eliminate all cheating.[10]

The basic task of a cartel is to set a uniform market transaction price. Uncertainty about the costs of monitoring and policing the agreement will often imply that a cartel will start with a price well below the monopoly price. As experience, trust, and discipline grow, the price will ratchet up towards the profit-maximizing monopoly price. Thus, a cartel must regularly meet to reset the price, particularly to take into account shifts in demand or supply conditions. If different grades exist, price discounts and premia must be established and perhaps adjusted over time. The cartel must develop policies that discourage its members from expanding their sales through service differentiation. All these tasks will be made more effective if the cartel can agree to set observable market shares for each participant or divide markets by geography, product form, or by customer.

Price Fixing Conduct Defined

Price fixing is the quintessential example of cooperative behavior. The aim of oligopolists that enter into an overt agreement on price is to increase the *pool* of profits available to all sellers in an industry. The agreement on price might benefit some sellers outside the collusive group, but to be effective it must raise the pool of profits for those in the club above that

9 The presence of third-party reporting on transaction prices to sellers will generally facilitate illegal conspiracies. Organized auction markets are unlikely places for collusive price agreements whereas markets that depend on posted prices or bilateral negotiations are fertile grounds for collusion.

10 Cheating will be tolerated up to the point where the marginal costs of policing the agreement equal the profits gained from preventing cheating.

amount available prior to the agreement. Once the pool of additional profits is created, the collusive group must assure its members will share the pool as an incentive to join or remain in the group. This type of cooperative behavior is called joint-profit maximization.

Noncooperative strategies are pursued with the objective of increasing single-firm profits, possibly at the expense of the profits of the firm's rivals. Some types of price-leadership behavior are noncooperative oligopolistic conducts. In most price leadership cases, a single firm may be designated as the first mover in announcing price changes. This works as a collusive device because the leader conjectures that it will be followed under certain conditions and because the followers conjecture that a sufficiently large share of leading firms will follow. If such a form of industry behavior evolved through historical repetitions, it is tacit collusion.[11]

Price fixing has long been recognized as a problem in natural markets. Adam Smith, the founder of neoclassical economics, was a keen observer of the business practices of his day. Perhaps alluding to behavior he had observed in the coffee houses of 18th-century Edinburgh, he wrote in his famous 1776 book *The Wealth of Nations* that

> ". . . people of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

This passage neatly describes *horizontal* price fixing, that is, an explicit arrangement among sellers of the same product. It also points to the fact that a conspiracy may involve a wider array of specific agreements besides price fixing *per se.* Indeed, "price fixing" is really just a popular, short, and convenient phrase for the broader class of activities called "restraint of trade," a term that has a complex meaning in economics and the law.

Setting Prices and Conditions of Sales

A more complete list of collusive restraints is shown in Table 2.1. While raising prices (and thereby profits) is the key or ultimate objective, many other actions may be agreed upon to support that objective. There are six categories of trade restraints covered by the general term "price fixing." The first category covers price agreements proper and terms of sale that can directly affect the prices paid by customers. In

[11] If, however, the leading firms overtly agreed to such a strategy, it could be held illegal.

every case, these decisions by a group of sellers have the effect of reducing the total number of different prices sellers can charge and reducing the discretion of sellers in bargaining over price. By narrowing the array of alternative prices, a cartel reduces the costs of negotiating an initial agreement on prices and the costs of monitoring adherence to an agreement in force.

Most cartels begin by agreeing on *list* prices, that is, the price quoted to potential buyers in a company's catalog, on its web site, or by fax or telephone by its salespersons. The agreed-upon price tends to be an exact rounded number, such as $1.20 per pound (rather than $1.185 per pound) (Lanzillotti 1996). For ordinary consumers, there is no distinction between list price (also called "posted" or "shelf" prices) and the price at which a transaction will occur. However, for industrial products only the smallest or most anxious buyers will pay the full list price. Purchases for immediate delivery are called spot sales.

Many industrial products are sold primarily through annual supply contracts. The purchasing managers or agents for major buyers will expect a discount for the large quantities their company expects to purchase, and they may be willing to sign a long term supply contract to enhance their bargaining position. In some industries, the largest buyers solicit written bids from sellers they believe qualified to serve them. Spot sales, contract sales, and accepted bids result in *transaction* prices, all of which are usually lower than list prices. Over time, list and transaction prices tend to move together.

In many industrial markets, the conditions of sale are well known, customary, or specified by widely accepted uniform contract provisions. Where this is not the case, conspirators often must negotiate a common set of transactional conditions. These may include payment dates (e.g., due within 30 days of delivery), price protection clauses (limits on purchases made after a price increase is announced but before it is effective), price ratios for different quality grades (if any), and transportation charges. Eliminating or limiting discounts or rebates are a form of price fixing. Supply contracts that contain promises to match the price cuts of other sellers ("most-favored-nation" clause) or to "meet-or-release" buyers who find lower prices are frequently used to support collusion (Jacquemin and Slade 1989).

The classical economists of the nineteenth century implicitly assumed that trading occurred in a double oral auction in which the participants could observe the price of every transaction. Modern economic analysis verifies that auctions of several types do result in clearing prices and quantities exchanged that are quite close to these predicted by the model of pure competition (Marion *et al* 1987, Plott 1989). However, monopoly and

oligopoly tend to be associated with other trading and exchange systems: private negotiations, posted prices, formula contracting, administered pricing, and various vertical arrangements. A common characteristic in non-competitive markets is non-transparency of transactions; not all the prices or quantities traded can be observed by market participants.

Where quality grades exist, most conspiracies will focus on the purest or most common product form and rely on conventional discounts or premia to be applied to the modal product form. List prices frequently are quoted on the assumption that the seller will provide delivery of a full truckload or rail car within some conventional delivery

Table 2.1 Collusive Activities in Restraint of Trade

Pricing:	● Agreeing on list or transaction prices ● Agreeing on delivery charges ● Agreeing on discounts, rebates, or premia ● Agreeing on bid prices ● Agreeing on currency exchange rates ● Agreeing on price protection clauses
Shares:	● Setting global sales shares ● Setting global quantities per seller ● Setting regional or national shares ● Allocating specific customers ● Allocating winners on bids
Production:	● Agreeing on global output reduction ● Agreeing to limits on export destinations ● Restricting arbitrage by buyers ● Agreeing to restrict production capacities ● Refraining from production or sales
Monitoring:	● Sharing frequent, detailed sales information ● Agreeing to third-party certification of shares ● On-site inspections of facilities or inventory ● Meeting-the-competition clauses
Enforcement:	● Dominant firm targets deviants ● Periodic compensation mechanism ● Marketing agency for pooling sales ● Pooling and division of profits ● Trigger-price agreements
Cover-up:	● Destroy evidence of travel, meetings, communications, or monitoring ● Create or use existing trade association ● Use code language or ciphers

zone. Smaller loads or more distant deliveries will require price premiums. In some cases customer pick-up discounts will be specified. Unless transportation charges are set by customary industry practice, cartel members must grapple with creating them; otherwise buyers will be able to use them as bargaining points to obtain discounts that are difficult to detect. Geographic price differences may be quite complex in an extensive market like the United States; collusion will be more difficult if production sites are widely scattered and if imports from multiple plants is significant.

Cartel managers must be wary of raising prices too quickly, too high, and in the wrong season. Unless there is some extraordinary surge in demand or supply interruption, buyers will ordinarily be suspicious of radical price changes. With global sourcing so prevalent today, industrial buyers will soon alert antitrust authorities if prices rise in one geographic market but remain unchanged in some more distant region. Ideally cartels are formed around a unique product. However, the higher the prices of most products rise, the greater the number of close substitutes, and the looser becomes the cartel's control of supply. Many cartels have seasonal price fluctuations; raising prices during the conventional trough often helps overcome customer resistance.

Global price fixing is further complicated by the existence of multiple currency regimes whose exchange rates fluctuate. If regional price differences become too pronounced, a price agreement on storable commodities can be undermined by geographic arbitrage by companies outside the cartel (Bush *et al.* 2004). Most of the global cartels covered in this book used the U.S. dollar to maintain nearly uniform regional prices. Cartel managers typically met quarterly to adjust prices in response to exchange-rate movements.

Fixing Market Shares

The more successful a collusive group is in setting transaction prices at or close to the monopoly level, the greater the incentive for individual members to offer secret discounts to customers. Cheating on the price agreement will result in an increase in the quantity share of the deviant firm. The effect is to increase the deviant's profits and lower the pool of joint profits. The ability to detect secret price-cutting is a key feature that explains the effectiveness and longevity of cartels Stigler (1964). To counter such tendencies a cartel may assign volume limits or market shares to each cartel member. Negotiating volume or sales shares for its members is not strictly necessary for a cartel, but share

agreements reinforce cartel cohesion because quantities can be more easily monitored by the group than the prices of transactions. Faithful members of a cartel can use changes in market shares as indicators of cheating more easily than trying to verify allegations of price discounts to particular buyers.

Typically, each member of the agreement is assigned its historical share of whatever market is being cartelized. However, negotiating acceptable shares in a more dynamic setting, particularly where potential members have been gaining shares in the recent past, will be more problematic and may require considerable diplomacy and compromise. The largest members of the cartel may be asked to give up some of their present market share to satisfy newer upstarts. Alternatively, a low cost member of the cartel may demand a quota above its historical share.

In the case of geographically widespread cartels, the level of calculating the shares must be decided. The simplest agreement is one that encompasses global sales. A global share agreement is also likely to be the easiest to monitor if cartel members share production or sales data frequently. The extreme example of a localized approach to setting shares would be a cartel that assigns specific buyers to specific sellers in the cartel. However, in many cartels there is a tendency for members to desire hegemonies in their home markets or others that they have historically dominated. Although assigning territorial or customer shares is appealing in its simplicity and holds the promise of easy monitoring, there are several disadvantages. It may prove difficult to reach an initial agreement that involves many territories or customers, and once in place customer allocations will increase the number of opportunities for bickering among the conspirators. Perhaps most problematic are the suspicions raised by customers that observe refusals to deal by all but one of the cartel participants, suspicions that could lead to complaints to antitrust authorities.

Limiting Production or Sales

Given the "law of demand" (i.e., prices and quantities demanded are inversely related), raising prices and reducing quantity should be in principle perfect substitute conducts. That is, a cartel would appear to have the option of raising price or contracting output but should not need to do both. In practice, cartels frequently make volume-reduction agreements in order to reinforce previously agreed price increases. Volume restrictions can be global in scope and may involve sales or investment plans. Agreements to avoid plant expansions are particularly

appealing ancillary deals because in a growing market the appearance of capacity constraints would in itself raise prices. Moreover, agreements on plant capacities are much easier to monitor than agreements on sales transactions. Failure to expand capacity as quickly as demand insures the cartel of long-term stability because capacity typically takes years to create and full utilization discourages defections from the cartel.

In global cartels, the phenomenon of international trade in the cartelized product may raise vexing problems. Agreements on export restrictions may have to be reached in order to effectuate regional or territorial share agreements. Even if cartel members are disciplined in their observance in volume agreements, their customers may not be. Wholesalers may engage in geographic arbitrage if regional price differences widen during a conspiracy. Large geographic price differences may especially appear if a cartel engages in geographic price discrimination. The usual answer to such a problem is rather unappealing: cartel sellers must intimidate buyers into observing a no-arbitrage rule.

Monitoring the Agreements

Simple price fixing can be monitored by individual cartel members if their customers show a willingness to pay close to the agreed price. Offering price guarantees that require evidence of a lower price is a way of turning customers into price monitors for a cartel. For market-share or volume-reduction agreements, more elaborate information systems may be established by a cartel. One of the most common monitoring systems involves regular reporting of members' sales or production levels to a designated cartel secretary. The secretary in turn totals up the reported sales and prepares "scorecards," running accounts of each participant's market shares or progress toward a volume-reduction goal. Honest reporting that shows movement toward cartel objectives is an indicator of group harmony and discipline.

Misreporting (usually under-reporting) of company sales may spur the cartel to institute a system of third-party verification. International accounting firms are sometimes hired to perform on-site inspections of plant production, sales, and inventory records. The cooperation of an accounting firm is more likely if the client is a trade association.

Enforcement of Agreements

A common feature of cartels is a firm that takes on the role of "the enforcer." Typically a leading or dominant cartel member will threaten ad-

verse actions against potential deviants in the group. The enforcer may poach customers from a suspected cheater or organize a broader boycott against the recalcitrant firm possibly supplemented by rumor mongering, bribes, or other strong-arm tactics. Sometimes the threat, usually an increase in production so large that it causes a precipitous decline in price, is directed at firms that are reluctant to join the cartel in the first place. Thus, the enforcer must have sufficient excess capacity to make the threat a credible one. The wavering candidates for membership must be convinced that the enforcer both has sufficient excess capacity and is willing to employ it as a competitive weapon. Historically, the formation of cartels is frequently preceded by price wars because these are tangible demonstrations of the power of the enforcer over market price. Once formed, the enforcer may continue to threaten the others in the cartel with price wars, or the cartel may adopt a "trigger mechanism," a side agreement among cartel members to increase output by a specified amount should cheating be detected. However, the price war is a terribly blunt instrument redolent of self-flagellation. The problem with price wars is that it punishes all the members of a cartel, the enforcer included. Moreover, after the deviants surrender the details of the cartel agreement must be renegotiated.

An alternative to a designated enforcer is a mechanism that will redistribute the monopoly profits among cartel members. One such technique is periodic compensation. A disciplined cartel controls supply but has little influence on demand and may be faced with substitute products that have uncontrollable prices. The likelihood of substitution increases as the cartel becomes more successful in raising price. Thus, even a well-intentioned market-share agreement may be difficult to maintain with great precision over time. Some cartel members, despite their best efforts, may overshoot or undershoot their target market shares. This problem can be handled by developing a compensation system whereby cartel members with excess sales transfer product at cost to those who undershot; the recipients then resell at the elevated cartel price, recouping lost profits in the next period. In effect, cartel members that sell more than their allotted share are penalized, thus providing deterrence for future violations of the share agreement.

Another mechanism for redistribution of cartel profits requires a high degree of trust among conspirators. It involves the creation of a secret or illegal joint venture. The new subsidiary of the cartel becomes the sole marketing agency for cartel output. In some historical instances the common sales agency actually took title to the product, as would a merchant wholesaler. Quarterly or annually this joint venture would redistribute profits to its "stockholders," the members of the cartel, according to some previously agreed formula. Alternatively, a less formal profit-sharing plan

might be developed by a cartel. Periodically, the members will meet and share its internal profit-and-loss statements, calculate the total profits of their profit centers, and apply the formula for redistribution. In the latter case, the level of trust is extraordinary because each of the participants must reveal their costs of production. However, profit pooling is particularly useful for attracting and holding cartel participants with relatively high costs of production.

Covering Up Cartel Activities

Where cartels are legal, no covers need be implemented. Indeed, cartels may prefer to register their contracts with a national administrative body or court system so that legal authorities will help enforce the cartel's agreements. In the United States, Webb-Pomerene export cartels submit reports of their collusive activities annually to the Federal Trade Commission.

However, when a cartel operates in a jurisdiction with an effective antitrust law, efforts are made to keep its activities clandestine. Evidence that could help possible future prosecutions is destroyed or kept to an absolute minimum. Face-to-face meetings are still the preferred mode of communication of cartels, because they avoid possible future indictments for mail fraud or wire fraud. If the telephone must be used, code names or ciphers are devised. The major problem with face-to-face meetings, especially for global conspiracies, is that they create a paper trail of travel records. To overcome this problem, cartels often hold meetings concurrent with those of an otherwise legitimate trade association. Commodity trade associations operate for nearly every industry with at least a few hundred million dollars in sales; indeed, the formation of such associations is actively encouraged by the European Commission. In some cases, cartels create sham associations with fake agendas as a cover for illegal price discussions.

Conditions Facilitating Collusion

A great contribution to cartel analysis was the explosion of mathematical models of collusion emanating from the relatively new field of game theory.[12] Game theory is well suited to the study of oligopolistic decision making because of the many analogues between games and oligopolies.

12 The field grew out of a seminal book by John von Neumann and Oskar Morgenstern entitled, *Theory of Games and Economic Behavior* (1944). However, analytical difficulties limited progress in the field until the 1970s (Friedman 1977).

Both have a limited number of players, well-defined payoffs (such as profits), and strategies for winning. In a market setting, strategies are rules or decision criteria that are limited by the environment (cost and demand conditions) and formed on a basis of conjectures about the anticipated reactions of rivals. Conjectures may be formed *independently* by merely observing rivals' actual choices through time as market conditions vary or *cooperatively* by an overt agreement or by signaling intent. Collusion is one cooperative strategy available to those firms in an oligopoly game.

Mathematical game theories vary greatly in the degree of realism embodied in the assumptions (Pearce 1992). Early models assumed that the payoffs were fixed and known with certainty; more recent models allow for variable-sum payoffs in which the total profits can rise or fall as the firms choose alternative strategies. In some, players start out with identical endowments, while in others firms may have access to variable cost configurations. In some models, players choose quantity of production (Cournot) in others price (Bertrand). The earliest games were single-period (comparative-static). Others allow for two stages in which different strategic choices are made at each stage, and still others for an infinite sequence of moves and countermoves (so-called supergames).

Infinitely repeated interaction among firms often leads to outcomes that can be described as cooperative behavior (Grout and Sonderegger 2005). Most such models assume that cartel contracts are not legally enforceable. Rather, the contracts made by independent rivals exist only if they can be *self-enforced.* That is, a cartel agreement will persist if and only if members of the cartel implement *credible punishment mechanisms.* Cooperation is rewarded by higher profits, but deviation from monopoly output levels is punished by reverting to non-cooperative conduct (often Cournot equilibria) that will generate lower profits. Recent models have been able to incorporate environmental uncertainty and learning by the players over time.

Game-theory models have some limitations for the study of cartels. They tend to result in ambiguous conclusions about the role of market and firm characteristics; put another way, predictions about market equilibria depend crucially upon often small changes in assumptions or parametric values. Most cartel models tend to focus on the conditions that foster episodic sustainability, ignoring cartel formation and multi-episodic secular duration. Cartel stability is modeled as equilibria in which the losses from long-run price wars outweigh the short term gains from cheating. A major drawback of game theory is that few models explicitly incorporate communication among cartel members. As a result, legal tacit collusion cannot usually be distinguished from illegal conspiracies. Put

another way, the need for overt agreements is greatest when the conditions favoring tacit collusion are weak, and many factors predicted by theory as adverse to collusion can be negated by reliable, frequent communication within the cartel (*ibid.* p. 36).

From formal theorizing and generalizations from empirical studies of collusive behavior, a number of facilitating conditions for cartel formation and stability can be deduced. A facilitating factor is one that increases the probability that a cartel will be formed, stable, or enduring.[13]

High Seller Market Concentration

Assuming that there are barriers to entry, the Stigler model and virtually all others predict that the expected market price under collusion will be positively correlated with the degree of seller market concentration. Generally this result is a continuous one. That is, there is no threshold level for concentration above which collusion first becomes feasible; also, most models do not require a lower limit on the number of firms to obtain a collusive result. An exceptional model is by Selten (1973).[14] As a rule of thumb, Selten predicts that cartels are unlikely to be formed when there are more than five equal-sized firms (Herfindahl index below 2000). Phlips (1995) and Ferris *et al*. (2001) find that six is the critical threshold. Dick (1998) argues that very high levels of concentration are likely to induce tacit rather than overt collusion; moderate seller concentration is more conducive to cartel formation and persistence.

Market concentration and the shares held by a cartel are conceptually distinct, but as most leading firms join cartels the two measures tend to be the same. Among contemporary international cartels, formation and effectiveness seem to require that a cartel control at least 70% of industry supply. Cartels tend to lose their ability to raise prices when an uncooperative fringe of suppliers exceeds 20 or 30% of production; if fringe suppliers choose to engage in umbrella pricing (following the cartel's moves without formally joining the collusive agreement), then sustainability may not require a high degree of cartel control.

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13 The sections that follow are a distillation of conclusions of Scherer and Ross (1990), Carlton and Perloff (2005), Grout and Sonderegger (2005), Jacquemin and Slade (1989), Martin (2002), Grossman (2004), Posner (2001), Levenstein and Suslow (2002), Hovenkamp (1999), Connor (2001), and Porter (2005).

14 A one-period, homogeneous-product Bertrand oligopoly with identical firms predicts zero profits from collusion with three or more firms (Martin 2002). One-shot models are generally less applicable to the study of cartels.

Empirical studies of prosecuted price-fixing conspiracies have confirmed the tendency of cartels to be formed by a small number of firms. Hay and Kelly found that 80% of the U.S. cartels in their sample had ten or fewer members. Fraas and Greer (1977) found that the majority had fewer than eight firms, but there have been successful prosecutions of cartels with up to 30 participants. The median number of firms in a sample of 167 modern international cartels is five (Connor 2003). Price-fixing cartels with relatively large numbers of members often are assisted by trade associations. Bidding rings seem to be compatible with large numbers of sellers; long-running bid-rigging schemes with hundreds of firms called *dangō* are common in the Japanese construction industries (McMillan 1991).

Low Buyer Concentration

Often overlooked is the structure of the direct buyers' market. Cartel formation and sustainability are facilitated by an atomistic structure among buyers. The reasoning is straightforward. To achieve the same level of additional sales, a deviant firm will have to make a larger number of price concessions when there are many buyers compared to a more oligopsonistic structure. A large number of price cuts mean a greater chance of detection, especially when buyers report their transaction prices to other members of the cartel or to third parties. Furthermore, when there are few buyers paired with few sellers, buyers may be more loyal to their suppliers (Stigler 1964). Stability in buyer identities makes it easier to detect cheating indirectly through changes in market shares, as does fewness in the number of distribution channels. Low buyer concentration is not a necessary condition of collusion because sharing reliable information among cartel participates nullifies the ability of buyers to wrest lower prices by making claims about better offers from cartel members.

Buyer concentration is considerably more difficult to measure than seller concentration. Measures of buyer concentration require information on customer lists, and these are typically closely guarded by companies. Perhaps for this reason, little empirical verification can be found among cartel studies that low buyer concentration facilitates cartel behavior. However, the prevalence of direct-purchaser class actions with hundreds of plaintiffs attests to the fact that price-fixing is most compatible with small buyers. The case studies in this book also suggest that, no matter how sophisticated the buyers, it is easier to cartelize minor ingredients than major inputs.

Homogeneity and Standardization

Product homogeneity is often cited as a necessary condition for effective collusion. By definition, a pure monopolist sells a product that is unique: No other brands exist, and there are no substitutes. Cartels may not require pure homogeneity to operate successfully. Certain types of product differentiation will mask price cutting while others will encourage nonprice rivalry. Heterogeneity can originate from several avenues, some of which can be accommodated by a cartel.

First, product differences in tangible or subjective quality can cause heterogeneity. Heterogeneity arising from the first source may be traced to purity, power, durability, or some other gradation in quality that all buyers prefer more of. This type of differentiation (technically, vertical differentiation) can be handled by the development of industry grades or product standards. A cartel can accommodate grade-based price differences, though at some additional costs of negotiation and enforcement (Hackner 1994). However, difficulties in forming a cartel will be presented if vertical differentiation is based upon competing production technologies that are associated with variable costs of production.

The second type of differentiation arises from a taste for variety among customers that can be reinforced through brands and image advertising, from space, or from time.[15] This "horizontal" differentiation is most likely to be incompatible with pricing coordination. Carried to its extreme, horizontal differentiation implies that a unique bundle of real or imagined characteristics is sold to each buyer. Cartel contract negotiations are more costly in such markets, and cartel members can cheat on price more easily by appealing to putative quality differences. The prices of strong brands are insulated from each other's price movements, and this implies that separate price agreements must be made for each brand. Custom-made products make for nearly insuperable barriers to price collusion. Thus, collusion on airline services is much more likely than collusion on large commercial aircraft.

A second source of horizontal product heterogeneity is spatial differentiation. Customers will often prefer products that originate from certain locations or sellers that are closer to them. When sellers are located in widely separated regions or countries, transportation costs alone will tend to create geographically localized monopolies. While local cartels may flourish in such markets, the effects of spatial heterogeneity, the phenomenon greatly complicates international price schemes. As a result, collusion

15 Sellers can still exercise market power in such situations, but it is unilateral (single-firm) power not multilateral.

is more common for industries in which production or sales locations are either geographically clustered or markets in which transportation costs are small relative to selling prices.

Third, product designs may change frequently over time. This is true in fashion goods and in industries experiencing rapid technological change. Temporal differentiation frustrates attempts to collude on price because frequent renegotiations of an agreement increase both the costs of operating a cartel and the chances of bickering (Ivaldi *et al.* 2003).

Inelastic market demand at the pre-cartel price is often mentioned as a prerequisite for cartel formation and effectiveness. However, inelastic demand flows from the fact that a market has well defined product and geographic boundaries, in other words markets few or no substitutes. Successful cartelists are skillful at recognizing clear market boundaries and predicting how high prices can go before inviting substitution.

Cost Conditions

Heterogeneity among sellers may be due to differences in production or distribution costs, in capacity utilization, or in rates of process innovation. Variations in costs across firms will make agreement on an optimal cartel price more difficult to reach and to sustain (Rothschild 1999). High cost firms will prefer higher prices, and vice-versa. While such differences do not make arriving at a consensus impossible, it raises the costs of colluding. In addition to lengthening negotiation time, a profit-pooling arrangement may have to be implemented to attract high-cost participants to the cartel. Alternatively, high-cost participants may have to be granted larger market shares from the cartel than their historical market positions would dictate. If the largest firms have the lowest costs, they may have to intimidate the smaller ones into joining the cartel, which does not bode well for stability of the agreement.

The foregoing discussion suggests that cartels are less likely to be formed during the early years of a new industry than an industry's more mature phase. At an industry's formative stage, there are likely to be several potential production technologies vying for supremacy. Later, the less efficient methods of production will be weeded out leaving a more standardized combination of plant size and input-output relationships across firms. Moreover, when an industry reaches a certain threshold in size, it is more likely to have a trade association or cadre of industry analysts that help spread information around about the industry's best technologies. That is, asymmetry of costs and information will decline. Secret cost information is antithetical to unruffled collusion (Athey and Bagwell

2001). Frequent information-sharing among cartel members is an antidote to asymmetry, because collusion can be sustained through side-payments; indeed, market-quota concessions to weak members are one form of side-payment.

Collusion is also facilitated by constant returns to scale at levels of output after collusion begins. That is another way of saying this is that cartels work better in industries with relatively low fixed costs relative to variable costs. As industry output contracts when prices rise, excess capacity will develop for cartel members, and this provides an additional to cheat on price agreements. High excess capacity *per se* has an ambiguous effect on collusion (Abreu *et al.* 1986). While it encourages cheating, it also gives cartels ringleaders the wherewithal to punish deviants. Perhaps the ideal condition for cartel stability is for excess capacity to be concentrated in the hands of the leaders (Compte *et al.* 2000).

Ample empirical evidence exists showing a relationship between cartel operation and cost, product, or technological homogeneity (Dick 1996, Asch and Seneca 1975, Fraas and Greer 1977).

Growth and Demand

There is a large and somewhat contradictory literature on the role of demand changes in collusive decisions. This literature does not apply so much to seasonality or regular cycles in demand as to unforeseen demand shocks. In the cases of regular seasonal demand, both formation and stability are improved by raising prices just before seasonal demand would raise prices anyway.

In general unexpected non-seasonal growth favors the formation of cartels, whereas stable growth helps cartel sustainability (Haltwanger and Harrington 1991). Surges in growth are expected to lead to increases in capacity utilization (decreases in excess capacity). The traditional view is that, like monopolists, collusive arrangements would require a "passive sales" rule; that is, rather than adjust price or volume in the face of demand perturbations, collusive firms would want to absorb the changes by building up inventories or increasing orders backlogs (Scherer and Ross 1990). On the other hand, passive sales behavior increases the likelihood that during unanticipated recessions would be tempted to dump excess stocks, thus setting off a price war. When demand is low and excess capacity high, the threat of entry is reduced making the likelihood of cartel formation (and higher prices) higher. Thus, compared to competitive industries, the conventional view is that collusive behavior results in dampened price flexibility and in countercyclical price change movements (Rotemberg and Saloner 1986, 1989; Schmitt and Weder 1998).

If cartel members cannot reliably observe sales of its members, they will not be able to distinguish demand fluctuations from cheating. Staiger and Wolak (1992) and Goodhue (1998) use somewhat different theoretical approaches to conclude that demand volatility tends to cause more and more severe price wars, but they do not agree with the timing. A model developed by Green and Porter (1984) and generalized by Abreu *et al.* (1986) predicts that cartels would punish deviants with a price war whenever the cartel observes negative demand shocks. That is, cartels would induce procyclical price changes.

Regular sharing of firm-level sales data can nullify the destabilizing effect of demand shocks. Quarterly or monthly monitoring of sales or production is a common feature of private cartels. Alternatively, sales reports can be provided by trusted third parties, such as independent accounting firms, industry trade associations, or government statistical agencies. Albaek *et al.* (1997) provide a concrete case of government transactions data that promoted collusion.

Finally, there are models that predict that long-term duration is enhanced by certain future cyclical growth patterns (Bagwell and Staiger 1997). Longevity is increased if cartel participants expect the future to consist of long booms interspersed by brief recessions.

The evidence on countercyclical price changes in collusive (or high concentration) industries seems to be supported by some studies (Domowitz *et al.* 1986) as does the tendency for cartels to be formed when demand is low or slowing down (Nocke 2000). The regularity of price wars is not well established empirically, partly because it is difficult to disentangle price wars from mere price reductions (Porter 1985). Moreover, there seems to be an untested presumption in this literature that a tendency toward frequent price wars is to be interpreted as supporting collusive behavior.

Conduct, Customs, and History

The sustainability of collusion is assisted by various industry practices, which may have evolved over decades to promote tacit collusion or may be implemented as part of a cartel scheme. These habits include standard contract terms, pricing rules of thumb, certain details of internal cartel management, and a history of collusion. Ephemeral factors like business culture probably are part of the mix.

Industry-wide pricing rules can overcome problems of horizontal and spatial differentiation. Standard price differences for recognized industry grades and basing-point pricing are examples. A pattern of advance notification on price changes is helpful to price coordination. Standardization

of terms of sale helpful to collusion include details about delivery charges, credit terms, quantity discounts, follow-up services, and the treatment of used, rebuilt, or recycled substitutes. Contracts that contain "most-favored-nation" or "meet-or-release" clauses are especially useful in detecting price chiseling.

Rules followed internally by the cartel often facilitate stability. The advantages of market quotas and passive sales rules were already discussed. A pre-arranged trigger strategy may be effective in discouraging defections. Many cartels have agreed on internal fines to be paid by members that exceed their quotas; an alternative tactic is to agree on compensation of under-quota members through the inter-firm sale of product at a competitive price. A very effective technique because of the information and profit-sharing advantages is to establish a common sales agency. Although unusual, cartels can effectively raise prices using *only* agreements on terms of trade and internal rules (Genosove and Mullin 2001).

There is widespread agreement in the literature that a history of collusion eases the establishment or re-establishment of collusion in the next episode (Verboven 1998). A collusive group may recognize the need for merely tweaking a predecessor's operating procedures. Cartel formation and stability are also served by a history of multimarket contact between firms (Bernheim and Whinston 1990). That is one reason that most cartels are populated by highly diversified companies. Paradoxically, regular pauses in collusion may be a positive sign for the long-term duration of cartels. Brief reversions to more competitive pricing conduct can signal a cartel's flexibility in the face of changed market conditions, its willingness to accommodate important new entrants, or the expected implementation of disciplinary triggers.

Entry Barriers

High concentration and product homogeneity are usually sufficient conditions for at least some type of collusion in the short run. Entry barriers foster cartel formation, and the prospect of barriers continuing at higher cartel-induced prices facilitates stability of collusion. A cartel will not be durable unless entry is slow or difficult.

Many models of collusion assume that entry into the industry is blockaded during the period of analysis (Pearce 1992). Actual entry or the threat of entry will complicate the formation and stability of collusive arrangements. Entry will be slow or forestalled by inaccessibility to low cost production methods by would-be entrants, sunk costs of production (which may be signaled by high fixed costs of production),

and customer loyalty (Schmitt and Weder 1998, Scherer and Ross 1990). In addition, the established firms in an industry can pursue strategies that will raise barriers to entry or exit. They may limit prices below the short-run profit-maximizing level or raise rivals' costs (Granitz and Klein 1996). When cartels are successful in raising price, new entry is more likely to be induced but the greater the share of fringe firms, the lower the cartel price will be (Nocke 2000). The ideal mechanism for preventing entry is government sponsorship or regulation of cartels; the power of government can be used to make membership in a cartel compulsory. In the 20th century, cartels were often the favorite tool for governments to "rationalize" industries. Short of sponsorship, government may be induced to use its regulatory powers to slow or prevent entry (Lanzillotti 1996).

Private cartels may have to take steps to slow entry. One method is to reduce the cartel price below the level it considers optimal. The additional stability may generate more profits in the long run than those sacrificed near term by the lower price. Another technique is for the cartel or its leading members develop large excess capacity so as to credibly threaten output increases upon unwelcome entry. Saudi Arabia played this role in the well-known OPEC oil cartel, but in many cartels the designated enforcer may build excess capacity to threaten both would-be deviants and potential entrants. Predatory tactics have been noted in several historical studies of cartels (Scott-Morton 1996, Levenstein 1993).

Other Cartel Factors

Early work is appearing on a host of other possible determinants of collusive behavior. There is a hint in the work of Lambertini (1996) that the shape of the industry demand curve may affect collusion. While most theorists specify linear demand, Lambertini suggests that Cournot behavior is more likely when demand is highly convex, a demand condition associated with differentiated product industries. The attitudes and cultural orientation of cartel managers may affect cartel formation. With long run financial goals uppermost, cost heterogeneity is less likely to inhibit cartels (Scherer and Ross 1990). This hypothesis may explain why cartel formation is more common among firms in Asia, where managers have reputations for focusing on distant profit or market-share goals. Highly localized markets seem more prone to collusion (Dick 1998). This could be a surrogate for high seller concentration, or it may capture a tendency for more uniform business cultures to spawn collusion. If so, both geographic and cultural propinquity will facilitate conspiracies. Even the leadership styles of CEOs are being factored in. Industries that lack innovation may find cartel

formation to be more compatible with an autocratic management style (Rotemberg and Saloner 1991).

Effects of Collusion

Welfare Effects [16]

A successful cartel demonstrates its power by moving the market price. A sellers' cartel will attempt to raise the price paid by its customers, and a cartel of buyers will aim to lower the price it pays to its suppliers. Figure 2.1 illustrates the first case, market power exercised by sellers.

A market consists of two sides, a set of buyers who have different degrees of willingness to pay for a product at different quantities and a set of producers whose technologies of production determine their ability to supply various quantities at different prices. The willingness to buy is summarized in the demand curve shown in Figure 2.1. Demand curves are almost always downward sloping because as the market price falls more customers enter the market and existing customers will be able to afford to buy more. The ability of suppliers to make and sell product is represented by the supply curve which can be either flat or upward sloping. The area on the graph *below* or to the right of the supply curve is an infeasible region because suppliers will not be able to recover their costs.[17] The area *above* and to the right of the demand curve is not a feasible equilibrium zone either. Thus, the point at which the two curves cross represents the maximum quantity (Q_c) that can be sold at price P_c; and at price P_c consumers will purchase all of Q_c placed on the market. The intersection point is the long-run competitive equilibrium point in this market, given the preferences of buyers and the current technology of supply. The price P_c that consumers are willing to pay for quantity Q_c is exactly equal to the full marginal costs of production of supplies M_c.

16 This section focuses on the so-called static welfare effects of monopoly pricing. In addition to price increases, cartels will normally cause posted and exchange prices to become less dispersed compared to prices in non conspiracy periods. Price discrimination may become common (and prices more uniform within target segments). Dynamic effects include price variation disjointed from cost variation, reduced capital investment, and a slowdown in innovation (Posner 1976, Lanzilotti 1996, Scherer and Ross 1990).

17 These are marginal costs of production and distribution including the opportunity cost of capital (i.e., normal profits). In the short run these are roughly equivalent to variable costs; in the long run a producer must cover both variable and fixed costs. We assume long run in this chapter.

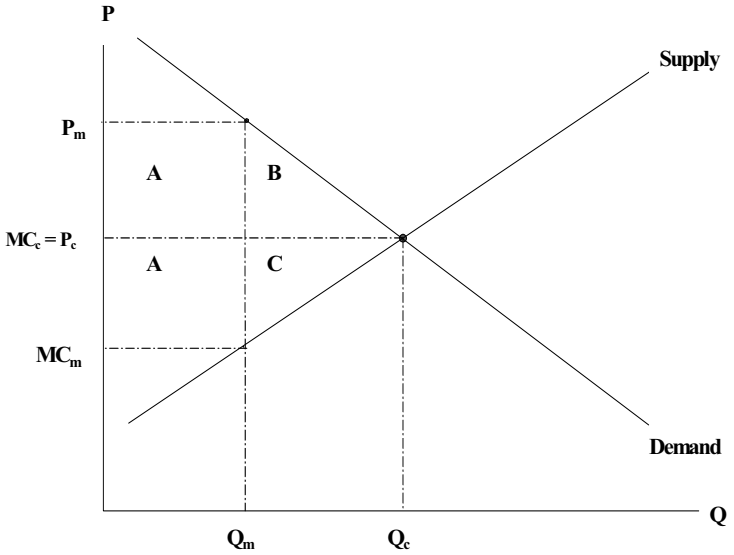

Figure 2.1 Welfare Effects of Collusion.

When a cartel is formed encompassing all suppliers in the industry, it will maximize the profits of all of them by setting the price at P_m, which is what a monopolist would charge in the same market. Given no other changes in this market, when the price jumps from P_c to P_m, consumers pull back on their purchases. The maximum quantity that those who remain in the market is willing to buy at price P_m is Q_m. Suppliers have no power to force consumers to buy more than Q_m, so the cartel must reduce its output to Q_m also. This simple one-period model can be made more elaborate by considering changes in inventories and other dynamic features of markets, but it illustrates the main points as it is.

Price fixing has two distinct effects on the market participants. First, there is a change in total market revenues and costs of production. Before the price was increased, total revenues for producers were $P_c \cdot Q_c$ dollars. When the price rises to P_m, the revenue becomes $P_m \cdot Q_m$. At the same time, as the quantity of industry output shrinks from Q_c to Q_m, the marginal costs of production falls from MC_c to MC_m. The total cost of producing Q_m is always going to be less than producing Q_c.

The upshot of all these changes is that the aggregate profits of sellers will increase from zero when the price was competitive to the rectangle

A when price is P_m.[18] That is, when quantity declines to Q_m, profits will become the difference between total revenues $P_m \cdot Q_m$ and total costs $MC_m \cdot Q_m$. The profit rate will be $(P_m - MC_m)/P_m$, and this is a direct measure of the degree of market power held by the cartel.[19] In actual market situations, a cartel may fail to attract all the suppliers, may fear impending entry, or may miscalculate. If so, the market price will be somewhat below P_m. Similarly, the cartel may incur additional costs in policing its agreement, which would raise its costs above MC_m and cause some reduction in profits. If cartel enforcement costs are too high, it will not be formed. If formed, cartel members must anticipate that its monopoly profits will outweigh the possible costs of discovery and prosecution.

No matter what additional costs of colluding might be, the buyers end up paying all of rectangle A as a sort of monopoly tax on their purchases. This *overcharge* $((P_m-P_c)\cdot Q_m)$ is a monetary measure of the economic harm done to buyers of a cartelized product. Formally, the overcharge is a transfer of income from buyers to the owner of the supplying companies.[20] Because conspiring is never a free good, the size of the overcharge (the injury) is going to be larger than the amount of monopoly profits generated (the gain). Some economists believe that the additional costs of carrying out a conspiracy and industry lobbying for market power should be counted as a loss for both consumers and producers (a social loss).

The second effect of cartel pricing is entirely a social loss. On figure 2.1 it is represented by the two triangles B and C. The upper triangle is a loss to consumers, and the lower triangle is a loss to producers. These losses are incurred because of the cutback in sales and output from Q_m. For consumers, this loss is a result of their withdrawal from the market due to an unacceptably high price; they are forced to give up consumption of the cartelized product and use their spendable income on an inferior substitute

18 The monopoly price P_m is discovered by equating the marginal costs of production (points on the supply curve) with the marginal revenue (not shown, but it passes through the supply curve at the point where $MC_m = Q_m$).

19 Figure 2.1 implicitly assumes diseconomies of scale in production because unit costs rise as Q rises. With constant costs, the supply curve would be flat, but total costs will still decline. Whether revenues increase depends on the elasticity of demand at Q_c. $(P_m-MC_m)/P_m$ is called the Lerner Index of market power. At the monopoly level of profits, $(P_m-MC_m)/P_m = HHI/\eta$, where HHI is the Herfindahl Index of concentration and η is the absolute value of the elasticity of market demand.

20 Note that "supplying companies" includes both cartel members and those non-cartel firms that passively support the cartel by pricing up to P_m. Legally, the cartel is responsible for all the injury caused to the buyers, even non-cartel sales. Free riders gain but are not legally culpable. If some suppliers choose to price competitively, they create no overcharge.

if any exists. For producers, the contraction in industry output means operating at suboptimal levels or exiting the industry. In either case, some labor and plant resources will lie idle. This monopoly loss is called the *dead-weight loss.* Although not apparent in Figure 2.1, the dead-weight loss is typically many times smaller than the overcharge.

Empirical Studies

There are hundreds empirical studies of the price effects of cartels. Connor (2006c) surveys 259 published studies that contain 1,040 quantitative estimates of overcharges of private hard-core cartels. The primary finding is that the *median* long-run price mark-up for all types of cartels over all time periods is 25.0%. The price effects of international cartels were higher, about 31%. Moreover, cartels with multi-continental effects raise prices higher than other types of international cartels.

Price mark-ups vary from zero to 2500%. About 7% of the sampled cartels were unsuccessful in raising prices. Because cartel overcharges are positively skewed the *mean* overcharge for all successful cartels is 43%. Convicted cartels are on average as equally effective at raising prices as unpunished cartels, while bid-rigging conduct displays somewhat lower mark-ups than price-fixing cartels.

Cartels have their defenders. Some governments have mandated "crisis" cartels to address perceived failures by certain national industries to withstand global competition. These are often justified as actions to encourage cost savings through economies of scale. The EU permits cartels to operate if they are organized to promote technological progress and do so for the benefit of consumers. U.S. law allows joint ventures among competitors for research and development. On the whole, it is difficult to find empirical studies that conclude that efficiencies generated by secret cartels are significant.

Although cartels have their apologists, their writings smack of the Elizabethan art of adoxography.

Cartel Histories

Soon after they first appeared in the U.S. economy around the 1870s, there were many popular writings about the "trusts" that were organized in the sugar, railroad, petroleum, tobacco, and many other industries. "Trusts" was the turn-of-the-century term for large economic combinations, often forged by mergers, for creating and sustaining market power. Today these

organizations would be called holding companies, syndicates, pools, joint sales agencies, or simply monopolies.

By 1916 Ripley could differentiate these phenomena using terms in a manner that has endured. Pools or corners were contractual joint-profit-increasing agreements by independent sellers over prices or quantities; today these are called cartels (Ripley 1916: xiv). Ripley cites the U.S. cordage cartel, formed in 1860, as the first documented U.S. pool. Other 19th century cartels include cotton bags, distilling, iron pipes, steel, salt (Jenks 1888), and wire nails (Edgerton 1997). Trusts proper were legal instruments used in the United States from 1882 to 1902 for merging companies. Yet the word "trust" was used loosely and popularly to cover both cartels and mergers intended to increase market power.

The Earliest Cartels

Serious books about cartels began to be published in the late 19th century and continued to about the 1920s. Levy (1968), a careful scholar, cites about 30 books on cartels published before 1927, the great majority in German. His book contains unique information on 18th and 19th century British cartels. Liefmann (1897) published one of the first and most influential economic monographs on cartels in 1897. His book appeared in five editions in German from 1897 to 1929. Liefmann (1932) devised one of the most cited and pithy definitions of cartels: "free [voluntary] associations of producers for the monopolistic control of the market (p. ix)." By this definition he meant to include only arrangements by independent companies linked by formal or informal contractual agreements; compulsory commodity schemes enforced by government decrees or parliamentary statutes are not true cartels by his definition. Liefmann's positions continued to influence German economists for decades to come.

An issue among early writers is when and why cartels first appeared. Sayous (1902) makes a well documented case for the existence of private cartels in the strict sense of the term in 17th century Holland. The Dutch Company of the North was chartered in 1614 to exploit the Greenland whale-oil industry. By 1618 the Company had adopted a supply-restraint objective to keep domestic prices above competitive levels, but its power waned in the 1630s because of entry. Liefmann (1932), also using a modern definition of cartels, believes that the first domestic German cartel was the Neckar Salt Union, an 1829 combination of salt mines in three German states. Five similar private cartels were formed before 1870, but Liefmann and other writers point to the German depression of the mid 1870s as a peak for cartel formation. By 1905 German government

surveys found 385 industrial cartels operating; the number rose to 3000 by 1925.

Seagar and Gulick (1929) trace the earliest of the U.S. pools to the cordage industry, which began making agreements on prices at least as early as 1861; cordage manufacturers formed a formal association in 1878. The Michigan Salt Association, formed in January 1876, may be the first well documented formal U.S. cartel (Jenks 1888). Because of the high costs of transporting salt, an elaborate organizational structure, and the highly inelastic demand for salt, this cartel was successful in dominating the Midwest market for 25 years.

As for *international* cartels, Liefmann (1932) identifies the 1867 merger of the Neckar Salt Union in Germany with the Eastern French Salt Works Syndicate as the first of its kind. By 1897 there were at least 40 international cartels with German companies as members, most of them in chemical or nonmetallic minerals product markets. Andrews (1889) drew upon contemporary business publications to recount what is quite possibly the world's first *global* cartel, the infamously scandalous Paris-based Secrétan copper syndicate of 1887-1889. Edgerton's (1897) paper on the U.S. Wire Nail Association is a superb analysis of the evolution, operation, and price effects of a short-lived but tightly structured, highly effective manufacturers' cartel which was written with the help of insider interviews just a year after the cartel dissolved. This study is notable because the conspiracy is the first U.S. work on a U.S.-based international conspiracy. Notz (1920) stated that there were 114 international cartels in 1912; by 1920 he found 11 international cartels with participation of U.S. companies.

Among the earlier monographs in English by economists are books by Jenks (1900, 1907, 1911), Jenks and Clark (1917, 1929), Hirst (1905), Jones (1914, 1921), Michels (1928), Seagar and Gulick (1929), Domeratsky (1928), Notz (1929), von Beckerath (1930), Piotrowski (1933), and Plummer (1934, 1951). With the exception of Jenks' and Hirst's books, most of these studies describe cartel membership and contracts but contain little or no quantitative data. One European writer who was concerned about the lack of concrete measures of market power is a then young lawyer and economics lecturer, Hirst (1905). Noting that German cartels frequently exported surplus output to other countries at lower prices than their fixed domestic prices, he proposes using the export prices as a yardstick. Although there is some danger of overstating the domestic overcharge if the cartel is dumping product at predatory prices, he applies this method to six German cartels using 1900-1902 prices. This work may be the first to use the now well accepted yardstick method.

Jeremiah W. Jenks was a political science professor at Cornell University in 1900 when the first of his five editions of *The Trust Problem* was published, though he had already been researching pools, trusts, and monopolies for 20 years by that time. Jenk's 1888 study of the Michigan salt cartel seems to be the first economic study of cartels to appear in a peer-reviewed professional journal. His publications display a strong interest in gauging the economic effects of cartels. Unusual among academics of the time, his commitment to the study of trusts seems to have been cemented by his extensive work as an advisor for the U.S. Industrial Commission, which held a series of public hearings in 1898-1899 on conditions in several oligopolistic industries. His books contain carefully constructed series of wholesale prices for refined sugar, whiskey, wire nails, barbed wire, steel, and other products controlled by cartels or dominant firms. Among his analytical advances was the creation of coterminous price series for the principal inputs for the final products (corn for whiskey, steel for nails, etc.). By correcting for changes in product prices due to input prices, he was able to determine more precisely when and how strongly prices were affected by a cartel. This innovation is now called the constant-margin method.

The paucity of journal articles in this period is probably evidence that academic orthodoxy frowned on cartel studies. Stevens' 1912 study of the gunpowder trust is notable for focusing on what was believed to be the longest-running discovered cartel in the Nation's history; Stevens carefully delineated three distinct phases of the cartel, and he drew upon the records of a 1911 antitrust trial to document the final episode. Allen's 1923 account of the 18th century English copper-smelting cartel seems to be the only assessment of cartel effectiveness by a European economist to appear in a peer-reviewed academic journal.

Eliot Jones' (1914) book deals with 1871 to 1914 episodes of cartelization of the U.S. anthracite coal industry. This study is for its time one of the best analyses of the economic history, market structure, collusive conduct, and price effects in any industry. It is one of the first books to combine an empirical interest in industrial concentration with attention to the antitrust laws. In addition to detailed ownership and price data from industry trade sources, Jones had available testimony and exhibits from one of the early U.S. antitrust trials. Scores of later studies would follow this model.

In the United States federal government victories in the courts against price fixing led to the disbanding of most U.S. cartels by World War I. However, many private commodity cartels were re-established during the interwar period in Europe. During the 1920s and 1930s several of the formerly "domestic" cartels (some controlled exports) took on an

international character. For example, the 1933-1939 international steel export cartel managed production and sales among several of the major continental European steel-producing nations (Barbezat 1993). Stocking and Watkins (1946) wrote about several international cartels that were active in the interwar period in the markets for magnesium, aluminum, incandescent electric bulbs, and several chemicals.

Cartels were a concern of the League of Nations, which sponsored a major conference on the subject in 1927. Papers prepared by some of the leading European cartel scholars of the day were published as part of the conference proceedings (e.g., de Rousiers 1927, MacDonald 1927, and Wiedenfeld 1927). The near absence of empirical detail in these reports and other studies by European scholars active in the interwar period provide a striking contrast with the industrial analyses emerging in the United States. The final report of the 1927 conference revealed a deep split between those participants who believed that cartels harmed national economies and international trade and those who believed that cartels stabilized prices, investment, and employment. In the 1930s in Europe and Japan, cartels became instruments of government policies to reduce excess capacities, raise prices for certain raw commodities, or extend the power of authoritarian regimes over labor and industrial production. The League later sponsored cartel studies with more empirical content (Benni *et al*. 1930, Oualid 1938). Some exceptions are studies of the German coal and steel cartels (Weganroth 1964, Peters 1989). Lundqvist (1998) examined the formative period of the Swedish beer cartel in the 1890s, which operated quite harmoniously for 50 years (1906-1956).

The Interwar Cartels

There were relatively few cartel studies in the 1930s, but during and immediately after World War II, a surge in publications examined the roles of cartels active in international trade and in war production. Several books were written about the role that German cartels and the Japanese *zaibatsu* played in the emergence of totalitarian political structures in the Axis countries in the 1920s and 1930s. (Reimann 1942, Hexner 1946). Several more books on the topic were written by three of the most prominent economists of the fledgling field of industrial organization: Edward Mason (1946), Corwin Edwards (1944, 1967), and George Stocking (Stocking and Watkins 1947, 1948). Edwards and Stocking had direct experience with the German and Japanese cartels as advisors to the Allied occupation authorities just after the war. They were directly involved in the imposition of U. S. type antitrust laws and the establishment of

national agencies to enforce the new laws: the Federal Cartel Office in West Germany and the Japan Fair Trade Commission. Edwards (1944) provides many examples of interwar collaboration, some of it unwitting, between U.S. and German companies that ultimately aided the Axis war effort. Edwards relates instances of cooperation that resulted in militarily valuable technology transfers from U.K and U.S. firms to German chemical companies.

Ervin Hexner (1946) produced the most comprehensive economic study of international cartels yet published. Hexner had an insider's knowledge of cartels. He had served as secretary of the Central European group in the international iron and steel cartel (Barjot 1994:65). Louis Marlio (1947), a French economist who wrote a detailed account of the international aluminum cartel, had a similar background in the aluminum industry. Both of these authors found much to admire in the effects of international cartels, whereas post-war works by American authors tended to be distinctly more skeptical, if not hostile concerning the economic and political effects of the interwar cartels (e.g., Berge 1944, Edwards 1946).

Perhaps the first publications to attempt to quantify systematically the price effects of cartels were a pair of books produced by a team of economists that had access to information handed over to investigators of Congressional committees and to prosecutions after grand-jury antitrust investigations (Stocking and Watkins 1946, 1948). These books set a new standard for rigor and detail in the economics literature on cartels. In my estimation, Stocking and Watkins (1946, 1948) represent a new era in the economic literature on cartels, because they were the first to apply rigorous modern concepts of the emerging field of industrial economics and because they were among the first to focus on the market effects of international cartels. Numerous and continuing citations to their books by leading scholars attest to their status as classics in the field.

The negative impacts of the interwar cartels during 1920-1945 began to bring about a reappraisal of cartels among Europeans just after World War II. In Germany there was a healthy parliamentary debate over its cartel laws in 1951-57 (Wells 2002:165-74). The German cartel law would prove to be quite effective in purging most of German industry of cartels. The UK had a common-law tradition that disallowed the enforcement of cartel contracts by the courts, but this law did not discourage price fixing by trade associations. Through the early 1950s, a majority of the UK's manufacturing output was affected by cartels (Symeonidis 2001, Swann 1974). The reconsideration of the benefits of cartels began around 1950 with a series of empirical studies of cartels by the Monopolies Commission. By the late 1950s UK anticartel legislation had been adopted that placed the burden of proof on cartels to prove the economic benefits of

their price fixing and related conduct. Germany was the prime mover behind the adoption of tough anticartel provisions in the Treaty of Rome, which solidified the antitrust tradition in the EU and its Member States.
the EU and its Member States.

The embarrassing role of international cartels in contributing to World War II combined with an active program of prosecutions by the U.S. Department of Justice in the 1940s seems to have caused a hiatus in international cartels for almost 50 years. Until the late 1990s very few legal or economic studies were written about post-war international cartels, perhaps because there were so few of consequence.

The Electrical Equipment Conspiracy

There was a short lived U.S. interest in domestic cartels when the "Great Electrical Equipment Conspiracy" burst onto the Nation's consciousness in 1960-1961. This cartel resulted in the publication of more publications in a few years than any other single historical event since the beginning of cartel literature. The scope of the conspiracies, their duration (up to 40 years), the as yet unsurpassed size of the sales involved ($7 billion per year in the late 1950s), the fame of the leading companies involved, and the U.S. Government's aggressive prosecution of the violators – all these factors lead to a degree of public fascination and publicity about an antitrust action not seen since 1911. More than 1900 private suits offered unusually detailed pictures of the cartel's organization (Herling 1962, Smith 1963, U.S. Congress 1965, Sultan 1974, Sultan 1975, and Bane 1973). In addition to the books, three economic studies were devoted to the cartels (Kuhlman 1967, Finkelstein and Levenbach 1983, and Lean *et al.* 1985). These studies have become staples in textbooks in industrial organization (e.g., Carlton and Perloff 2004).

Recent Cartel Studies

There was brief revival of interest in international cartels after 1973 when the Organization of Petroleum Exporting Countries (OPEC) first used its power to raise crude petroleum prices. Many books and articles were written about the cartel (Eckbo 1976, Griffin 1989). OPEC is one of many international commodity stabilization schemes established by international treaties, and therefore are immune from antitrust prosecution.

Relatively few books were written about cartels from the early 1960s until the revelations about the international lysine, citric acid, and vitamins cartels began in the late 1990s. Four books may be traced to high profile U.S. and EU prosecutions that began in late 1996 (Lieber 2000, Eichenwald 2000, and Connor 2001). Harding and Julian (2003) provide a legal overview of EU cartel enforcement that began in 1969. They note that

the European Commission began publishing book-length decisions in the late 1980s that often contained rich detail on the internal organization and conduct of EU-wide cartels.

However, there has been a strong upward trend in academic papers on cartels since the 1970s. Many are focused on testing new quantitative methods. There is a huge new literature on auctions and bid rigging (Porter 2005). Most recent economic studies are written by North American academics using cartel episodes that affected commerce in the United States or Canada. Some classic studies are: the 1885-1914 bromine cartel (Levenstein 1997); collusion in U.S. railroads that began in the early 1880s (Porter 1983); and the U.S. railroad express cartel lasted for an extraordinary 52 years (Grossman 1996). One reason for the continuing interest in these early cartels is they were entirely legal at the time and there are numerous historical records available.

Chapter 3: Anticartel Laws and Enforcement

> *"Although library shelves groan under the weight of legal and economic scholarship devoted to the substance and process of competition law and policy,…. there has been relatively little work devoted to competition-law remedies"* (Calvani 2005:4-5).

Monopolies and cartels are the epitomes of destructive forces that can wreck markets. They do so by wielding market power. This chapter explains the nature of market power, the laws that are meant to contain it, and what nations have done to combat international cartels.

Market Power

The principal application of industrial economics to antitrust analysis is to identify exercised market power. In economics and the law, market power is the ability to control exchange prices or to prevent entry by a buyer or seller into a market. That control is a matter of degree. A market participant has power over price if it has discretion to influence price over some range. Similarly, a seller need not be able to blockade market entry entirely to have market power – merely the ability to slow down the rate of entry or prevent one new potential seller from entering is enough.

Exercised market power may derive from the concerted action of buyers or sellers (also called multilateral market power) or from the conduct of a single, typically dominant firm (unilateral market power). Collective action by buyers or sellers that has as its principal aim the increase or maintenance of their market power is called *collusion* in economics and *conspiracy in restraint of trade* under the competition laws of most modern industrial countries.

Monopoly is the oldest word in the language to describe market power. It came into English in Sir Thomas More's *Utopia* published in 1551. By 1601 treatises and court decisions in English Common Law condemned monopoly behavior as an unlawful business practice that resulted in the enrichment of the monopolist at the expense of the buyer. Originally, the word monopoly covered both the case of a single seller and the

case of a few sellers, but by the late 19th century the latter situation had come to be called *oligopoly.* Oligopoly is a descriptive term for an industry with a few sellers, but it does not necessarily denote illegal behavior. Other closely related terms are syndicate, pool, trust, or cartel. Trusts were often the legal instruments used to hold the combined assets of merged firms and thereby exercise true monopoly power. Thus, by the 1870s "trusts" had taken on a pejorative connotation. In 1890, G.B. Shaw defined trusts as "a combination to destroy competition and to restrain trade." When the Sherman Act was passed in 1890 to control abusive trust behavior, it became popularly known as an "anti-trust" law. *Cartel* is the most precise term to describe business combinations formed by agreement to regulate production, sales, or prices. Cartels are oligopolies that explicitly engage in monopolistic conduct.

In economics the most widely accepted measure of the extent of exercised market power is the Lerner Index, also called the price-cost margin. For a given industry, the Lerner index is the difference between the observed market price and a competitive benchmark price divided by the market price. The numerator of the Lerner Index is called the *overcharge* because it is the amount buyers overpay for price-fixed goods. Given the demand and cost conditions in a particular industry, the Lerner Index for a monopolist represents the maximum profit that a firm can earn in the industry.[1] In a perfectly competitive industry, the Lerner index will be zero. By analogy, the Lerner Index captures the profit rate on sales that can be attained by an effective cartel.

The time frame is critical in assessing the degree of market power, and it has important implications for antitrust applications. In the short run, some capital costs are *fixed* in that they do not vary with the level of firm or industry output, whereas the remaining portion of total costs are *variable*. In the short run fixed costs are irrelevant to maximizing profits, and the appropriate measure of costs in the Lerner Index is *short run marginal costs*. From the point of view of antitrust analysis, the presence of long run market power is more serious in the sense that it generates monopoly profits for sellers and causes injury to buyers. The degree of market power in the short run is always greater than or equal to market power in the long run. In the short run, a profit maximizing firm with market power may not be covering its full costs; that is, the firm's economic profits may be negative and it may not be imposing an overcharge on its customers.[2] That is,

[1] It is also the profit-maximizing condition for firms that choose prices in an oligopoly with differentiated brands. In all three cases, the Lerner Index is the inverse of the own-price elasticity of demand facing the firm (market, residual, and brand demand, respectively) (Werden 2000).

[2] Economic profits or rents do not include a normal return to investors or bondholders in the firm, whereas conventional accounting concepts may count these as part of the profits

a positive Lerner Index in the long run may be considered evidence of *monopoly power* or, in the phrase used in antitrust case law, "a high degree of market power" (Werden 2000).

U.S. antitrust case law has incorporated the economic definition of market power in decisions of the Supreme Court going back to 1969. The term "monopoly power," the more common term used by the courts, is "the power to control prices or exclude competition." This formulation may be interpreted as two alternative ways of exercising a high degree of market power: price fixing and raising barriers to entry. Alternatively, the reference to exclusionary conduct may be interpreted as showing concern for duration as an aspect of high degree of market power.

In sum, U.S. antitrust decisions seem to equate monopoly power or a high degree of market power with a positive Lerner Index in the long run. High market shares, concentration, and barriers to entry are often cited as practical indicia of monopoly power. The Lerner Index can also be inferred from the own-price elasticity of demand, and increasingly the courts seem to be adopting this approach (Werden 2000).

Anti-cartel Laws

The philosophical foundation of the antitrust laws incorporates two principles (ICN 2005a). First, the *retribution* principle stresses that sanctions should be imposed on violators in proportion to the harm inflicted on the victims. In economic terms, antitrust fines and compensation should be related to the economic harm generated by price fixing. Second, the *utilitarian* principle insists that society is best served when penalties are high enough to prevent recidivism, either by the perpetrator himself (special deterrence) or as an example to other would-be wrongdoers (general deterrence). Antitrust enforcement promotes economic welfare through a combination of organizational and individual penalties that disgorges illegal monopoly profits to parties who purchased price-fixed goods and discourages future cartel formation. That is, penalties ought to be both compensatory and punitive.

Optimal deterrence theory dates from a classic 1968 paper by Gary Becker (Garoupa 1997). Most theories of optimal legal enforcement assume that the aim is maximization of social welfare. From this principle one can deduce several strong conclusions. Optimal enforcement may involve a combination of fines and imprisonment. Where prisons are expensive (as in Europe), fines will be preferred to monetary fines; the opposite

of a firm. In equilibrium, competitive firms earn zero economic profits but may make positive accounting profits.

seems to be the case in the United States. Under the simplest of assumptions, the optimal fine is the harm caused by the crime divided by the probability of detection. Risk-avoiding behaviors require a lower optimal fine than risk-loving ones. Amnesty programs save enforcement resources and are generally preferred to regimes with no amnesty programs. Litigation costs lower the optimal fine. Systems of justice that mistakenly convict the innocent should have lower sanctions; criminal-law systems with extensive protections for the accused should have higher sanctions. Deterrence is enhanced by legal systems that punish conspiracies to commit crimes, even though the conspiracy may be ineffectual. Private suits result in overall lower costs of public and private enforcement. These conclusions, while sensible, have received only limited empirical verification.

Historical Development

In his magisterial survey of the world's competition laws in the mid-1960s, Edwards (1967) found 24 countries with antitrust laws. Twelve had been adopted prior to World War II, though most of these had fallen into disuse or had been superseded by government policies that actively promoted cartels in the 1930s. By and large, prior to 1945 countries with cartel laws had weak or nonexistent penalties. Often the laws merely permitted investigations or required registration of cartels. Sometimes, as in France, the courts found anticartel laws in conflict with laws that permitted businesses to form industry associations. In other cases, the laws left on the books were simply unenforced. Except for 1933-1937 when depression concerns led to the passage of the National Recovery Act, only the United States steadfastly enforced its antitrust law before the 1960s (Wells 2002).

From 1973 to 1989 at least 17 more countries adopted new or greatly strengthened antitrust laws, many of them Member States of the EU (Palim 1999). For example, the UK passed its first anticartel law in 1956, but the weak remedies (investigation and administrative pressure to cease certain collusive practices) had little effect on subsequent industry price competition (Symeonidis 2000). On the other hand, Germany's strengthening of its competition law in 1958 (cartel penalties could reach triple damages) was particularly influential, prompting the European Economic Community to adopt its own competition law in the same year (Harding and Joshua 2003). During 1990-1996 no less than 26 additional countries implemented serious competition laws, all of them outside the EU (Palim 1999). The total of 70 nations accounted for 78% of global GDP. Today more than 100 countries have antitrust laws.

Adoption of antitrust laws was motivated by several factors. Immediately after World War II the former members of the cartels were

politically weak, partly because of abuses revealed by post-war investigations; in some cases cartels were held responsible for inflation, international trade restrictions, or retarded productivity growth; and cartels were judged to be incompatible with the dismantling of national planning policies.

The post-war national competition laws varied in several respects from those of the United States. Their purpose was to keep prices at "reasonable" levels, protect business from unfair competition, and to maintain economic stability. The U.S. concept of protecting the competitive process for the benefit of consumer welfare is unusual in non-U.S. antitrust statutes. Despite the differences in antitrust philosophy, the *content* of most antitrust laws is quite similar. In about half the cases, price-fixing was strictly prohibited (except for export prices); the remainder prohibited cartels operating "contrary to the public interest".

Passage of national antitrust laws accelerated in the 1990s because of four factors (Connor 1997, Palim 1999). First, many countries in the Soviet bloc and Latin America abandoned price controls and centralized economic planning; antitrust laws were viewed as necessary to constrain the market power of privatized firms in concentrated sectors. Second, with the liberalization of international trade and investment rules by many newly industrializing countries, multinational firms began lobbying for a more predictable legal environment for business, including more transparent competition laws. Chile's highly successful growth strategy was due in part to the clarity of its national antitrust enforcement policies. Third, as many countries turned away from military or dictatorial regimes, antitrust laws were passed as part of the process of democratization, of which the dispersion of economic decision making is seen as one part. South Korea's Fair Trade Commission is often cited as an example in this regard. The World Bank began making the implementation of effective antitrust enforcement a condition of loans for economic restructuring as early as 1991 in the case of Argentina. Such policies were often welcomed in countries that had relied on heavy investment in state enterprises as a major development strategy, often with disappointing results for employment creation and industrial efficiency.

A fourth motive for the adoption of antitrust laws is the formation of customs unions. When expansions of the EU occurred in the 1990s, the formation of national competition-law agencies with substantive and procedural features compatible with the EU's became a necessary condition for membership. Poland, Hungary, and other new EU members have framed competition laws on the model of the German Federal Cartel Office. In North America, the formation of the North American Free Trade Agreement (NAFTA) area prompted Mexico to pass new competition laws in 1993.

Cartels have come to be condemned by international bodies (ICPAC 2000). The United Nations' Commission on Trade and Development (UNCTAD) began holding annual conferences antitrust laws in the mid-1970s. In 1980 UNCTAD issued a set of nonbinding recommendations to its member countries for laws that control restrictive business practices, including clear prohibitions of cartel activities. Prior to 1980 only about five developing countries had instituted competition laws, but during the 1980s UNCTAD was reporting annually on the adoption of about three new national antitrust laws.

Another multilateral agency concerned with cartel policies is the Organization of Economic Co-Operation and Development (OECD). In 1998, its 29 members adopted a set of recommendations on cartel enforcement which ICPAC called "the first consensus statement on an approach to international hard core cartels." The OECD statement defines a hard core cartel as an anticompetitive agreement, concerted practice, or arrangement by competitors to fix prices, rig bids, restrict output, or to divide markets by allocating market shares, customers, suppliers, territories, or lines of business. The OECD recommends the adoption of laws that prohibit cartels and that provide for effective enforcement and sanctions. Moreover, member countries are encouraged to sign mutual assistance agreements between their antitrust agencies and repeal legislation that blocked cooperative enforcement efforts. The ICN (2005b:5) has reinforced the OECD theme:

> "Secret cartel agreements are a direct assault on the principles of competition and are universally recognized as the most harmful of all types of anticompetitive conduct."

Despite the exhortations of UNCTAD and the OECD, anticartel laws and enforcement procedures remain quite variable across the 100 or so jurisdictions that now have such laws. These differences often reflect the general differences in national legal systems. The UNCTAD and OECD recommendations do not have the force of international law; they are more like model laws or workable principles. In general, Australia, Canada, Korea, and the European Union have the most active programs of anticartel enforcement after the United States. In most other countries in Asia and Latin America (e.g., China and Venezuela) there are laws on the books that are as a practical matter unenforced (Connor 1997).

Some national antitrust laws specify extensive lists of multilateral conduct that are deemed *per se* illegal, just as price fixing is in the United States, but most national laws follow a rule-of-reason approach even for

hard core cartels.[3] The types of sanctions available to the antitrust units or the courts also vary considerably across jurisdictions. Cease-and-desist orders or court injunctions are quite common, and future violations of such orders can bring about very severe additional sanctions. Fines are also typical, but fining policies vary greatly. Most antitrust laws cite exemptions for labor unions, farmers' cooperatives, and certain directly regulated industries. A very large majority of the world's antitrust regimes, beginning with the United States in 1918, permit export cartels to fix prices (Levenstein and Suslow 2004).

The ability of plaintiffs to bring private damages suits, the sanctioning of individuals and leniency policies vary internationally. Like corporations everywhere, individuals guilty of price fixing are typically subject to civil penalties or none at all. The United States, Canada, France, Ireland, Israel, Latvia, UK, Norway, and Japan have criminalized their price-fixing laws, but only the United States and Israel regularly prosecute individuals and seek prison sentences for the ringleaders of cartel. Individual fines are often, capped at modest levels, but Germany allows for treble damages to be assessed on persons.

The Sherman Act

The Sherman antitrust act was made law in the United States in July 1890 (Hovenkamp 1998). Although it was preceded by similar laws in several U.S. states, it would prove to be the world's first effective anticartel statute.[4] The Sherman Act is descended from the English common law that underpins much U.S. law, but its passage was primarily a populist response to abuses by large-scale industrial trusts that first appeared in the 1880s (Sullivan and Fikentscher 1998). The major goal of the Act was to enhance various libertarian economic and political values protected by the U.S. constitution: property, contract, economic opportunity, and political liberty. Simply as law, the Sherman Act may be viewed as federalizing the common law of trade restraints (Hovenkamp 1998). Its emphasis on preserving the competitive process, protecting buyers from exploitive prices, keeping market entry free, and shielding companies from abusive tactics made the Sherman Act a uniquely American invention. In the early 20th century, the goals of antitrust shifted somewhat as the courts interpreted

[3] Sullivan and Fikentscher (1998) assert that in Germany and the EC there is no distinction between antitrust violations as per se or rule-of-reason.

[4] Several Western and Midwestern states of the United States had antitrust laws in the 1880s, but sub-national units had difficulties devising remedies for convicted national firms. France (1790) and Canada (1889) also passed laws against price fixing, but these laws were unenforced for many decades (Connor 1997).

antitrust as a tool for furthering laissez-faire economic policies. Up to the early 1930s, both the administrative branch and the courts consistently supported anticartel actions. After a brief hiatus in the mid 1930s, the growing realization of the symbiotic relationship between German cartels and the rise of National Socialism stimulated a renewed animus toward cartels.

The Department of Justice won its first price-fixing case in *U.S. v. Trans-Missouri Freight Assn.* in 1897 (Hovenkamp 1998). One reason for the lag between passage and enforcement was the broad, even vague language of the Act. Congress intended to state general principles of illegal conduct rather than enumerate specific types of conduct. Thus, Section 1 of the Sherman Act rather simply prohibits

> ". . . every contract, combination . . . or conspiracy in restraint of trade or commerce among the several states, or with foreign nations . . ."

In effect, Congress delegated the interpretation of the law to the federal courts.

As is true of any important law, legal battles are fought over nearly every word in the statute. For example, notwithstanding Congress' use of the word "every," the Supreme Court decided as early as 1911 that only *unreasonable* restraints were intended to be prohibited. Some restraints are classified as unreasonable under every circumstance. Conspiracies that involve agreements on common prices, on market shares, on exclusive sales territories, and on boycotts are generally deemed unreasonable. Such cases are decided on a *per se* illegality basis. That is, these behaviors are illegal irrespective of the circumstances or their market impacts. On the other hand, some types of collusive conduct may have pro-competitive effects as well as effects destructive of competition. These cases are decided on a "rule of reason" basis.[5] That is, the courts will entertain economic evidence about the balance between the benefits and the harm caused by the restraint and will examine under which circumstances one effect may dominate the other. In *per se* violations no economic evidence need be presented to the court. One justification of the *per se* rule for price-fixing cases is conservation of judicial resources.[6]

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5 "All you need to know about *per se* vs. rule of reason is that under the latter, defendant wins." (Aphorism attributed to Albert Foer.)

6 Not all academic writers agree. Posner (1969) takes the position that there is no substantive difference between cartel behavior and tacit collusion. If so, the logical conclusion is that all price fixing cases should be decided on a rule-of-reason basis with full information presented on market effects (Gertner and Rosenfield 1999). However, so far such opinions remain in the minority.

The borderline between *per se* violations of the Sherman Act and rule-of-reason violations has shifted somewhat in the last 30 years or so (Gilbert and Williamson 1998). One type of restrictive practice that is no longer considered a *per se* violation is exclusive dealing. Similarly, some types of vertical price-fixing arrangements have been considered under a rule-of-reason approach. Setting maximum prices to be charged by franchisees is no longer illegal. It is nearly impossible to find credible U.S. antitrust experts advocating the abandonment of the *per se* rule for horizontal price fixing, even among those writers hostile to antitrust enforcement in general (Bork 1978).[7]

The Sherman Act may be prosecuted by the DOJ as a criminal felony or as a civil matter at the discretion of the courts. Prosecutors will bring forth criminal charges if they judge the price fixing to be a serious violation and if the evidence for prosecution seems strong enough. The burden of proof in a criminal prosecution falls on the government and involves four elements (Bell and Gaskin 1999). First, the prosecutors must demonstrate beyond a reasonable doubt that a conspiracy or *explicit agreement* was entered into by the parties. Normally, one or more of the parties to the agreement must testify that their oral or written communication was in fact a genuine deal or contract. Second, the defendants must have knowingly and *intentionally* entered into the agreement. In the case of a cartel, the intent must be shown to be the goal of increasing prices or profits of the participants. Third, the conduct must fall into the category of unreasonable restraints. Naked cartel behavior always qualifies. Fourth, federal prosecutors must demonstrate that the market spilled across state or international borders. Intrastate trade can only be prosecuted under antitrust laws passed in at least 44 of the 50 states.

Although nearly all overt price conspiracies are prosecuted by the Department of Justice as criminal matters, in a small percentage of cases the evidence may not be strong enough to convince a jury "beyond a reasonable doubt." The DOJ then has the option of prosecuting an alleged cartel as a civil matter. In a civil trial only the preponderance of the evidence is required to obtain a conviction. In most price-fixing cases the most difficult element is the question of intent, so in civil proceedings the jury is often presented with circumstantial evidence about the parallel behavior of the firms that may allow it to *infer* that an agreement must have been made. The Federal Trade Commission, the state attorneys general, and parties injured by a cartel also have standing to bring civil suits against

[7] McChesney and Shugart (1995) believe that some types of cartels are socially efficient. However, even if the cartels can reduce industry dead-weight losses, these benefits may not outweigh jurists' concerns for conservation of judicial resources or society's concerns for equity or small-business protection. Japan and the EU regularly grant exemptions for cartels in industries with excess capacity.

alleged cartels. As plaintiffs, they too are required only to show that a conspiracy was more likely to have occurred than not.

Defendants in Sherman Act cases have a number of possible defenses that may let them go free. First, a defendant may present evidence that it withdrew from the conspiracy more than five years before the case was filed. Second, a corporate defendant may attempt to show that the managers who ran the conspiracy did so in direct violation of company policy. Of course, the "rogue managers" are still liable for prosecution. Third, defendants may attempt to prove that the companies involved in the cartel were in fact under common ownership and control. A company cannot conspire with itself, only another independent business can. Fourth, defendants may argue that they have already been prosecuted in the jurisdiction for the same crime; this is the "double jeopardy" defense. Fifth, defendants may try to establish that they were acting under government authority. Price-fixing agreements may be legal if a government regulatory body oversees an industry. Moreover, certain types of organizations are immune from Sherman Act prosecution; most nonprofits are exempt, and since the 1920s farmers' cooperatives and labor unions have been exempt. Sixth, perhaps the most common defense concerns intent. Defendants will frequently argue that their agreements were for some purpose other than raising prices. They might suggest that their meetings were management-training exercises or that they met simply to exchange innocent information. For both prosecutors and defendants, the actual effect on prices is irrelevant to guilt or innocence. Nor can defendants suggest that they were unaware of the law.

Legality of Tacit Collusion

The important distinction between tacit and overt collusion seems to be clearer in economic analysis than it is in the law (Gertner and Rosenfeld 1998). U.S. courts generally use the term price fixing to encompass all forms of cartel behavior and to indicate that it is *per se* illegal. Often the key feature in a case that determines whether the *per se* rule applies is the legal and economic meaning of the "agreement." Naked cartels always meet the test, but not all prosecutions of cartels have evidence of secret meetings with explicit agreements.

A contract between two firms to merge is also an explicit agreement that will restrain competition between the two entities, yet mergers are always analyzed under the rule of reason. Moreover, the courts have treated certain types of open joint sales under the rule of reason because they arguably increased output and social welfare (e.g., *Broadcast Music, Inc. v. CBS* 1979). Certain types of joint ventures also may legally engage

in pricing (*Daugher* 2006). In some cases prosecutors will allege cartel behavior but lack direct evidence of an explicit agreement. In these cases, it will be necessary to present circumstantial evidence about market effects so as to allow the jury to infer that an explicit agreement must have occurred. If this evidence is persuasive, then liability for the price fixing follows the *per se* rule.

Many effective price-raising conducts involve the formation of tacit understandings among rivals. Some types of price leadership require a leading firm to initiate a round of price changes in the industry by an explicit announcement or "signal." The followers need not explicitly express their concurrence with the price change by communicating it to the leader, but they can achieve the same result by announcing a parallel price change to their customers or indirectly to their rivals through trade publications. Such parallel pricing actions have usually been classified as "non-cooperative" behavior in economic models of oligopoly – strategic oligopolistic interdependence that does not constitute overt collusion or conspiracy under the law. Tacit collusive actions usually require a punishment mechanism in order to be effective in raising long run profits. While price wars are the classic form of punishing deviants from a tacitly collusive arrangement, punishment may take the form of predatory actions targeted against deviants. Moreover, strategies covering market segmentation, most-favored-nation contracts, exchanges of information through trade associations, and early credible price announcements can help discover deviant behavior. These are called facilitating practices. In general, facilitating devices increase the predictability of future behavior among rivals.

Predatory behavior and facilitating devices may be illegal collusive conduct. Historically parallel behavior, especially in prices, may be used to infer the existence of an express agreement. In general, absent direct evidence of such an agreement, merely parallel behavior cannot suffice for price-fixing liability. However, evidence of parallelism in behavior can be combined with so-called "plus factors" that may seal the guilt of a group of sellers under the Sherman Act. Among the plus factors are identical bids in sealed-bid auctions, a predictable pattern of winning or losing in auctions, conduct against self interest, exchanges of excessively detailed transaction data, price announcements far in advance of purchase dates, preventing new product introductions, or other evidence of a dramatic change in market conduct that could not be due to shifts in demand or supply.

U.S. law on facilitating practices for tacit collusion is a bit unsettled. An important case was the issuance of detailed price books by General Electric and Westinghouse during 1963-1974. Combined with a quickly adjusted multiplier and price protection clauses, the two companies perfectly matched their prices on large turbo-generators. In 1977,

a consent decree ended the practice (Hay 2000). However, in a similar case involving makers of a gasoline additive (*Ethyl* 1980), the court said that advance signaling for the purpose of informing rivals of their pricing intentions had no efficiency defense. If so, the practice could be declared a *per se* illegal implicit practice; that is the adoption itself was an *implicit conspiracy.* In the *Airline Tariff Publishing Co.* case (1993), advanced price announcements that involved communications among airlines through their shared reservation system were found to be illegal even though the practice had legitimate business purposes that benefited consumers. This conduct was declared illegal under a rule-of-reason analysis: the harm to entry conditions outweighed the benefits of early announcements.

Thus, Hay (2000) argues that an independently adopted industry-wide practice for the purpose of suppressing price or non-price competition may sometimes be declared *per se* violations of the Sherman Act. They are probably legal in homogenous-product industries with good price information if (1) the practice does not alter the parallel pricing that would emerge without it anyway or (2) the removal of the practice would not improve market performance. If the practice has no legitimate business purpose, its adoption is probably *per se* illegal. Moreover, even if the practice can be defended as an efficient one, injured parties in a civil case might argue that the harm caused them outweighs any efficiencies.

Extraterritoriality

Unlike the competition laws of some other countries, the Sherman Act permits the prosecution of conspiracies in restraint of trade that occur outside U.S. territory so long as those acts affect U.S. trade and commerce. This "extraterritoriality" provision of U.S. antitrust law often remained entirely theoretical because of practical barriers to gathering evidence or serving subpoenas abroad, but in recent years bilateral treaties or protocols have allowed for greater cooperation among the world's many antitrust agencies. The extent to which extraterritoriality applies to global cartels became an issue in several U.S. suits in 2000-2005 against members of global cartels. Many legal scholars argue that companies that purchased cartelized products outside U.S. borders ought to be allowed to sue for damages in U.S. courts because raising prices domestically was *intrinsic* to the success of collusion abroad (Bush *et al.* 2005). For the moment, the courts have taken the view that concerns about "judicial burden" and "negative comity" have trumped the need for stronger penalties to deter global cartels (Davis 2002, Fox 2005).

European Union Rules

Until after World War II the United States was nearly alone in the world in having a strong commitment to anticartel enforcement (Wells 2002). National laws outlawing price fixing were passed in the late 1940s in Japan and Germany as part of the occupation policies of the Allies to prevent the reappearance of concentrated economic and political power in those former Axis countries. Although the Japanese antitrust laws were weakened in the 1950s, those in Germany were strengthened just before the Treaty of Rome that created the European Economic Community (EEC) was signed in 1957. Like the interstate commerce clause of the U.S. constitution, the EU's competition laws were designed to preserve the smooth functioning of a customs union that is evolving into a single market. By the 1960s, the competition laws of the United States and the EEC (now part of the European Union) had become the world's two great legal templates (ICN 2005b:14).

In language not unlike that of the Sherman Act, article 85 of the Treaty prohibits agreements and concerted acts in restraint of trade, when that trade is between member countries of the European Union. "Agreements" in EU parlance are roughly equivalent to overt conspiracies in the U.S. tradition: written or oral agreements or joint announcements about conditions of sales. "Concerted practices" are forms of business cooperation based on mutual understandings or exchanges of information, i.e., tacit agreements (Venit 1996).

All forms of naked cartel behavior are considered serious infringements of EU competition rules. Allegations of price fixing are handled by the EC as an administrative proceeding. There is no concept of price fixing as a criminal justice matter under EU competition law. Some scholars have taken the position that criminal proceedings are inherently superior in deterring cartels because there are likely to be fewer enforcement errors than in an EC-style administrative system (Schinkel and Tuinstra 2004). The EC has in the past issued "bloc exemptions" to companies, industries, or trade associations that have inquired about the legality of certain practices; such negative clearances are no longer made. EU law does not permit personal penalties and has no provisions for mandatory divestiture of companies.

The European Commission's Directorate-General for Competition (DG-COMP) is the world's second most powerful antitrust authority.[8]

[8] The DG-COMP has about 500 professionals, half the Antitrust Division's number, but has had broader legal responsibilities (state subsidies, issuing negative clearances, etc.) than the Division. Moreover, the U.S. DOJ has available investigators from the FBI, whereas DG-COMP staffs its own probes. On the other hand, the national competition authorities of

DG-COMP has dedicated anti-cartel units. The DG-COMP has the power to demand information from potential violators in writing and to conduct on-premise surprise inspections. These are now standard practice in cartel cases. Unlike the U.S. system of criminal law, the EU employs an administrative law system (ICN 2005b). The powers and procedures of the DG-COMP resemble those of the U.S. Federal Trade Commission.[9] EU law treats antitrust violations solely as civil infractions by business entities.[10] After a lengthy investigation that relies mainly on written documents, if there is probable cause the EC issues a Statement of Objections to the putative violators. The accused companies have the opportunity to reply in writing or in a brief oral hearing. If a violation is deemed to have occurred, a draft decision is circulated to a committee of experts for comments. The final decision must be approved by the Commissioner for Competition and voted on by the full Commission. Adverse EC decisions can involve enjoining conduct, voiding contracts, or fining corporate transgressors. Once issued, the decision is often successfully appealed to the EU courts. The EC's decisions take an average of four years after U.S. prosecutions are announced for the same international cartel (Connor 2003: Table A.3). Individual conspirators are not personally liable for monetary penalties or prison sentences.

Harding and Joshua (2003) conclude that "... European law has over [1980-1990] caught up with American law" (p.270) in the sense that cartels are now subject to "categorical censure". Since the 1970s "... the classic price-fixing, market-sharing cartel has... been driven underground and become strongly prohibited... "(p.229). EU legal thinking has evolved by integrating the common-law concept of conspiracy to prosecute cartels (Joshua and Jordan 2004). In 1998 the EC issued guidelines for the calculation of price-fixing fines that explained practices being followed during the 1990s (*ibid.* p. 242). Moreover, in 1996 the EC issued its first leniency notice, which was revised in 2002 in a way that closely mimicked the U.S. policy. Therefore, by the late 1990s, the EU had also developed a set of government anticartel sanctions for corporations that were similar to those in the United States and Canada (*ibid.* pp. 216-222). EU law has no provision

the EU are much larger (up to 300 employees) than the typical U.S. state attorney general's office.

9 Like the FTC, the EC competition directorate investigates allegations of antitrust violations, holds hearings in which defendants can present their side of the case, makes an initial determination of guilt, recommends sanctions, has those decisions approved by the full commission, and may have its decisions appealed by the guilty parties to two higher courts.

10 Besides the USA and Canada, nine other countries provide for criminal sanctions: Austria, Germany, France, Norway, Ireland, Slovakia, Japan, the UK and South Korea. Australia is considering such laws (Hammond 2002).

for private antitrust suits, but there is gathering steam for compensatory suits in the national courts of the Member States. There is also a debate as to whether EU competition law should be criminalized (Wils 2001).

Canadian Law

Canadian federal competition law dates from 1889, but was rendered ineffective by court decisions until the tough Competition Act was passed in 1986 (Ross 2004). Now Canada treats price fixing as a serious criminal offense. Antitrust allegations are investigated by the Canadian Competition Bureau. Section 45 of the Act makes price-fixing conspiracies that "unduly lessen competition" illegal. Although this sounds like a rule-of-reason approach to enforcement, naked cartels are as a practical matter prosecuted by the Ministry of Justice as *per se* offenses. Under Section 47 of Canada's law, covert bid-rigging is a *per se* violation. Finally, there is a special section (46) that empowers the Ministry of Justice to indict cartels that have operated outside of Canadian territory; prosecution under this section requires Canadian affiliates of multinational corporations to turn over evidence that may be held abroad; conviction may result in unlimited fines. Efficiency defenses are not permitted.

In 1992 a new Canadian law approved the use of civil class actions for plaintiffs to seek single damages. Within ten years follow-on damages suits for price fixing became "a virtual certainty (Goldman *et al.* 2003: 3). Unlike the messy U.S. procedures, recoveries for both direct and indirect buyers are handled simultaneously.

Prosecuting International Price Fixing

This section examines the general policies and procedures followed by the world's major antitrust authorities when confronted with allegations of illegal cartel conduct

Modern international cartels -- those discovered since 1990 -- have distinct characteristics, many of which make them more difficult to prosecute (Griffin 2002, Hammond 2005c). Although they operate with full knowledge that they are breaking the laws of several nations, cartel members view those laws with a mixture of utter contempt and fear of U.S. detection. As a result they make extraordinary efforts to avoid U.S. territories and to cover up and destroy evidence of meetings. Industry trade associations are convenient for covering up conspiratorial meetings. In recognition of the key industry positions attained by East Asian manufacturers in many lines of business since 1960, most modern cartels have

had to include Asian corporations as members. Companies outside the United States are unlikely to have adequate antitrust-compliance training for their employees (Kolasky 2002). Typically, international cartels have sought to control markets in what business marketers call The Triad – North America, Western Europe, and the most industrialized nations of East Asia. This *global reach* in price fixing means that buyers are unable to find lower prices in distant markets and are therefore less likely to complain to antitrust authorities. The involvement of top executives is a common feature because of the delicate negotiations needed to agree on worldwide market allocation schemes and to renegotiate periodically those allocations. Underlings are unlikely to become whistleblowers when collusive schemes are legitimized by company leaders. The use of precise score sheets to chart adherence to share agreements, third-party verification of reported sales, compensation for under-quota members, and threats by leading firms that cow smaller participants – all of these are techniques that discourage defections into the arms of antitrust authorities.

At the same time modern international cartels do face greater risks of detection and punishment than cartels in the early 20th century. Since the adoption of effective anticartel enforcement by Canada and the European Union in the mid 1980s, international cartelists have had to weigh the benefits of monopoly profits against some probability of being apprehended and punished for collusion.[11] Moreover, U.S., Canadian, and European antitrust authorities implemented new policies and procedures in the 1990s that significantly increased the probability of detection and the harshness of penalties directed at international cartels. These authorities reallocated enforcement resources toward prosecution of such cartels, increased cross-authority coordination, adopted more effective automatic leniency and "amnesty plus" programs, imposed higher corporate fines, and in some jurisdictions applied individual criminal penalties (Connor 2001, OECD 2002, Wils 1998, ICPAC 2000, Spratling 2001, Klawiter 2001, Kolasky 2002). Beginning in the late 1990s, speeches of top antitrust officials began to acquire a tone of triumphantisim rather than concerned calls for reform in the face of a cartel onslaught (Hammond 2001b, Monti 2002, Pate 2003, Klein 1999). Economists previously critical of antitrust enforcement because of the presumptive natural fragility of cartels and because of its excessive public and private costs concede that prosecution of cartels is an eminently rational pursuit for governments (Shughart and Tollison 1998).

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11 The story of the increasingly effective EU prosecution of cartelists told in Harding and Joshua (2003). Canada, Australia, and South Korea have taken harsh actions against international cartels since 1990. Opinions vary about the dedication of Japan's FTC to fighting cartels (First 1995, Chemtob 2000).

Monetary fines are frequently imposed on convicted corporate cartel participants, but the limits on such fines or the ways that they are calculated also vary. Anticartel statutes often specify absolute upper limits on the size of corporate fines, such as the $10-million statutory maximum for Sherman Act violations in the United States during 1990-2005. The United States and other jurisdictions have upper limits based on a percentage of "affected sales," that is, sales in the cartelized market during the conspiracy period.[12] Usually the sales concept is geographically or temporally restricted. The percentages mostly fall in the 5 to 20% range. Typically, national cartel fines are based solely on national sales during the affected period. However, the EU fine structure allows the Competition Directorate to recommend fines up to 10% of a violator's *global* annual sales in all its product lines; U.S. law also permits the use of global sales if a fine based on U.S. sales were to grossly understate the seriousness of the offense. The United States, Canada, and Germany place no limits on the length of the affected period, but other jurisdictions limit the sales from which to calculate the fine to three years or even one year. Beginning in 2000, the UK Office of Fair Trade was authorized to assess fines on cartels as high as 30% of sales for three years.

U.S. Government Suits

Price-fixing suits may be brought by federal or state antitrust agencies or by private injured parties. The Department of Justice has sole authority under the Sherman Act to bring criminal charges against alleged corporate or individual price-fixers, but civil indictments may be launched by any of the parties just mentioned. The procedures available to the DOJ for prosecuting criminal defendants are quite different from civil cases. The procedures for civil indictments are all fairly similar for plaintiffs, whether government agencies, state attorneys general, or private injured parties. However, the U.S. Federal Trade Commission only infrequently launches civil cases against cartels. The form and substance of civil antitrust suits pursued in state courts are quite similar to those in federal courts (O'Connor 1996).

Historically, federal antitrust agencies usually opened most investigations after receiving credible complaints from citizens; less commonly, the agencies' staffs might open an investigation on the basis of press reports. Since the late 1990s amnesty applications have accounted for the majority of cartel cases. After a preliminary staff analysis that affirms the possibility of a violation and confirms that the market has imperfectly competitive characteristics, a more formal investigation is

[12] Belgium, Italy, Finland, Sweden, and Spain follow the EU rule of 10% of a group's annual sales. Greece allows 15%, Austria single overcharges, and Denmark has no upper limit (*Financial Times* August 10, 1999:6).

opened. Determining the feasibility of a market to support price fixing is called screening (Dick 1995).

For a criminal case, when emerging evidence evaluated by DOJ lawyers and economists becomes strong enough, a grand jury will be established with the approval of the Assistant Attorney General for Antitrust (Victor 1998). Most grand juries are set up in major cities where the Division has field offices. Although under the supervision of a judge who ensures that federal rules of procedure are followed, the grand juries are very much tools of a prosecutor. The juries issue subpoenas and hear testimony that is almost always kept secret. Citizens on grand juries can ask questions of those testifying, but their main role is to restrain over-zealous prosecutors. Grand juries usually do not interview the targets of an investigation, but do hear individuals who might provide useful testimony in a trial.

Foreign companies are immune to U.S. subpoenas, unless they have U.S. subsidiaries or sales offices. Grand juries have no authority to compel appearances from companies or persons resident outside the United States. Subpoenas can only be served on persons residing in the United States or to businesses that are registered in U.S. territory. Therefore, in the case of global cartels, the DOJ may seek the voluntary cooperation of foreign residents or companies. Testimony may be taken in third countries, sometimes in U.S. embassies. In potential criminal matters, the DOJ may seek the assistance of foreign ministries of justice under mutual assistance treaties. Joint criminal antitrust investigations can be conducted with a few countries.

If probable cause is established to the satisfaction of the prosecutors, the jury will vote on whether to indict companies or individuals or to request search warrants from a local magistrate. Warrants will be issued only if a sworn DOJ statement asserts "probable cause" of criminal activity. Requesting search warrants for antitrust matters was rare until the 1990s. Searches and seizures of documents are carried out in "raids" by the Federal Bureau of Investigation (FBI). The final action of the grand jury, after reviewing testimony and seized documents, is to vote on whether to hand down indictments for specific persons or companies.

When both sides in a case have had sufficient time to prepare their positions, lawyers from each party will attempt to negotiate a mutually acceptable deal prior to a grand jury vote on indictments or prior to the start of court testimony. Nearly all U.S. antitrust cases, both criminal and civil, are settled out of court. A smaller number may even be settled in the midst of formal court hearings, but once guilt has been decreed by judge or jury the only matter subject to negotiation is the severity of the sentence. In criminal cases, prosecutors have a great deal of discretion over which charges to make, the time period of the alleged crime, and how many persons in the

conspiracy to charge. The wording of an indictment on a guilty plea agreement can be crucial in determining both the immediate criminal penalties and future civil liability. The plea agreement can include advantageous language on "the scope and duration of the alleged conspiracy" (Victor 1998:501).

If a company decides to explore the possibility of cooperating with prosecutors and pleading guilty before trial, prosecutors may agree to grant amnesty to the company or to immunize all but a few of the company's employees from indictment. If the company's cooperation comes at an early stage in the multiparty negotiations and the testimony offered is helpful in prosecuting other co-conspirators, all employees may be immunized, subject to full and continuing cooperation with prosecutors.

Since 1978, the DOJ has had a Corporate Leniency Policy that offers full amnesty on fines for companies that are the first to alert the agency about a cartel, so long as the company did not initiate the cartel and no government investigation was in progress. In 1993 an improved policy made amnesty applications automatic for qualified cartelists and grants immunity to all the company's directors and employees (Spratling and Arp 2005). The decision to apply is a complex one; the benefits of U.S. amnesty have to be weighted along with the chances of amnesties in multiple jurisdictions, civil liability, shareholders' suits, and enhanced fines for *not* applying (Zane 2003).

Leniency less than full amnesty may also be negotiated. Prosecutors can also promise to seek reductions in the size of the fine normally required by the U.S. Sentencing Guidelines, subject to court approval. Before concessions are offered, prosecutors need to know in advance how much cooperation they can expect. The degree and type of cooperation is outlined in a proffer letter presented by defense counsel to prosecutors. The second company to offer cooperation in cartel cases can expect to receive about a 60 to 80% discount from the maximum fine. After two defendants agree to plead, the rest typically have no useful new information about the conspiracy, so their ability to bargain is much reduced. Nevertheless, those arriving third or later that agree to plead guilty and cooperate have also been rewarded with substantial discounts from the guideline fines. Immunity agreements usually contain conditions about the degree of continuing cooperation that permit prosecutors to revoke the immunity of a guilty party that becomes recalcitrant. Leniency agreements are rarely overturned by the courts.

Another revision of the leniency policy ("amnesty plus") in the late 1990s extended full amnesty to a company that does not quite meet the aforementioned conditions but instead offers evidence of a cartel in another line of business for which there is no DOJ investigation. If a company qualifies for the Amnesty Plus program but fails to report its second

offense, the DOJ's "Penalty Plus" policy is to seek the maximum fine possible. Discounts are justified by the conservation of prosecutorial resources. Without the offer of downward departures in corporate and personal penalties, many more labor-intense courtroom battles would have to be fought by the government.

Until 2004, DOJ prosecutors could not directly offer relief to defendants from civil damage suits by injured buyers. Even those firms that received amnesty for their cooperation with the government were liable for civil penalties equal to three times the overcharges paid by direct buyers. However beginning in 2004, the leniency program was made more attractive to potential applicants by granting amnestied companies a reduction in *civil* liabilities from treble to single damages. All other members of a cartel are still subject to treble damages.

Guilty pleas or court decisions become *prima facie* (incontestable) evidence of a conspiracy in a civil indictment; moreover, even if an alleged member of a cartel is not indicted or found innocent in a trial, the company can still be made to pay civil damages because in a civil proceeding the standard is the "preponderance of the evidence," not "beyond a reasonable doubt." However, the wording of a company's guilty plea can affect the size of a civil damage award, as can the content of testimony in the rare price-fixing trial. When a criminal investigation is completed, most of the evidence collected that is relevant to assessing a cartel's overcharge is turned over to the plaintiffs during discovery; all the testimony and evidence collected for presentation at trial will become available to the plaintiffs as well. In international cases, documents turned over to non-U.S. antitrust authorities may be ordered to be made available to U.S. plaintiffs (Goldman *et al.* 2003). This evidence may bear on the size of the economic injuries. For these reasons, it is usually to the plaintiffs' advantage to delay settling until most criminal matters are completed.

Although the law and rules of legal procedure give government prosecutors great powers, it must not be forgotten that they bear the burden of proof when a case goes to trial. Moreover, the standard of proof – "beyond a reasonable doubt" – is a very high barrier to surmount. The difficulty of prosecuting criminal international conspiracies is even greater because of problems in gathering evidence outside national borders.

U.S. Prosecution before 1990

Perhaps the first lawsuit by the U.S. government against a global cartel was *U.S. v. American Tobacco et al.* that was filed in 1907 and decided by the Supreme Court in 1911 (ICPAC 1999). There were 94 U.S. defendants and two UK tobacco companies listed as defendants in this massive price-fixing case. One of the indictments brought against

the tobacco firms was that they had agreed to a geographic division of world markets for tobacco products. The American Tobacco monopoly was broken up into several entities and all the defendants were enjoined from allocating world geographic markets in the future. For many years after *American Tobacco* there were few international cartel cases launched by U.S. prosecutors (Klein 1999).

In the 1940s, U.S. prosecutors brought a number of cases against international cartels, some of which involved criminal charges. Most of these cases involved allegations of global market-allocation agreements. Estimates made by scholars writing in the late 1940s place the number of documented international cartels operating prior to World War II at around 179 (Edwards 1944). The principal type of company in these cartels was European manufacturers, but U.S. companies had joined about 60% of those cartels. In the 1930s, cartels were believed to control approximately 40% of world merchandise trade. These mostly Euro-centric cartels operated quite openly, unhindered by concerns of legal prosecution. Among the global cartels indicted for price fixing by the U.S. DOJ were those selling aluminum, dyes, light bulbs, nylon, titanium, tungsten carbide, roller bearings, and precision instruments (ICPAC 1999). Many of these cases involved leading U.S. and European manufacturers engaged in naked price-fixing conspiracies in globally traded products with substantial sales.

Such cases became rare for about 40 years after the early 1950s. The U.S. antitrust agencies continued to prosecute price fixing and bid rigging, but nearly all cases were domestic in scope.

> "For about half a century antitrust did not concern itself with international cartels – either they were not there, or the enforcers could not find them" (Davis 2002: 1).

Commentators on the U.S. antitrust laws were convinced that antitrust could declare victory over price fixing:

> "The elimination of the formal [overt] cartel remains the major achievement of American antitrust law" (Posner 1976:39).

Perhaps the only important international price-fixing case during this period is the well-known uranium cartel, prosecuted in 1975 as *In re Westinghouse Electric Corp. Uranium Contracts*. Most of the few remaining international cartel cases focused on more sophisticated collusive

mechanisms, such as patent pooling.[13] Caves (1996) attributes the pause in discovered global cartels after the early 1950s to several factors. First was the successful prosecution of many global cartels by U.S. antitrust authorities during the Truman administration. Second, the adoption of antitrust laws in a score of industrialized countries immediately after World War II probably had some deterrence effect on the formation of cartels. Third, the largest U.S. manufacturers shifted their behaviors from cooperative to relatively aggressive behavior in the 1950s. They opportunistically invested in the war-ravaged economies of Europe and Asia and broadened their product lines. U.S. foreign direct investment combined with the rapid recovery of major companies in the industrial sectors of Europe and Japan caused global concentration to decline in most industries. Finally, the mix of industries shifted away from homogeneous primary materials and intermediate inputs towards those making differentiated consumer or high-tech capital goods. The latter industries have less incentive to form cartels.

The 1980s were a period of greatly reduced antitrust enforcement. Partly for ideological reasons, the sizes of the two big federal antitrust agencies were cut substantially (Preston and Connor 1992). While there was a continuing commitment to prosecution of domestic price fixing, there was little desire by the new leadership to move the agencies in the direction of novel legal territory by prosecuting global price fixing, even if evidence of such conspiracies had been presented. While the reduced resources of the DOJ managed to bring a respectable number of price-fixing cases each year, they were in economic terms little cases.

Price-fixing enforcement patterns shifted markedly during the Reagan-Bush presidencies in 1981-1992 (Connor 2001: Table 3.1). First, the mix of price fixing cases was altered considerably. Cases against trade associations, which had formerly comprised about a quarter of all price-fixing cases, practically disappeared. Moreover, the proportion of "other" cases, in which the victims were mostly corporate buyers, dropped to less than half of the historical proportion. These types of cases were replaced by allegations of bid-rigging conduct. The bid-rigging cases mostly concerned companies conspiring against government buyers in small geographic markets. Beginning in 1995, a shift toward fewer but larger cases aimed at price fixing by large corporations is apparent.

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13 The *Singer* cases (1963) involved a conspiracy to pool patents on sewing machines to eliminate Japanese imports into the U.S. market. The *Canadian Radio Patents* case (1962) was similar. The *Quinine* case (1975) involved an arrangement whereby one European company would bid for U.S. government quinine stocks, but would subsequently share its stock with non bidders (ICPAC 1999).

Changes in U.S. Policy in the 1990s

There was a clear change in antitrust priorities at the federal level in 1993, the first year of the Clinton administration. President Clinton's newly appointed head of the DOJ's Antitrust Division, Anne K. Bingaman, announced the shift in a speech given in October 1993.[14] Bingaman (1993) stated that enforcement of international-cartel prosecutions and greater international antitrust cooperation were necessary because of the increasingly global reach of the U.S. economy. Although unknown to those in the audience, Bingaman would follow her words with actions by pursuing five big criminal cartel cases that, because they went to trial, would illustrate the pitfalls and the promise of pursuing global cases.

The first case, the prosecution of General Electric Co. and De Beers Consolidated for price fixing in the global market for industrial diamonds, was an unmitigated defeat for the government. The last, the lysine case, would be cited as a triumph for the Department.[15] When Bingaman made her 1993 speech, the Antitrust Division knew that its year-old investigation of the lysine cartel was turning up strong evidence of a vast global conspiracy.

The *Industrial Diamonds* case was litigated during November-December 1994 but ended with a dismissal by the presiding judge after the government's case was presented. Analysis by the *New York Times* and *American Lawyer* mention the government's lack of preparation and relatively small team as factors in the government's loss, but the major failure seems to have been the absence of a key witness and documents held by a South African alleged corporate conspirator. Three of the four defendants failed to appear at trial and refused to cooperate in pre-trial discovery. As a result, the government was unable to show that prices were exchanged by the two defendants.

The loss of *Industrial Diamonds* was the cause of considerable criticism of the Antitrust Division's thrust towards prosecution of global cartels. Critics charged that big international cases might drain the Division of resources, much as happened in the 1970s when it tackled two big

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14 While Bingaman graciously gave credit to her predecessor, James F. Rill, for initiating some global cartel investigations, there seems to be little evidence that global price fixing was a high priority during 1989-1992. One or two cases were under investigation in 1992.

15 Joel Klein, head of the Antitrust Division from late 1995, sometimes cites the *Plastic Dinnerware* cartel as an important transitional case. From 1994 to 1996, 14 guilty pleas were obtained (five corporate, nine individual) in this $100-million-per-year industry. It was precedent-setting because of the large fines (more than $40 million) and the prison sentences for two Canadian executives, the first foreigners imprisoned for Sherman Act violations (Klein 1999). However, the cases were not global in scope.

monopoly cases. Getting documents and witnesses located abroad was likely to be a continuing problem, especially for criminal cases. Critics like William F. Baxter were unsympathetic to pursuing global cartels:

> "[The DOJ] started off with unrealistic ambitions [and a] crusading notion that there's lots and lots of violations . . . The larger companies are well counseled and don't get into the kind of trouble that the Antitrust Division is looking for. So, instead they go after the little companies . . ." (*New York Times* October 22, 1995, §3, p.1).

As prognostication, Baxter's statement is found wanting.

A second international cartel case, *Plastic Dinnerware,* ended in June 1996 with a total of five corporations and nine executives pleading guilty to criminal price fixing. The fines were large ($40 million) and the executives received prison sentences of from four to twenty-one months, the last probably the stiffest ever meted out in a U.S. price-fixing case up to that time. The case is also notable for resulting in sentences for two Canadian citizens, the first foreigners to be sent to U.S. prison for Sherman Act violations.

A third international case was the DOJ's prosecution of a cartel in *Thermal Fax Paper*, a product used in small capacity facsimile machines by households and small businesses. The global industry was comprised of five dominant manufacturers: Appleton Papers, Inc. of Wisconsin, Elof Hansson AB of Sweden, and three Japanese companies (Mitsubishi Corp., Nippon Paper Industries Co., and New Oji Paper Co.). By April 1996, five manufacturers, two paper wholesalers, and six individuals had either pleaded guilty or been indicted for criminal price fixing. Two of the companies and most of the individuals resisted pleading guilty because all of the conspiracy meetings were held in Japan in 1990-1992 and because most of the executives resided in Japan. The resisting defendants argued that the Sherman Act did not apply to offshore conspiracies, a position supported in a brief submitted by the Government of Japan but rejected by a U.S. court of appeals. Japan bases its brief on *comity* – the idea that U.S. antitrust laws cannot be applied if doing so would upset harmonious international relations. Waller (2000) suggests that *Fax Paper* settled the issue of comity in the context of international cartels.

The largest U.S. supplier and its vice president, refused to plead guilty. The *Appleton Papers* case was tried before a Wisconsin jury in early 1997. Without tape recordings of the alleged telephone calls, the government was forced to rely on the testimony of one of the convicted Japanese conspirators to make its case. While the prosecution's witness did

his best, juries tend to view convicted felons that have received "handsome plea bargains" as no better than "mob enforcers turned stool pigeons" (*American Lawyer April 1997:66*). Performance at trial is a "persistent weakness at the Antitrust Division," with a conviction rate of only about 20% *(ibid*).

Bingaman and the Division persevered throughout 1995 and most of 1996 with modest results from their global-cartel strategy. The October 1996 guilty plea of Archer Daniels Midland Co. for lysine and citric acid price fixing changed all that. On virtually her last day in public office, Anne Bingaman was able to enjoy the fruits of four year's labor and a return to the widespread respect for the antitrust laws that had been the mission of her administration.

U.S. Government Sanctions

The DOJ has a panoply of sanctions that can be imposed on guilty cartelists. Injunctions or cease-and-desist orders can prohibit certain conduct, but this is rarely used for naked cartels. A form of corporate probation is also possible but seldom seen. Structural relief, such as mandatory divestitures or restructuring of governance structures, can be undertaken, but most courts are loath to order such extreme measures. The most common U.S. Government sanctions are corporate fines, individual fines, and incarceration of responsible managers.

For 65 years after the Sherman Act first became law, the fines on corporations were modest because the violations were misdemeanors. Until amended in 1955, the maximum statutory fine the courts could impose was $5,000 per count (Connor 1997). Prior to 1960, the average corporate fine in federal price-fixing cases was less than $100,000 (Posner 1976). Moreover, corporations were frequently allowed to plea *nolo contendere* ("no contest") rather that "guilty." The former plea reduced the company's exposure to civil suits because it was not *prima facie* evidence of a crime having been committed that could be used in follow-up civil proceedings. In general, firms regarded the fines and decrees as minor nuisances equivalent to corporate parking tickets (Fuller 1962).

Agitation by government prosecutors, members of the antitrust bar, and other antitrust experts got the attention of Congress. The maximum fines for Sherman Act violations were increased in 1955 and 1974. In 1974, the maximum *corporate* fine became $1 million. In 1990, on the centennial of the Act, the maximum corporate criminal fine was raised to $10 million per count. In 1998, the Assistant Attorney General for Antitrust testified before the Senate Judiciary Committee that the size of the economic injuries being caused by cartels in the 1990s required another increase in the

statutory maximum (Klein 1998). He proposed that it become $100 million per company. That recommendation was made law in 2004.

Two changes in federal sentencing rules have allowed prosecutors to seek higher corporate fines. First, beginning in 1987 the courts have been obliged to apply the U.S. Sentencing Guidelines to companies that plead guilty or that are convicted by trial (Connor and Lande 2006). Prosecutors prepare a brief for the court that explains how the guidelines apply to the particulars of the case at hand; at a sentencing hearing after conviction at trial, the defense will submit a brief that will argue for lower culpability. These guidelines require that the government calculate a "base fine" equal to 20% of the company's net sales in the cartelized market; if prosecutors have reason to believe that the cartel raised prices by much more than 10% due to the conspiracy, it may propose a higher percentage figure. Then the base fine is multiplied by a "culpability score" that rises with the number of aggravating factors (e.g., the company initiated the conspiracy or acted as the cartel's enforcer) and falls with mitigating factors (e.g., it left the conspiracy voluntarily). In many recent cartel cases the culpability multiplier has ranged from about 1.5 to 4.0.[16] That is, the Sentencing Guidelines typically specify fines equal to 30 to 80% of affected sales However, prosecutors can and usually do request large downward departures from the fines implied by the Sentencing Guidelines if the company has offered even minimal cooperation with the government's investigation. The discounts granted by the courts are frequently in the 50 to 90% range.

Second, violations of the Sherman Act were categorized in 1974 to be federal *felonies* rather than misdemeanors. A corporation convicted of any federal felony (fraud, tax evasion, price fixing, etc.) is subject to a conceptually simple fine structure: the larger of either twice the harm caused to citizens or twice the illegal gains. In the case of price fixing, twice the harm is double the overcharge, and this is always larger than twice the gain.[17] These felony price-fixing sanctions are usually referred to as the "alternative fine statute" (18USC §3571). The felony-law alternative will result in a larger maximum fine than the Sentencing Guidelines whenever the overcharge is greater than 40% of sales. One-third of all cartels achieve overcharges of 40% or higher (*ibid.* Table 5). One disadvantage of the twice-the-harm approach is that in a litigation situation the prosecution would have to present expert economic testimony of the size about the company's overcharge during the sentencing phase, and the defendant would

16 To be more precise, there are two multipliers specified for each level of culpability. The top end of the fine range is double the low end. For prison sentences, the guideline range is narrower.

17 Some would argue that the injury also includes the dead-weight social loss (Hovenkamp 1998). In any case, profits will be less than the overcharge because collusion is not a free good.

be obligated to rebut the government's estimate. The Sentencing Guidelines require only company sales, about which there is usually little debate.

It is not clear when the courts should implement the felony standard instead of the Sentencing Guidelines in criminal cases, except in cases where the overcharge is significantly higher than 10%. From the point of view of deterrence effect, a defensible rule would be to calculate both fines and choose the larger.

The first time that the U.S. government's use of the alternative fine provisions came to the attention of the antitrust bar was in October 1996 when the Archer Daniels Midland Co. agreed to pay a $100 million fine for two price-fixing counts. A corporate defense counsel believes that beginning in 1996 "[t]hat . . . is what the government is going to be pushing in every case" (Victor 1998: 502). In fact, the "two-times rule" has been invoked to impose high fines on corporate price fixers scores of times since 1996. Beginning in 2005, a Supreme Court decision (*Booker*) rendered the Sentencing Guidelines advisory rather than mandatory; consequently, the DOJ began to rely upon the alternative sentencing provision for all cartel fines above $100 million.

Sentences for *individuals* who are convicted for price fixing also fall into three categories. First, during 1990-2004 the statutory limit for persons was $350,000 and three years' prison time; in 2004 the maximums became $1 million and ten years in prison. Second, the Sentencing Guidelines suggest that fines ought to be from 1 to 5% of affected sales, up to the statutory cap. Prison time is determined by a long list of specific aggravating and mitigating factors that result in a range of months within which the sentencing judge chooses. Third, fines may also be calculated under the so-called alternative sentencing provision. In the last case, fines of up to $25 million can be imposed on individuals if the cartel's overcharge is large enough. The alternative fine standard was first successfully litigated in 2000. Again, there is some ambiguity in the law as to when the alternative fine provisions can or must be used in criminal cases.

Most penalties for price fixers are the result of pre-trial bargaining between prosecutors and defendants. To avoid a protracted trial but also obtain a conviction, prosecutors will offer "downwards departures" from the guidelines to induce defendants' cooperation. Because the U.S. Sentencing Guidelines already take into account corporate leadership, recidivism, and economic impact, the standard for awarding varying "downward departures" below the guidelines range to cartel participants is simple but not transparent: the degree of corporate cooperation in the government's investigation.

Besides formal downward departures from the Sentencing Guidelines, which must be approved by a federal judge in an open sentencing hearing, there are other tools available to prosecutors to sweeten the deal

for a corporate whistle-blower. One such option concerns the identity of the corporate entity to be named in the plea agreement. Although it is the stated policy of the DOJ to charge both a parent firm and its subsidiary if both engaged in the conspiracy, the DOJ has the flexibility to charge only a subsidiary if it wishes. This option is particularly critical in the case of global cartels because multinational participants often have only minimal assets in the county prosecuting a cartel. Because judges are loath to fine a company in excess of its net assets or ability to pay from revenues, charging a company's small sales office rather than the parent organization can place a very low upper limit on a company's fine. In addition, a company can benefit from the phrasing of its guilty plea agreement, a document that carries the weight of *prima facie* evidence in derivative civil suits. The agreement may use language that defines the cartelized market in a narrow way or minimizes the length of the conspiracy period. In other words, the precise description of the illegal activity can reduce the implied size of the overcharge and, hence, a firm's liability for civil damages.[18] An uncommon concession is for the DOJ to negotiate a favor from another government department for a company willing to plead guilty. An example is failing to disbar a guilty company from signing sales contacts with the federal government. Finally, numerous concessions may be extended to employees of the conspiring companies. For executives residing outside the United States, the DOJ can offer a convicted felon a right that is normally taken away, the ability to cross U.S. territorial borders.

Cartel Sanctions: Canada and the EU

Canada has had since 1990 an upper fine limit of C$10 million for price-fixers, but this limit applies only to domestic conspiracies (Low and Wakil 2004, Low 2005). There is no cap on fines for international price fixers. While there are no written fining guidelines, by the late 1990s corporate fines followed a predictable pattern. The first company to plead guilty and agree to substantial cooperation with the government would be fined 10 to 12.5% of its Canadian affected sales. The second firm or group of firms to plead guilty and agree to cooperate would be fined 20% of sales. Cartel participants that came forward well after the second wave and uncooperative firms were required to pay 30%. Only an inability to pay or the occasional amnesty might cause a departure from this fine schedule.

In the EU since the passage of the Treaty of Rome, corporate members of cartels have been subject to maximum fines of 10% of sales in

[18] Some cease and desist orders are crafted in ways that resemble house arrest or a suspended prison sentence for an individual. Capital punishment for corporations (i.e., fines that lead to bankruptcy) is pretty much off the table.

the year prior to the year in which the EC makes its decision. Harding and Joshua (2003) state that EU fines are supposed to incorporate both compensatory and punitive components, and that the latter is to serve deterrence (p. 240). The EC's fines can be based on the *global* sales of an offending firm in *all* its lines of business, but in practice cartel fines tend to be correlated with a violator's EU sales in the affected line of business only (Connor 2001: 401-407).

The EU adopted guidelines in 1998 for calculating firm-by-firm fines (Harding and Joshua 2003: 240-252). First, the EC considers the "gravity" of the offense. Although a matter of discretion, cartels are usually placed in the "very serious" category, which is the highest of three levels of antitrust infringements. Cartels with large damages that are geographically widespread add to the gravity. The fine calculations base for the most serious infringements start at €20 million. Second, to account for disparities in the power of fines to deter, relatively large companies are fined more than smaller participants: in several global cartels, companies in the upper half of the cartel's size distribution had their fines doubled. Third, fines are increased by 10 percentage points per year for each year the cartel is effective. Fourth, these three factors result in a base fine (called a "basic amount") for each company that is adjusted for culpability; upward for cartel leaders and downwards for various mitigating factors.[19] Fifth, under the EU's Leniency Notice, violators are given 10% to 50% discounts for their degrees of cooperation. In a few cases, amnesty has been granted. Finally, after applying the last five steps, the Commission ensures that fine amount does not exceed 10% of global sales in the year prior to the date of the decision.

The EC's 1998 guidelines for cartel fines give an exaggerated impression of the degree of precision of the process in practice. Moreover, firms can and usually do appeal the EC fines to the European Court of First Instance, where they often receive modest downward adjustments. Nevertheless, the fines meted out by the EC for 15 cases of global price fixing during 1990-2003 reached an impressive $1,852 millions (Connor 2003: Appendix Tables 11 and 12). The first global cartel fined in the 1990s was lysine.[20] This fine of nearly $100 million was the fifth largest ever imposed

[19] Similar to U.S. practice, mitigating factors include playing a purely passive role, non-implementation of the agreement, immediate termination after discovery, and good prior antitrust training programs.

[20] The EC's lysine investigation was launched one year after the FBI raids were publicized and four years after the FBI's probe began. The EC's decision was announced on July 27, 2000, four years after the DOJ's convictions. This count of global cartels excludes three shipping conferences fined in 1992 and 1998: the previous largest fines on the TACA conference were reduced to zero by a 2004 decision of the European Court of First Instance.

EC and the first of 11 global-cartel fines up to mid 2003. In 2001, decisions were reached in four huge cartel cases with total fines of $1,115 million (together with other antitrust fines, DG-COMP imposed €1.8 billion in fines in 2001). In 2002, the EC announced an historic decision to fine four companies $250 million for global price fixing in the market for the amino acid methionine; this is the first time since 1990 that the EC has prosecuted a global cartel prior to a U.S. conviction.

Suits by Private Parties

The United States

The 1914 Clayton Act authorized private suits for treble damages and reasonable legal costs (Hovenkamp 1999). The idea of making injured companies or individuals into civil prosecutors was consistent with ancient traditions of English common law that were absorbed into American jurisprudence, yet the United States is one of the few countries in the world that permits private citizens to prosecute antitrust violators for substantial compensation.[21]

Treble-damage awards provide for compensation (the overcharge), for the costs and risks of private investigation and legal costs, and a punitive component.[22] By specifying that plaintiffs should be awarded settlements equal to *triple* the economic damages inflicted by defendants, Congress intended private parties to inflict punitive sanctions on antitrust violators so as to deter those violators (specific deterrence) and their potential imitators (general deterrence) from repeating their illegal behavior. In addition, the award of treble damages was intended to deny conspirators the fruits of their illegal conduct (the monopoly profits) and to compensate victims for overcharges on their purchases, the costs of investigating possible

21 Since 1990 Australia, the U.K., Germany and Canada have introduced laws permitting private antitrust suits for single damages.

22 There is a lively debate in the law-and-economics literature over the desirability of treble damages suits. Papers published in the 1970s and 1980s expressed concern that treble damages would encourage buyers to delay suing price fixers in order to increase their legal recoveries – a perverse incentive. Other researchers have suggested "neutral" welfare consequences; that is, private suits result in pure income transfers with no social welfare impacts. The latest word in this stream of the literature is Besanko and Spulber (1999). Their game-theoretic model with apparently reasonable assumptions deduces that treble damages generally leads to positive welfare increases if the probability of conviction and the multiple of damages recovered are high enough.

violations, and legal costs. Because the burden of proof is on the plaintiffs, single damages would in many cases lead to awards that were less than the illegal profits obtained by conspirators.[23] Moreover, given that legal costs are typically 10 to 30% of the treble damage awards, plaintiffs would recover much less than their injuries had Congress specified that only single damages could be recovered. Treble damages are high enough to provide a reasonable incentive for private parties to bring suits that have some deterrence effects. More than treble damages could lead to frivolous suits or the use of antitrust suits to harass rivals (White 2000). Even the most jaundiced observers of class actions concede that follow-on private actions are needed for deterrence (Baker 2004: 383).

Not all conspiracies in restraint of trade cause compensable harm to buyers or sellers. It is possible for a cartel to be formed with every intention to manipulate a market for the cartel's benefit and yet fail miserably in the enterprise. Ineffectual conspiracies are illegal and are prosecutable by the government, but they would not invite civil treble-damages suits because no direct harm could be demonstrated.

When private plaintiffs believe a price conspiracy was effective, they face three tests.[24] They must prove in court that price fixing *occurred,* using as a standard of proof "reasonable certainty." In addition, plaintiffs must establish that compensable harm was the *direct result* of the conspiracy. The weight of the evidence, must demonstrate that the price effects did not derive from some other market conditions. Finally, plaintiffs must have a reasonable basis on which to base their claims concerning the *size* of the damages, which is where expert economists come into the picture. Therefore, although the standard of proof (i.e., the preponderance of the evidence) is lower for civil cases than for criminal cases, the amount of evidence that must be prepared to be presented in court is greater and often more complex. The list of additional challenges facing plaintiffs in international cases is quite long (Adams and Metlin 2002). Many civil cases are settled prior to or during actual court proceedings through negotiated settlements.

Direct buyers that believe they are victims of a cartel must first file suit in their local U.S. District Courts, often without knowing about similar allegations in other court districts. Tipped off by press reports of a government investigation or simply suspicious behavior by sellers, buyers may approach a lawyer to try to interest the law firm in filing a suit in the court

23 Legal practice does not allow defendants to subtract the extra costs associated with operating a cartel from the extra profits made. Nor can the fines and damage awards be counted as costs of doing business for income tax purposes.

24 There is a fourth test that is usually not an issue. Plaintiffs must show that the last violation occurred no later than four years prior to filing the case.

district where the alleged violations took place. Alternatively, price-fixing suits may be instigated by attorneys who learn of grand-jury investigations, possible plea bargains, or impending government indictments. These attorneys then try to identify groups of purchasers who may have been harmed by the conspiracy, alert them about possible settlements the buyers might receive, and sign them up as clients. In either case, as soon as at least one purchaser and one antitrust lawyer judge the suit winnable, a suit is filed alleging price fixing that names the product, defendants and gives other facts about the alleged illegal acts.

The announcements of criminal indictments or convictions will bring more injured parties forward as plaintiffs because of the publicity itself and because the chances of winning a favorable settlement increase. However, not all civil cases tag along after criminal ones. There are many more private antitrust cases filed in federal courts than there are cases brought by public prosecutors (White 1988). Occasionally, private parties may bring even price-fixing cases that the government has decided not to investigate or litigate.

Since changes in federal rules of procedure in the 1970s, treble-damages suits scattered across several court districts have been consolidated by the courts into "multi-district litigation," more commonly known as class actions (Calkins 1997).[25] If a panel of judges determines that the alleged violations and defendants are similar enough, the suits filed in multiple U.S. federal court districts are gathered up into one action assigned to one supervising federal judge. The location is often chosen for the convenience of the plaintiffs or defendants but the workload of the court district is also a consideration. The class-action route is particularly important when the buyers are mostly small companies or consumers.[26] This process allows many scattered claims to be unified. It enhances efficiency by spreading the more or less fixed costs of litigation over a greater potential settlement amount.

Launching a class-action suit is chaotic. For the plaintiffs' law firms, there is often great uncertainty about the odds of winning a settlement and the prospect of negotiations and litigation against typically well financed defense counsel with no compensation for up to five years or more. Nevertheless, as more and more information becomes available about the dimensions of the conspiracy, its time span, and the identities of the conspirators, dozens or scores of law suits may be filed all around the

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25 Federal class-action suits were made much easier to file after important amendments to federal court procedures in 1966.

26 The class action *In re Domestic Air Transportation Antitrust Litigation* (N.D. Ga. 1993) had 12.5 million air travelers as plaintiffs. The presiding judge must also be satisfied that plaintiffs' counsel have a feasible plan for contracting all potential award recipients.

country. As soon as the number of plaintiffs begins to stabilize, their counsel will negotiate a common set of allegations and petition the courts to consolidate their many cases into one or a few cases.

Usually within a year or so of the first filing, the supervising judge will "certify" the federal class, that is, determine that all the plaintiffs have standing to sue for damages from the same set of defendants. The judge assigned the consolidated case holds hearings to certify that the plaintiffs are numerous and have similar complaints. Next, the judge chooses one or a very few lead counsel to represent the class. The lead law firm may be proposed by a majority of plaintiffs' counsel, may be appointed by the judge upon application, or may win the right in an auction.

Most private civil antitrust suits are filed by plaintiffs who are able to convince a law firm to take the case on a contingency basis. After a case is filed in court, evidence is gathered by both sides under a process called "discovery." During discovery, plaintiffs will demand business records or other evidence from defendants relating to a conspiracy. Moreover, defendants or others that may have relevant information are required to be deposed under oath. If economic or technical evidence is to be presented in court, the written opinions of testifying experts on both sides will be exchanged followed by rebuttals from each; the experts may be deposed as well. In big cases, dozens of experts may be employed to develop briefs and affidavits, but only the testifying experts may be deposed by the opposing sides.

The decision to join a suit as a plaintiff may not be an easy one for many companies. Buyers who sue face the disruption of what often times is a comfortable supplier relationship. Moreover, because cartels arise in concentrated industries, the number of alternative suppliers is severely limited. Suppliers that have been identified as cartel participants typically are desperate to hold on to their market shares in the tumultuous conditions following disclosure, so they may renegotiate better supply conditions with loyal customers. The improved contract terms have the effect of making buyers more reluctant to sue. Although long shunned by major corporations, class actions are increasingly being joined by leading firms that have decided that turning down potentially large recoveries was not in their shareholders' interest (Crawford 2004).

If a negotiated settlement is proposed prior to a trial (or the conclusion of a trial), the judge holds a "fairness hearing" in which the defendants and class counsel will present arguments and evidence that the settlement amount is "fair and reasonable." This is a fairly elastic standard, particularly if the hearing is scheduled without any prior criminal guilty pleas.

Finally, after approval of the settlement, members of the class may agree to take a prorated share of the settlement (net of legal fees and costs),

or they may opt to leave the class. The opt-outs file individual suits but usually try to settle later for larger recovery rates, though some may not settle out of court at all. If no settlement can be negotiated, the class action may go to trial and be heard by a jury or, if the defendants prefer, a judge only.

Indirect buyers are those who did not purchase from members of a collusive group yet were injured because a direct buyer passed on all or some of its overcharge when it resold the product (or sold a product containing some of the monopolized goods). If a direct buyer absorbs the entire overcharge, then indirect buyers are unharmed, but most economic models conclude that direct buyers pass on from 50 to 100% of their overcharge. It is possible that a direct buyer may use the occasion of a cartel-generated price increase to raise its price by a percentage that exceeds the original overcharge percentage (Cotterill *et a1. 2000*). Since a 1977 Supreme Court decision captioned as *Illinois Brick,* indirect buyers have had no standing in federal court to sue in price-fixing cases. However, about half of the states do permit indirect-purchaser suits, whether as single or class plaintiffs, and the Supreme Court has decided that the states were within their rights to do so. Indeed, multi-state classes of indirect buyers can be formed. Virtually all of the states have antitrust laws that allow civil antitrust litigation to be decided under principles and procedures that are very similar to federal law.

The final type of plaintiff is the state itself. The Federal and state governments can be parties to suits by virtue of being a direct purchaser from a cartel, but the more interesting case relies on the legal principle of *parens patriae.* Rooted in English constitutional law, this principle allows states to sue in federal court in its sovereign capacity on behalf of its citizens (Calkins 1997). There are *parens* suits that predate the formation of the Republic. A couple of high court decisions in the early 1970s threw into doubt the power of states to invoke *parens patriae* to recoup treble damages from price-fixing conspiracies for their corporate or individual citizens. However, in 1976 Congress enacted Section 4C of the Clayton Act to make such state authority explicit. The clear intent of Congress was to make state attorneys general consumer advocates in the area of antitrust enforcement in recognition of the fact that consumers often have no other recourse to obtain compensation for antitrust injuries. Section 4C empowers state attorneys general to file civil antitrust actions in federal court to seek treble damages for consumers and intermediate buyers that reside in their states. The attorneys general may negotiate or litigate settlements individually or as groups; when litigating as a group, the states essentially form a federal class of plaintiffs.

Private antitrust suits provide complementary deterrence with public prosecutions. Civil class-action suits are a vehicle especially suitable

for permitting small buyers – small firms or consumers – to win relief against price-fixing conspirators. The conspirators are mainly large, powerful corporations in highly concentrated industries. Their great wealth and access to legal resources generally brings a David-and-Goliath aspect to antitrust class actions. Some conservative legal writers view private enforcement as superior to public enforcement because the former operates by market-like incentives (Posner 1976).

Yet, there are many legal commentators that have misgivings about class-action treble damages suits. The theoretical liability facing criminal price fixers in the United States seems to be high. Combining the maximum U.S. liability facing corporate price fixers from government and private prosecutions after 1990 was *six to ten times* the cartel's overcharge. However, the actual monetary sanctions are almost always much lower multiples of damages. In the case of international cartels operating outside North America, fines are even lower proportions of the harm caused.

In part, the debate over the desirability of class-action treble-damages suits reflects a wider debate on the social benefits of treble damages themselves. Some believe triple damages to be unnecessarily high to deter (Easterbrook 1986), while others argue that plaintiffs often receive at most single damages (Lande 1993). If plaintiffs really do get close to single damages, then civil penalties alone provide virtually no deterrence because only a small portion of all conspiracies are discovered and prosecuted. The best economic study of this issue concluded that only 13 to 17% of all illegal U.S. cartels are caught (Bryant and Eckard 1991). If true, then six-times the overcharge is required to deter price fixing. Moreover, buyers who had to exit a market because of cartel-elevated prices are rarely compensated (Page 1996). Calkins (1997:441) suggests that the rise in successful government prosecutions makes the need for supplemental deterrence from civil cases much less justifiable. However, in the three global cartels examined below, it will be shown that the criminal fines imposed in the United States were less than one-half of the best estimates of actual overcharges, so the case for "supplemental" civil punishment would appear to be still strong.

Private Suits in Canada and Europe

Canada is one of the few jurisdictions outside the United States with effective private antitrust remedies (Goldman *et al*. 2003). As in the United States, private actions usually follow upon government indictments. Introduced in 1976, private suits were little used until Ontario issued formal class-action rules in 1992. Now at least four other provinces have such laws, but plaintiffs from any part of Canada may join a provincial

suit. "The situation in Canada increasingly reflects that of the United States and, in the event of a conviction of and international price fixing case in the United States … the commencement of one or more class actions in Canada … is now a virtual certainty" (*ibid.* p. 7).

Complementary private suits in the national courts of the EU have been encouraged by decisions of the European Court of Justice since at least 1976, spurred in part because of low deterrence of cartels in Europe. Under EC Regulation 1/2003, national courts are authorized to use EU competition rules to award "damages to the victims of infringements" (Olsen 2005). Nevertheless, a study commissioned by the EC found that private antitrust litigation is "totally undeveloped" in the EU (Ashurst 2004). Obstacles to this route include the inability of private parties to obtain evidence gathered by the DG-COMP (unless published), the "loser pays legal fees" rule, and disappointingly small damages awards. Although U.S. law has clearly inspired EU antitrust decentralization, adoption of treble damages seems unlikely at this juncture. Perhaps the most likely scenario is that the UK or Ireland, jurisdictions with generous discovery rules, will become the legal fora of choice for EU plaintiffs (Olsen 2005).

Estimating Damages

Figure 3.1 illustrates the degree of overlap between economic concepts of injury and the legal treatment of damages in the case of an effective price-fixing conspiracy. There are five potential groups that may be harmed by price-fixing. (Although illustrated by a case of raising the selling price of a finished product, the analysis also applies to cases where cartels collude to reduce the price paid for input).

The first and clearest case of damages occurs in the case of actual *direct purchasers* who pay an inflated price called the overcharge (rectangle A in Figure 3.1). Direct buyers of lysine spend P_mQ_m during the conspiracy which generates "excess" or "monopoly" profits of $(P_m\text{-}MC)Q_m$. Under economic reasoning the entire monopoly profits rectangle A is an income transfer from buyers to the cartel and should be considered damages, but under legal standards only the upper portion of the rectangle $(P_m - P_c)Q_m$ is recoverable as damages. Direct buyers have had standing to recover the overcharge since the first federal case was decided.

A portion of the overcharge is passed on to the indirect buyers of products containing the monopolized product Q. For example, hog and poultry farmers who buy prepared animal feeds containing lysine are harmed by a higher price of animal feed. Indeed, if an indirect buyer has a

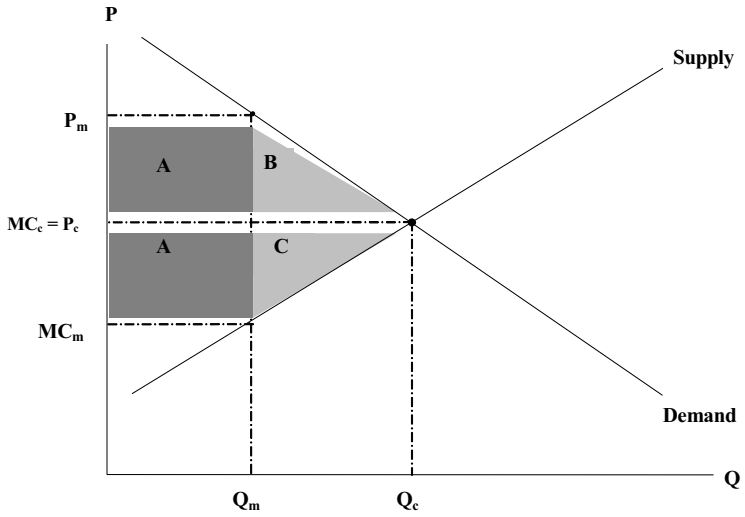

Figure 3.1 Welfare Effects of Collusion.

"cost-plus" contract with a feed manufacturer, all of A is passed on to the farmer. With other purchasing methods, rectangle A usually shrinks depending on the location of the *derived* demand and supply curves. In some cases, however, the overcharge on consumers can be larger than the direct overcharge. Under many state antitrust statutes, indirect overcharges are recoverable in state courts, but since the famous *Illinois Brick* decision of the Supreme Court in 1977, no standing is given to indirect buyers in federal courts. Since 1977, bills have been introduced in Congress each year trying to overturn the *Illinois Brick* ruling, but none has yet passed. If federal law did permit indirect-purchaser damages to be awarded, then a good case could be made for awarding only *lost profits* to direct buyers (Hovenkamp 1998:652).

A third group of buyers may be harmed. If a cartel does not enroll all the producers in an industry, it may happen that nonconspirators ("fringe" firms) raise their prices toward the monopoly price P_m (the "umbrella" effect). Direct buyers from noncartel sellers are harmed, while the fringe firms enjoy serendipitous excess profits during the conspiracy period. There is no Supreme Court ruling on standing this case, but while U.S. District Courts are split on the issue, the majority have allowed standing for this type of injury. Thus, cartel members are liable to pay damages even to direct buyers of output sold by nonparticipating sellers.

A fourth group harmed by price-fixing is those forced to buy inferior substitutes or those who reduce their purchases in response to a higher price. This injury is represented by the consumer portion of the dead weight loss (triangle B in Figure 3.1). Dead weight losses are social losses because both producers and consumers incur harm. Although well accepted as a loss in economic theory, the parties incurring dead weight losses generally have been denied standing. One basis for denial is the legal reasoning that treble damages are meant to deny conspirators the fruits of their illegal conduct, but the dead weight loss is not a gain to conspirators. In addition the courts view these losses as "remote" and identifying which non-buyers are injured a speculative exercise. Many legal commentators believe actual calculation is problematic, but formulas available are quite feasible to apply. However, the courts might allow damage claims if parties can show "a regular course of dealing with the conspirators" during non-conspiracy periods. The dead weight loss should be computed when assessing penalties in *public* prosecutions even when they are not permitted in private antitrust suits.

The last injured group is those suppliers of factors of production to the conspirators who lose sales or income due to output contraction. This corresponds to triangle C in Figure 3.1, the supply side of the deadweight loss. The courts do not usually allow standing for such parties, such as workers forced into unemployment, because the injuries are viewed as indirect or remote. A clear exception is that standing is allowed for employees who were fired because they refused to participate in price-fixing arrangements or became whistle blowers.

Estimation of the overcharges to direct buyers is in principal straightforward. $P_{m,}$ the actual price paid by buyers, and $Q_{m,}$ the volume sold during the conspiracy can be obtained from the business records of the plaintiffs or more conveniently from the cartel members during pre-trial "discovery." Other information required is $P_{c,}$ the price that would have governed sales "but for" the illegal conspiracy and the length of the conspiracy period.

Determination of the unobserved "but for" price P_c is often the most contentious area of expert opinion (Connor 2004b). The correct level of P_c can be calculated in five ways: 1) finding a "yardstick," i.e., a price in a comparable geographic area or industry with no conspiracy; 2) the "before and after" approach (that is, examining price levels immediately before or after the known conspiracy period); 3) assuming that gross margins remain constant; 4) econometric simulation of demand and supply relationships to obtain the competitive price (a dummy variable can be inserted to model the conspiracy period); and 5) information on cost of production by the conspirators (proprietary information on production capacity, utilization,

variable costs, and fixed costs of manufacturing and distribution). In the case of cartels, the defendants are not entitled to presume that they had colletive market power prior to their conspiracy. That is, the competitive price is normally the appropriate but-for price (Hovenkamp 1998:660).

In proving the extent of damages incurred by plaintiffs in civil conspiracy cases, the intent of the conspirators must be sharply distinguished from the degree of success in fixing prices. Strictly speaking, even an admission of guilt by the conspirators does not imply that the market's price was affected as intended. For example, conspirators may believe that their initial increase in list prices immediately caused transaction prices to rise, whereas market factors were in fact responsible. Thus, an appropriate damage analysis must be neutral with respect to either allegations or admissions by the defendants.

The Question of Timing

As mentioned previously, in permitting civil treble-damages suits, Congress envisioned that such suits would follow criminal indictments and convictions obtained by federal antitrust agencies. This is the historical pattern observed in most civil antitrust suits. The great advantage to civil plaintiffs is their ability to enter criminal guilty pleas or verdicts as *prima facie* evidence in civil litigation. However, it may be in the defendants' interests to offer civil settlements after being indicted but before they enter their guilty pleas. Defendants might wish to settle early to avoid bad publicity or to remove an impediment to a planned merger. Defendants may also offer early settlements to private antitrust plaintiffs because to do so would significantly reduce the size of the award compared to what they expect to pay after their pleas are entered.

Early settlement offers become beneficial to defendants when during plea bargaining it becomes apparent that the probability of indictment and successful prosecution is quite high. In the months proceeding making their pleas, defendants have a significant information advantage over the plaintiffs who harbor great uncertainty about the size of the expected settlement. Since the federal sentencing guidelines for criminal antitrust violators began to be implemented, guilty pleas are often accompanied by information on the defendants' overcharges or the size of the market's sales affected by the cartel. Once this information becomes public, plaintiffs' uncertainty about an appropriate minimum settlement amount is greatly reduced and, consequently, their bargaining position is enhanced. In other words, what might appear to be a generous settlement offer prior to guilty pleas becomes far less tempting after the prosecution lays out its justification for the fines levied in open court.

Forensic Economics

The role played by economic analysis in antitrust policy-making, public-agency prosecutions, and private litigation has greatly expanded in the last 30 years or so (Einhorn 1993, Coate and Klein 1996, Connor 2006d)). U.S antitrust agencies have scores of industrial organization economists on their rosters. These economists have had strong influence on antitrust enforcement since the mid-1970s. "Chicago School" ideas and the "New IO" movement affected the merger, vertical power, and price discrimination areas, but attitudes toward price-fixing did not alter very much if at all (Shepherd 2000). The major change in thinking may have been the issue of whether much observed collusion is achieved tacitly and the role of facilitating practices in collusion (and therefore putatively legally) (Hay 2000, Gertner and Rosenfield 1998). Perhaps the greatest contribution of economics to cartel policies was the use of game-theoretic concepts in the design of the U.S. Corporate Leniency Program (Kovacic and Shapiro 2000).

Private damages suits almost invariably require the services of forensic economists experienced in antitrust legal proceedings. Essays by forensic economists demonstrate the wide array of techniques employed to solve concrete legal questions, the stimulation that law cases provide for new research ideas, and the satisfaction that arises from influencing high-stakes legal battles (Slottje 1999). Consulting economists have been witnesses in antitrust trials since the 1960s (Kwoka and White 1994). Many are academics or solo practitioners, but recent decades have seen the rise of large economic consulting firms that specialize in regulatory or antitrust matters.

In the prosecution of cartels with sufficient evidence of an explicit agreement, the *per se* rule implies that the role of economic analysis will be limited mainly to rough estimates of the overcharge as a basis for negotiating the fine. If a criminal trial is held, defendants may engage economists as advisors to provide arguments as to the ineffectiveness of the cartel. Even though evidence on the issue should be irrelevant, defense counsel will try to sow doubt about price effects in the jury. When only circumstantial evidence of an agreement is available, the testimony of economists may be needed to assist a jury in inferring the existence of an explicit agreement. During the sentencing phase of a criminal trial the size of the monopoly overcharge or dead-weight losses may require economic opinions to guide the presiding judge.

In treble-damages cases, the role of forensic economists is often crucial because the size of injuries is the main issue to be decided or negotiated. The limited sophistication of juries or non-specialist judges will put a premium on simple analytical approaches and on the persuasive skills of testifying experts. While more advanced theoretical or empirical points

will often be presented in expert opinions, these exercises will often serve only to confirm opinions reached by simpler means or to neutralize the weight of the evidence presented by the other side during trials or negotiated settlements.

International Cooperation

Traditionally, when an antitrust agency needed information located beyond its territory, it could rely on either diplomatic channels or letters from a judge called rogatory requests (ICPAC 2000). National sovereignty made responses to such requests purely voluntary on the basis of comity. Prior to the 1980s, requests for antitrust assistance through these channels were often turned down because of national concerns about foreign interference with national firms, trade secrets, or substantive differences in legal principles. These difficulties were recognized as early as 1930 by the League of Nations (Decugis 1930). In the late 1940s, U.S. prosecution of the rubber, potash, and quinine cartels did not lead to parallel actions by European antitrust agencies in the countries in which the cartels were hatched (Edwards 1967). A 1948 U.S. antitrust suit (*U.S. vs. De Beers Consolidated*) failed mainly because the U.S. locked jurisdiction over cartel participants.

Many sticky issues remain, but several DOJ prosecutions of global cartels have involved cooperation with the antitrust agencies of other countries (Davis 2002). Since the early 1980s, DOJ investigations of global price fixing have been relatively unhindered by national blocking statutes abroad that prevented some corporations with headquarters outside the United States from providing documents or depositions even when the firms wished to cooperate. Foreign antitrust units are increasingly imitating the successful investigations or prosecutions initiated by the U.S. DOJ and offering material assistance under various international agreements. Compulsory document sharing and extradition issues are still divisive.

One relatively new development has been the signing of formal bilateral antitrust agreements. The first was signed by the United States and Germany in 1976. By the end of 1999, the United States had six more agreements of this type with Australia (1982), Canada (1984), the EU (1991), and 1999 with Israel, Japan and Brazil. They are not treaties but rather agreements by the Executive Branch of the U.S. government with the ministries of other countries. The purposes of these bilateral agreements include enforcement cooperation, information exchange, regular meetings, technical assistance, and mechanisms for dispute avoidance. Confidential information cannot be shared under these bilateral agreements, so in 1994 Congress passed the International Antitrust Enforcement

Assistance Act (IAEAA). The IAEAA permits U.S. antitrust agencies to engage in reciprocal exchange of confidential information with foreign antitrust agencies, except for merger filings. The first IAEAA agreement was signed with Australia in 1999. While exchanges under the IAEAA can occur for either civil or criminal cases, the United States has much more experience with a far larger number of Mutual Legal Assistance Treaties (MLATs). These treaties, which encompass only criminal matters, must be approved by the U.S. Senate. At the end of 1999, the United States had entered into 30 MLATs and another 20 or so were awaiting Senate approval (ICPAC 2000). The Antitrust Division of the DOJ reports many positive experiences in using MLATs, with nearly all such cases involving global price-fixing investigations. Article 15 of the North American Free Trade Agreement requires cooperation and some rudimentary harmonization of antitrust laws among the three signatories. In general, U.S. and foreign antitrust officials favor continuation and deepening of these various bilateral arrangements.

One issue currently facing U.S. antitrust officials is the extent to which the country should cooperate in multi-lateral solutions to antitrust enforcement. Perhaps the first successful international antitrust agency was the 1951 European Coal and Steel Community (ECSC). ECSC rules cover price fixing, mergers, and dominant firm behavior. Although not its principal objective, the ECSC has preserved and increased European competition in the coal and steel markets (Edwards 1967). Indeed, the success of the ECSC was a major stimulus to the formation of the European Economic Community (EEC), to which the ECSC belongs, and the inclusion of competition laws in the 1957 Treaty of Rome.

The General Agreements on Tariffs and Trade (GATT) was recently replaced by the World Trade Organization (WTO). Most of the work of the WTO's small secretariat has been directed at resolving bilateral trade disputes, but the agency is interested in sponsoring international antitrust rules. While not all of the WTO's 135 members have antitrust laws, several observers have recommended that the WTO make the development of global antitrust laws a priority. The EU proposed a binding WTO agreement on hard-core cartels (Evenett 2003). U.S. officials seemed disinclined to cooperate on such a broadening of the WTO's mission. ICPAC (2000) suggested that the WTO needed to expand its expertise in antitrust and then confine itself to government restraints on competition, not private ones, except where private practices may restrain international trade.

Cartel Sanctions

The focus of this section is on the outcomes of cartels prosecutions, especially the monetary and penal antitrust sanctions that have been imposed on discovered private international cartels since January 1990 (Connor 2004a, Connor and Helmers 2006). Monetary sanctions include *fines* imposed by antitrust authorities on both corporations and individuals. Monetary sanctions also include *recoveries* made by direct and indirect buyers of cartelized products that have brought private actions; most often these payments are made as a result of settlements made out of court prior to trial, but in a few cases are litigated judgments of a trial judge or jury. Private recoveries usually do not include the legal fees of defendants, which may be substantial but are almost never revealed. However, payments made by defendants to settle private class-action suits do include the legal fees and costs incurred by plaintiffs in prosecuting their cases.

An informal survey of the Web sites of 34 of the world's antirust authorities by the author in 2005 found statistics suggesting a great deal of activity in cartel enforcement. Every site showed some cartel investigations, filings, or decisions in process. Counting the peak year during 1990-2002, these 34 agencies were handling or had disposed of a total of no less than 2,600 cases of alleged horizontal restrictions. Except for a couple of new authorities with large backlogs, every authority with a time series had upward trends.

A more authoritative confidential survey of 18 of the largest antitrust authorities reports on cartel enforcement for the years 2001-2003 (ICN 2005a: 56). Using apparently consistent definitions, this survey found that there was an annual average of 199 cartels cases decided, of which 59% carried monetary penalties. Corporate penalties totaled $1.5 billion per year ($4.3 million per firm), and individual penalties $5.5 million ($127,000 per person). Prison sentences averaging 21 months of incarceration were being handed down to 21 persons each year (almost all by the U.S. courts).

The sanctions data discussed in this section cover only what Evenett *et al*. (2001) call "Type I" and the OECD calls "hard-core" international cartels. *International* cartels are those that have participants from two or more countries; the qualifier does not refer to the geographic scope of the cartel's agreement. *Type I* or *private* cartels are those that operate without the protection of national sovereignty. Thus, legally registered export cartels are not private, nor are cartels established by parliamentary statutes or by treaties among nations. Private cartels may contain state-owned or controlled corporations, but if such cartels can be prosecuted under the antitrust laws of any jurisdiction, they are considered private schemes. Connor (2004a) examines only those international cartels that

were "discovered" between January 1990 and July 2003. By *discovered* it is meant that they were prosecuted by a recognized antitrust authority, found liable for damages in a private suit, pleaded guilty to a criminal indictment, or agreed to pay damages in an out-of-court settlement.[27] The choice of 1990 is somewhat arbitrary, but is meant to capture the beginning of the current level antitrust sanctions in the United States, the EU, and Canada.

Cartel Fines in the United States

The DOJ's notable success in prosecuting international cartels after 1995 may be traced to several amendments to the law and improved investigatory techniques (Connor 2001, Baker 2001). First, the Sherman Act's penalties were steadily increased by amendments in 1955, 1974, 1987, and 1994 (Connor 2003: Table 8). In 1974, maximum corporate fines were increased twenty-fold and participation was made a felony. In 2004 the maximum statutory fine was increased to $100 million and the maximum prison sentence from three to ten years. Second, around 1993 an enforcement policy shift took place in the DOJ that placed a higher priority on investigating international antitrust violations and that instructed the FBI investigators to employ all the tools of their trade to collect evidence.[28] Armed with enhanced powers to sanction firms and their managers, prosecutors bargained hard to obtain confessions and to "flip" conspirators into useful witnesses against their co-conspirators. Prosecutors became sophisticated in their use of amnesty, leniency, or other blandishments to induce cooperation by exploiting the Prisoners' Dilemma. Third, the DOJ has introduced a number of methods of cooperating with other jurisdictions (ICPAC 2000, Pate 2003). Protocols between agencies permit sharing of information; Mutual Legal Assistance Treaties facilitate joint investigations; other bilateral treaties have legalized extradition of cartel managers; and regular meetings of enforcement officials have fostered the exchange of effective enforcement techniques.

Prosecutions of international cartels have become the top priority for the DOJ. Prior to 1995 less than 1% of the corporations accused of criminal price fixing were foreign-based firms; after 1996, more than 50%

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[27] By "prosecuted" I mean to include payments of civil penalties for violations of competition regulations as in the EU, criminal indictments, and announced formal investigations. The latter typically result in fines or guilty pleas.

[28] Prior to 1993 the FBI had treated price fixers with the gentleness accorded a shoplifter, and price-fixing fines had been cheerily paid with all the embarrassment associated with a parking ticket. But after 1992, price-fixing probes had all the trappings of a major conspiracy by the worst types of organized criminals (Eichenwald 2000).

were non-U.S. corporations (DOJ 2004, Hammond 2005). Fines imposed on global price fixers escalated steeply from 1996 to 1999, with new record amounts collected nearly every year. In 1999 alone, the $900-million-plus collected from international price fixers was far more than the entire previous 108 years of U.S. antitrust enforcement. From 1996 to early 2006 the amount the DOJ collected criminal fines surpassed $3 billion, of which more than 90% originated from international cartels. The use of personal fines and prison sentences has also escalated; since 1995, the U.S. government has sent more than 120 executives to prison for price-fixing, and one-third of them were foreign national from nine countries. The average prison term doubled in 2000-2005 compared with the late 1990s. Several persons indicted for international price fixing have been apprehended by INTERPOL and are awaiting extradition.

The DOJ's amnesty programs are increasingly the major source of international-cartel indictments. In 1996-2003, amnesty applications have led to more than 70% of the cartel fines collected. Half of the 100 criminal probes being conducted by the Antitrust Division in 2003 were investigating allegations of international price fixing. Moreover, the "Amnesty Plus" program is responsible for half of these international probes. Hammond (2001) provides an example of how the "reverse contagion" model works in international-cartel cases; the lysine conviction led to the citric acid cartel, which led to the sodium gluconate cartel, and so on to net five cartel convictions. The "Penalty Plus" program has also yielded some results; in one case a firm that neglected to report its involvement in a cartel was required to pay a fine equivalent to 70% of its affected sales.

Historically, the DOJ sought prison sentences for individuals in a minority of price-fixing cases. Prior to 1974, when price fixing was a misdemeanor, the upper limit on prison time was one year, imprisonment had been imposed in only eight corporate price-fixing cases, and very few convicted price fixers served more than 30 days. Since 1974, about half of all individuals convicted of criminal price fixing receive prison sentences and the average length had tripled. The rate was 23% all price-fixing cases during 1970-1999 (Connor 2001: Table 10). But in the case of *global* cartels, the DOJ obtained prison sentences in 50% of the cases since 1995. Half of the prison sentences are at the felony level of more than 12 months. On average, about three executives plead guilty or are indicted per global cartel. As of 2003, about 30% of the indicted executives not yet sentenced were residing outside the United States and were fugitives; another 10% were U.S. citizens awaiting trial (Connor 2003: Appendix Table 10). The share of long sentences imposed on the cartel ring leaders is particularly striking. In the one case where the managers resisted making deals for pleading guilty, the lysine cartel, the three ADM executives lost at trial and were sentenced to a collective 99 months in prison; ADM's Vice Chairman was

the first person in antitrust history to receive the then maximum 36-month sentence.

The executives who are fined or imprisoned for global price fixing by the U.S. DOJ are often at or near the top of their corporate management structures. Yet, in general the fines collected from individual criminal conspirators are modest compared with their corporate salaries (Connor 2003: Appendix Table 10).[29] The median fine is $50,000. Some non-U.S. companies pay the fines for their convicted executives.

One reason for foreigners' willingness to serve time in U.S. prisons is that if they reside or even *pass through* countries that have criminal statutes for price fixing, they may be extradited to the United States (Nanni 2002). The United States has explicit treaties with Canada, Ireland, and Japan that permit extradition for antitrust violations, though these are rarely invoked.[30] In 2002, Interpol added U.S. antitrust fugitives to its "Red Notice" watch list for the first time. When foreign executives plead guilty for price fixing, they are frequently granted the right of free passage across U.S. borders for their cooperation.

If there is a criticism to be leveled at DOJ fining practices, it is the tendency to award unnecessarily generous discounts to cartel participants that have little to offer prosecutors. The amnesties for the first to plead guilty seem well justified. So too are the 70 to 80% fine discounts for the second firm in a cartel to come forward and cooperate (Spratling 2000). Should the remaining members of a cartel refuse to plead and opt for a trial, prosecutors might well need the complementary testimonies of witnesses from two firms in order to prevail at trial. But offering discounts of 50 to 70% off the maximum fines for procrastinators who offer minimal cooperation seems too great a reward. In the vitamins cartels a large number of such firms got high discounts (Connor 2006b).

In summary, the financial penalties applied by the U.S. DOJ to global price fixers in the late 1990s were unprecedented in their harshness. Despite an increasing number of amnesties, average corporate fines for members of global cartels in the late 1990s were many times higher than

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29 However, there are two noteworthy examples of high fines paid by the ringleaders of global cartels. The first was a fine of $10 million paid in 1998 by the German Chief Executive Officer of SGL Carbon, the instigator of the graphite electrodes cartel. He paid a fine well above the statutory cap of $350,000 to avoid a prison sentence. Second, in 2002, the Chairman of Sotheby's art auction house was convicted at trial for fixing the fees for selling precious works of art. His fine of $7.5 million was the first litigated example of the alternative fine statue being applied for price fixing. This statute permits personal fines of up to $25 million, depending on the size of the overcharge caused by the cartel's operations.

30 In 2004 the first Japanese manager was extradited for a criminal cartel offense.

the fines collected in 1990-1996, but declined significantly after 1999. While individual fines remained modest on the whole, managers of global conspiracies were more than twice as likely to receive prison sentences as managers of domestic conspiracies, and the length of the sentences has remained high since about 1998. The main reasons for the escalation in fines in the late 1990s were the extraordinary escalation in legal standards, the expanded size of the markets affected, the high overcharge rates, the longevity of many of the conspiracies, and, if truth be told, the rising intolerance of the judicial system for thieves dressed in expensive suits. This rise is especially notable in light of the fact that, correcting for inflation, average corporate fines were essentially unchanged for the first 90 years of the 20th century.

European Union Fines

The competition unit of the European Commission (EC) has also pursued a rising number of investigations of alleged cartel violations since the 1980s (Connor 2004a). Almost all price-fixing cases pursued by the EC are international, i.e., the corporate participants hail from two or more EU nations and involve schemes that significantly affected trade between the member states of the EU. However, the great majority of these cases have involved companies and geographic areas totally within the jurisdiction of the EC.

Five changes in the nature of anticartel activity may be noted in Europe after 1995. First, the EC has become deeply involved in investigating and prosecuting *global* cartels for the first time. Second, the EC has for the first time formally and extensively investigated international cartels with the direct cooperation of antitrust authorities outside the EU. There are about 20 examples of such joint investigations (*ibid.* Table 7). U.S.-EC joint efforts are the most common, the first 1997. In 2000, the first global cartel investigation involving four jurisdictions was launched. Third, the competition directorate was reorganized in 1998 to create a special unit devoted to anticartel activity; a second unit was established in 2002 (Monti 2002:1-2). Fourth, the 1996 and 2002 leniency programs were highly productive. From 1996 to 2001, more than 50% of all conspiring companies received leniency for their cooperation. In early 2002, the EC was receiving two leniency applications per month (*ibid.*). Fifth, the EC issued a set of fining guidelines that "…embodied a sea change in the Commission's methodology for setting fines and a doctrinal shift of massive proportions" (Joshua and Camesasca 2004:1).[31]

[31] In late 2006 yet another set of fining guidelines was adopted by the EC. Instead of gravity, the basic amount of fines will be based on a proportion of the violators' sales and the duration of the offense.

Prosecution of cartels has involved an intensification of effort and greater harshness of sanctions after 1995. The EC's first decision against a secret cartel was adopted in 1969 (Monti 2002).[32] The total amount of cartel fines imposed from 1969 to 1995 was €500 million in 33 cases (i.e., about 1.4 cases and $23 million per year on average). From 1996 to 2001, 24 cartel decisions were handed down and €2800 million in fines were imposed on 160 companies. In February 2002, a revised leniency program was implemented that offered quicker decisions on discounts and the possibility of full immunity. In 2002 alone 9 cases were decided with fines of €1038 million (approximately $980 million). The EC's anticartel activity in 1995-2004 has comprised more than 90% of all the fines imposed since the EU was formed.

In addition to global cartels, the EC has been busy with cartels that functioned only within its jurisdiction. A few operated within one member state (Connor 2003: Table 17). The number and size of the EU regional cartels is close to that of the global cartels. Total fines imposed ($1,797 million) was only slightly less than those imposed on the global cartels. The total of EC fines on all types of international cartels up to 2004 is above $4 billion, which is almost double the DOJ's total over the same period.

The temporal pattern of the EC's international cartel fines is shown in Connor (2004: Figure 4). The years 2000-2002 were clearly banner ones; the years 2000-2002 account for 73% of the 1990-2003 total. The 2001 peak year for the EC follows that of the DOJ's by two years. However, the size of the fines in 2003-2005 appeared to be slowing relative to 2002.

DG-COMP has an uneasy relationship with the EU courts that supervise its decisions, namely, the Court of First Instance and the European Court of Justice. On appeal, from 1992 to 2005 these courts reduced the fines on more than 100 companies belonging to 13 cartels. Small adjustments were made for miscalculations under the Commission's fining guidelines for such things as the dates of the violations. The largest reductions were granted for procedural blunders: signatures by the wrong officials (€65 million in fines overturned), late submissions to the courts (€101), and failure to permit defendants to refute the evidence (€273).

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[32] The Quinine cartel of six undertakings was fined ECU 500,000 in July 1969 and the dyestuffs cartel a week later (ECU 490,000). However, the EC proceeded cautiously thereafter by fining only five cartels in the 1970s and 16 in the 1980s (Burnside 2003).

Court-mandated adjustments of cartel fines have always reduced the amounts imposed by the EC. The mean reduction in fines for the appellants was 57%; however, because not all members of the cartels appealed their fines, the mean reduction per cartel was 39% and the *median* reduction in fines per cartel is only 7%. Although modest, the size and frequency of the reductions have increased over time. From the first successful appeal (*Polypropylene* in 1992) to 1998, only four appeals were successful, with reductions averaging 10%. But nine cartels were awarded mean reductions of 47% in 2000-2005. As a result, an increasing number of violators have been encouraged to appeal their fines (Geradin and Henry 2005).

European analysts have been critical of the EC's vast discretion in setting fines (Korah 1997). Large discounts have been awarded to companies that made low monopoly profits, were first time violators, and cooperated with the EC's investigation. Korah (1997) suggests that there is an unwritten rule that non-EU firms get lower reductions than those headquartered in the EU. EC competition Commissioner Karl Van Miert rejected a U.S.-style point system as "too transparent" for violators (Alchin 1999). Perhaps most interesting was Van Miert's view that EC fines should be proportionately higher than parallel U.S. fines because Europe has no tradition of individual criminal liability for competition law offenses. This "U.S. plus" rule was applied to members of the lysine cartel in May 2000, but since then only inconsistently.

The 1998 cartel fining guidelines, for all their superficial rigor, are ultimately opaque and capricious (Joshua and Camesasca 2004). They were designed in response to judicial criticism to incorporate rules that varied fines according to the gravity, duration, and intentionality of the offense and proportionality across violators. One stated objective is to serve deterrence, but to do so without directly using affected sales to calculate base fines. The reason that EC fines are unpredictable is that the number of euros chosen as the "start point" for the fine calculations appears to be arbitrary. That figure is supposed to be related to gravity (i.e., the nature of the offense, market impact, and geographic extent), but the figure is also increased for large companies, and sometimes a special multiple for "deterrence" for single companies. There is some inconsistency in the creation of size categories and in applying deterrence multipliers. In the *Pre-Insulated Pipes* cartels the starting-point amounts were €1 million for the firms in the smallest of four size categories and €20 million for the largest; in addition the largest firm was slapped with a 150% premium "for deterrence." Thus, the starting points varied in a 50:1 ratio. The rest of the calculation is mere arithmetic to account for duration, culpability factors, and leniency, plus a check that the final fine does not exceed 10% of sales.

Even the worst offenders receive a 10% leniency discount for simply ceasing to collude after they were caught.

Canada

Canada and the EU have the most active anticartel regimes outside the United States Connor (2004a). In the 1990s, the price-fixing cases brought by the Canadian Competition bureau were increasingly international in scope. There were only two global cartel cases prior to 1997, but during 1997-2000, 64% were international conspiracies. Antitrust enforcement resources are rather modest in Canada, so about four-fifths of its global cartel convictions have followed U.S. investigations. Canada has had a mutual assistance antitrust agreement with the United States since 1991 and an extradition treaty that applies to criminal antitrust matters.

The Canadian Competition Bureau (CCB) together with the Ministry of Justice enforces criminal laws similar to those in the United States. The CCB is a small agency that cooperates closely with the U.S. DOJ, and its prosecutions tend to follow those in the United States by less than a year (Connor 2003: Table A.3). Naked cartel violations are crimes treated in effect as *per se* illegal acts.[33] Persons can be fined and imprisoned, but this power is used quite sparingly. As in the United States, the CCB has imposed record antitrust penalties since the 1990s. Fines typically represent 20% of Canadian affected sales.

Canadian cartel-enforcement policy shifted in the mid-1990s. Prosecution of large global cartels began in 1998 with the lysine and citric acid cases (Connor 2003: Tables 15 and 15A). The fines imposed on these two cartels were almost double the amount the CCB had collected from all other cases in 1990-1997. By mid 2003, Canada had collected US$85 million in fines from 11 global cartels. Of the 11 cartels, nine followed U.S. convictions and the other two EU sanctions. The setting of cartel fines by the CCB is fairly straightforward; except for amnesty applications, a high proportion of corporate cartelists are fined 20% of Canadian affected sales or slightly lower (Low 2004:19). Questions of degrees of culpability receive minimal attention.

Only one person, the CEO of a Canadian vitamin manufacturer, has received a prison sentence for price fixing, and this was commuted to community service. This sentence of 90 days was the first such punishment in many years. Three more cartel managers, from Germany, Switzerland, and Japan, have paid large fines for their roles in the citric acid, vitamins

33 A separate Competition Tribunal can impose divestment or cease-and-desist orders. Canadian laws do not explicitly make cartels *per se* illegal; if a suit is filed, the prosecution must present evidence of monopoly power (Low 2004).

and sorbates cartels. They paid a fines totaling $750,000, which were the third-largest fines in Canadian antitrust history.

In addition to global cartels, the CCB fined 20 corporations a total of $9 million for *regional* price fixing. Each of the six international cartels involved manufactured products, some of them imported. Nearly all of the companies fined were non-Canadian, which reflects the very high share of Canada's manufacturing sector that is foreign owned. The three international cartels convicted in 1991-1993 (compressed gasses and two forest insecticides) operated solely in Canada, but the remaining three cartels (fax paper, choline chloride, and sodium erythorbate) were jointly prosecuted with the DOJ in 1994-2001.

Canada does not automatically prosecute all global cartels that are found guilty in the United States. At least eight such convictions have had no Canadian follow-up. For example, four food-ingredient cartels with relative small affected sales fined by the DOJ in 2001 (e.g., maltol, nucleotides) have not been prosecuted in Canada. In four other cases (fine arts, carbon fiber, magnetic iron oxide, and the 3-tenors CD), the U.S. prosecutions were quite lengthy and difficult; the Canadian Department of Justice seems to have passed on indicting in order to conserve its resources for cases easier to win.

Although Canada has a relatively small national market and many of the convicted firms sold cartelized products only through exporting (thus, owning few if any assets in Canada that could have been seized in the event of nonpayment of fines), it has been able to mount a surprisingly effective anticartel campaign using very slim enforcement resources, simple rules for fines, and minimal involvement of Ministry of Justice lawyers. Canada is a model for many smaller industrialized countries that have tough anticartel laws on their books yet have small enforcement resources. Unlike many other areas of law enforcement, the returns to Canada's treasury far exceed the outlays.

EU Member States

Beginning in the mid-1990s, the EC began to discuss the decentralization of competition-law enforcement (Rodger and MacCulloch 1998). One direction involves the transfer of additional enforcement authority from Brussels to the national competition authorities (NCAs) of the member states of the EU. Allowing a national court to handle somewhat localized alleged violations became possible in 1993, so long as the EC declares the case to lack "Community Interest." Devolution of EC antitrust enforcement was prompted mainly by ". . . the lack of resources afforded DG-COMP to carry out into tasks" (*ibid.* p.580), but the process has been slow because of the lack of trained professionals in the national agencies.

In 2003 DG-COMP and the NCAs formed the European Competition Network that meets regularly to share information and negotiate the allocation of cases. Most of these cartel prosecutions have been pursued under the national antitrust laws of the member states, but NCAs are allowed to use EU law. The Netherlands has prosecuted an international cartel using Article 81 of the EU Treaty.

About 40 international cartels have been fined by European national antitrust authorities from 1997 to 2003 (Connor 2004a: 262).[34] The average fine imposed per cartel was $38 million, and the median about $11 million. These 51 cartels comprised 29% of the data set.[35] More than 350 companies (one-third of them foreign) were fined a total of $1,446 million by mid-2003. The total fines imposed is somewhat less than either the EU or United States, but an impressive amount given the restricted size of these national economies and the relatively few years of active enforcement.

Italy tends to be the most aggressive European NCA in prosecuting international cartels. The first international cartel to be fined by a European NCA was the glass-containers industry, a case reported by the national antitrust authority of Italy in July 1997. As of 2003 Italy had prosecuted 16 international cartels. Italy's rate of discovery has steadied to about two cases per year since 1999, but the national antitrust authorities in the Netherlands and France have become newly energized. All of the Netherlands's authority's cases were launched since mid-2001, shortly after its investigative powers were strengthened. Much of its work in the early 2000s was consumed by a major scandal involving hundreds of construction companies that rigged bids on Dutch government building projects. The new found assertiveness of the French national authority is also impressive given that council's formal subjugation to the Ministry of Finance.

34 Besides all the usual journalistic sources, information on these cases was supplemented by visiting the web sites of more than 25 national authorities, many of which have extensive translations into English. Another important source was these agencies' annual reports to the OECD, which tend to highlight most of the bigger cartel cases. Convictions by national authorities in the early 1990s are not as well documented as in more recent years.

35 The type of cases prosecuted differs somewhat from those in the EU and North America. A relatively large share of these cases involved government bid-rigging schemes; sales of drugs or diagnostic devices to national health programs; asphalt, concrete, and other public construction services; fuels purchased for the military; and retail gasoline distribution, many of which followed recent privatizations of national petroleum companies and withdrawal of government price regulation.

Most of the NCAs have a large measure of independence from government ministries.

Japan and Korea

The passage of Japan's Antimonopoly Act (AMA) in 1947 followed two decades of economic nationalism during which the government actively encouraged and enforced cartel agreements (Schwartzman 1993). The AMA was alien to Japan's regulatory culture (First 1995). The 1947 law had weak sanctions and was undermined by the creation of the Ministry of International Trade and Industry (MITI), which was in the 1950s authorized to form cartels in "depressed industries." Japan's Fair Trade Commission (JFTC) had no subpoena powers, could not recommend prison sentences, and could issue only limited cease-and-desist decrees. If companies violated the decrees, the Japanese courts had no contempt powers to sanction them.

In the late 1960s, the JFTC's political position began to improve with the increasing support of academics and consumer organizations. Its actions against the petroleum cartel in the early 1970s were popular and effective. In 1974, the High Court in Tokyo found the cartel guilty of *criminal* price fixing, a first for Japan. In 1977, the Antimonopoly Law was amended, allowing civil "surcharges" (fines) for violations and granting divestiture powers to the JFTC for the first time. Under diplomatic pressure from the United States, in 1991, the JFTC pushed through legislation that raised the mandatory cartel surcharge for manufacturers from 1.5% of company sales for up to three years to 6% of sales.[36] The JFTC strongly prefers negotiated "warnings" to levying surcharges (Fry 2001). Japan's law also permits individual and corporate criminal penalties and single-damages private suits, but both are rare. "Japan's system cannot really be said to be focused on deterrence," concludes DOJ official Chemtob (2000: 9), a position with which the JFTC (2003) agrees. An oddity of Japan's sanctions is that members of bidding rings who did not win a bid cannot be surcharged.

Although it has a reputation for lackadaisical antitrust enforcement, Japan's Fair Trade Commission (JFTC) has not been inactive in prosecuting cartels. In the ten fiscal years from 1989 to 1998, the JFTC issued a total of 259 "legal measures." These are administrative actions that include recommendations, cease-and-desist orders, or fines. Of the 259 actions, 73% were directed at cartels (ICPAC 2000). Fines, the JFTC's most potent sanction, totaled 47 billion yen (about 250 million yen per cartel or

[36] In 2006 after a major political battle the surcharge for manufacturers was raised to 10% of sales. As before, it is mandatory and nondiscretionary.

roughly $2 million).[37] Actions against international cartels are unusual. Despite the initiating of regular meetings with U.S. and EU antitrust officials in the 1990s, the JFTC's record on cartel fines shows no upward trend (Uesugi 2004).

Japan's weakness stands in stark contrast with the younger but far more aggressive Korean Fair Trade Commission (KFTC). Established in only 1981 and with an administrative structure similar to the JFTC, the KFTC has the political will to take frequent and strong measures to control cartel behavior. In its 2001 report to the OECD, the KFTC reports that it had taken 332 corrective measures against cartels in its first 20 years, including 76 surcharges on members of cartels (Shin 2002). From 1996 to 2000, the KFTC imposed $349 million in fines; in 2005 it assessed a record $251 million in fines. In more recent years this Asian tiger has been unafraid to sanction members of large global cartels; in 2002, the KFTC imposed fines of $8.5 million on six companies guilty of graphite-electrodes price fixing and $3.1 million on six vitamins manufacturers. The KFTC may be the first antitrust authority to offer bounties to whistle-blowers for information leading to the conviction of a cartel (*Korea Herald* August 31, 2005).

Weaknesses in Korea's cartel enforcement include an overly broad mandate, a business culture antithetical to the antitrust idea, few civil damages suits, an absence of class actions, and questions about the administrative independence of the agency from political interference.

Other Nations

In 1990-2003, there were 11 international cartels cases generated by eight non-EU countries (two of them, Hungary and the Czech Republic later joined the EU) (Connor 2004a). Most European cases have involved cartels that fixed prices inside their national borders.[38] Most of the remaining cases are also national-scope conspiracies. The only global-cartel cases prosecuted by a national authority outside North America and the EU were lysine, vitamins, and graphite electrodes. Mexico imposed a negligible fine on a couple of the lysine conspirators in the late 1990s, and Australia fined a few of the leading vitamin manufacturers.

Australia has had an antitrust law since 1974 that makes price fixing a *per se* criminal offense, but its effectiveness in combating cartels has

[37] Because not all cartels are fined, the average may be higher. Of those cartels fined, the affected Japanese sales amount to between 0.8 and 4.7 trillion yen or up to $40 billion. Criminal sanctions are almost unknown.

[38] One exception is the Grey shrimp case in the Netherlands, in which fines were imposed on German and Danish fishing cooperatives.

been limited by low fine limits (about $7 million) (ABA 2001). However, big changes are afoot as a result of two institutional changes. In 2003, the Australian antitrust authority implemented a corporate leniency policy on the U.S. model, which by 2005 was generating monthly applications. By late 2004 more than 100 suspected cartels were under investigation. After years of study, amendments were passed in 2005 that raised the maximum fine to the larger of A$10 million or treble damages. No sooner was the ink dry, and the antitrust authority proposed a US$318 million fine on a paper company that allegedly organized an international cartel (*Australian AP* December 21, 2005).

Fines across Jurisdictions

The fines imposed by the United States, Canada, and the EU are roughly proportional to the sizes of the affected markets' sales in the respective jurisdictions. In the 16 overlapping cases of global cartels available, government anticartel fines were highest in the United States, 4% lower in the EU, and about 6% of U.S. levels in Canada (Table 3.1). Even more impressive is the high degree to which fines were correlated in size between jurisdictions. The simple correlation between the U.S. and EC fines was +0.94, between the U.S. and Canada +0.97, and between the EC and Canada +0.98. Thus, corporate members of global cartels can use their fines imposed by the U.S. DOJ, usually the first to act, to predict with a high degree of certainty what their fines will be a year or two later in the EU and Canada. More importantly, these data show that despite large differences in stated fining policies, the practical outcomes highly similar.

Table 3.1 Global Cartels with Corporate Fines Imposed by U.S., EC, and Canada, 1996-2005

Cartel	U.S.	EU	Canada
	Million nominal U.S. dollars		
Lysine	92.5	97.9	11.5
Citric Acid	110.4	120.4	7.9
Vitamins	906.5	756.9	64.0
Sodium gluconate	32.5	51.2	1.6
Graphite electrodes	436.0 [e]	172.0	15.5
Sorbates	132.0	162.3	5.1
Nucleotides	9.0	21.1	--
Vitamin B3	29.7	--	2.5
Isostatic graphite	15.4	51.0	0.4 [+]
Fine art auctions	52.9	20.1	--
Methyl glucamine	5.0	2.83	0.34
MSG	15.0	21.1	--

(*continued*)

Table 3.1 (*continued*)

Carbon cathode block	2.09	--	0.51
Carbon electrical products	18.3	122.7	0.7
Art auction houses	52.9	20.1	--
Organic peroxides	10.0	85.2	--
Total	1920.2	1719.7	108.8

Sources: Connor and Helmers (2006).
-- = as of 2005, zero fines by this jurisdiction
e = Estimated
Note: Only global cases for which two or more jurisdictions have imposed fines.

Given the near absence of private antitrust litigation in Europe and considering the size of the EU's market, the total liabilities of cartelists operating in Europe are overall quite a bit lower in practice than an otherwise identical violation punished under U.S. or Canadian laws.

The UK and the Netherlands have responded in the late 1990s with new laws that have strengthened their local competition-law institutions. Progress in using private antitrust suits in national courts has been slower. One problem is that, unlike the United States, unpublished information gathered and analyzed by DG-COMP officials cannot be shared with private plaintiffs who would like to initiate follow-on actions. Several decisions of the European Court of Justice starting in 1976 have encouraged the use of national courts by private parties, but the few cases brought have resulted in disappointing, weak remedies or penalties. A 1993 EC notice also encouraged private cases where the EC believes there is a lack of "Community interest," a rather vague standard. Many questions relating to standing and sanctions are unresolved. The new UK law (effective March 2000) specifically encourages private antitrust suits, but it appears that indirect buyers will not have standing to sue. Multiple damages seem unlikely to be awarded in any Member State.

Private Settlements

Despite a thorough search of business and legal news sources, satisfactory information could be gleaned about only 17 private U.S. federal-court settlements or trials in 1990-2003, where the defendants were alleged members of international cartels (Connor 2004a). Nine were global and eight were regional NAFTA area cartels. Counting the main vitamins case as one observation, information is available on 47% of U.S.-prosecuted global cartels and 36% of the NAFTA regional cartels. Of the remainder, some have private suits pending resolution, some have been settled but were not newsworthy, and a small number had no private suits filed (e.g.,

in the USAID-construction case the federal government was the only injured party).

Private parties recovered at least $3.5 billion in the nine global cases (from $1 million in sodium gluconate to more than $2 billion in vitamins). Defendants in the eight regional cartels paid about $550 million to plaintiffs, the largest being cosmetics ($199 million) and choline chloride ($147 million). Even though both types are based on only U.S. affected commerce, the average global settlement was eight times as large as the average regional settlement.

Are these recoveries big or small? There are three ways of measuring the relative size of these private rewards: the ratio of the recovery to affected sales, to the overcharge, and to the government's fine (Table 3.2). Private settlements were roughly double the U.S. government fines. The median settlement rate for the 17 private cases was 13% of affected sales, with the global types four times as high. The median settlement rate as a proportion of the overcharge was 29%, and the global cartel median was 2.6 times as high. The median dollar settlement was about $92 million, but the median global-cartel suit settled for 1.75 times as much. By most measures, global cartels typically yielded settlements that were significantly higher than regional cartels. Although these cartel settlements recovered higher proportions of affected sales than typical domestic price-fixing cases a decade or two ago[39], the typical international-cartel settlement is still far below the triple damages envisioned by the framers of the Sherman Act.

Table 3.2 Size of Private U.S. Antitrust Awards, International Cartels 1990-2003

Ratio	Global	Regional
	Percent	
Median settlement/median government fine	175	206
Median settlement/affected commerce	18	1.3
Median settlement/overcharge	76	29

Source: Connor (2003: Appendix Table 6; Tables A.2, A.6, A.8, and A.12)

[39] Cohen and Scheffman (1989) provide a useful historical benchmark for actual U.S. price-fixing fines. From 1955 to 1974, the average fines amounted to only 0.4% of the cartel's affected sales. During 1974-1980, when the maximum corporate fine was raised to $1 million, the average price-fixing fines rose to 1.4% of affected commerce. On average, corporations received 86% discounts from the base fine in 1974-1980. A comparable survey of 1988 fines reported average price-fixing fines of only $160,000 per company, which was a mere 0.36% of the overcharges (Sheer and Ho 1989). Thus, while the fines on "regional" cartels remain about the same as formerly, the fines imposed on modern international cartels are many times higher than the fines imposed earlier on domestic price-fixing conspiracies.

There is little to be said about private cartel suits outside the United States. These types of suits are permitted in Mexico, Australia, and the national courts of most EU member states, but are rare in practice (Connor 2001: 89, 529-530). These jurisdictions typically permit only single damages, have high burdens of proof, do not permit broad discovery by plaintiffs, require losers to pay legal costs for both parties, do not permit class actions, and have low chances of substantive recoveries.

Outside the United States, Canada has the most active legal system for private antitrust suits (Goldman 2003). This activity was made possible by a 1992 law that permitted class actions. Buyers of citric acid in Canada were awarded $6 million, which is a relatively low 2% of the amount received by buyers in the United States.[40] Several other Canadian suits in the early 2000s resulted in large settlements against international cartels. In 2005, Canadian buyers of vitamins were awarded more than $100 million in compensation.

There is no provision for private compensatory suits under EU law. Some Member States have laws that permit private suits for single damages in their national courts, but such suits remain "rare" (Harding and Joshua (2003: 238). The few private actions that have been brought in the EU have faced highly uncertain outcomes and numerous practical barriers, such as the absence of class actions. Similarly, a handful of EU nations (UK, France, Ireland, Norway) have criminalized price fixing and the EU seems to be moving slowly in that direction (Wils 2005), but instances of incarceration seem to be unknown (Harding and Joshua: 258-262).

The absence of private suits outside of three countries has a negative effect on deterrence of global cartels, because only about one-fourth of the injuries caused by such cartels occur in North America. Foreign buyers who purchase their exports in the United States already have standing. At present buyers in other parts of the world have no recourse for private compensation in their local court systems. One possible remedy is to allow foreign buyers standing to sue for treble damages in U.S. courts (Adams and Bell 1999), but so far U.S. courts have for reasons unrelated to deterrence not permitted such suits.

Concluding Comments

Chapters 4 to 12 of this book examine the operations, economic effects, and legal consequences of the lysine, citric acid, and vitamins cartels. As many commentators have noted, the discovery of the lysine cartel in 1992

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[40] Sales of citric acid in Canada during the conspiracy were about 7% of those in the United States, and overcharge rates were about the same.

and its prosecution in 1996 proved to be the "tip of the iceberg." Out of public sight below the waterline, the U.S. DOJ was investigating about 25 more alleged international cartels in a variety of industries.

Since 1994 more than 60 global cartels have been revealed to the public, and in most cases the prosecutions and investigations are completed. As in the three cases covered in depth in this book, the U.S. DOJ's lead in prosecuting more global cartels has been followed by private civil suits in North America and by government actions in Canada, Europe, and elsewhere. Brazil, Japan, South Korea, Australia, and several member states of the EU have increasingly active anticartel agencies. However, the three jurisdictions with heretofore the most consistent legal responses to global cartels are the United States, Canada, and the EU.

The deterrence effectiveness of the highly touted monetary sanctions imposed on international cartels in the past decade may in fact be in part chimerical. The apparently large size of government fines is distorted by one overwhelming case – the global vitamins cartel. The failure of compensatory private suits to take hold outside of North America and the near absence of large fines in most Asian jurisdictions also casts doubt on the power of current penalties to deter recidivism by international cartels. Other than the United States and the United Kingdom, few nations have increased their maximum corporate or individual sanctions in the past decade. Without significant increases in cartel detection, in the levels of expected fines or civil settlements, or expansion in the standing of buyers to seek compensation, international price fixing will remain rational business conduct.

Chapter 4: The Citric Acid Industry

Citric acid is a product found in thousands of grocery products. This chapter answers the following questions: what is citric acid used for, who makes it, how do they make it, how much is made, and where is it made?

The Product

Citric acid is an organic chemical with a unique molecular structure. As an additive in foods like yogurt, sausages, and soft drinks, citric acid is one of several acidulents purchased by food manufacturers. Acidulents serve several useful functions in food formulations: sterilization, bacterial stabilization, flavor fixation, flavor enhancement, and standardization of acid levels. Besides its uses in the food industries, approximately one-third is purchased by detergent manufacturers. Citric acid has been replacing phosphorus in detergents because it does less harm to the ecology of rivers and lakes. Although there are about six other commercially important acidulents, citric acid accounts for more than 80 percent of the value of all acidulents sold in the U.S. market.[1] In most food and beverage formulations, citric is the only feasible acid.

Technology and Early Development

Citric acid may be manufactured in three ways. The oldest method extracts the acid from citrus fruits. In the early 19th century, a cheaper method of making citric acid by chemical synthesis of calcium citrate was put into commercial production in the United Kingdom. However, because the calcium citrate was mainly extracted from Italian lemons, the industry had

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[1] Except for the substitution of citric acid for phosphorus in detergents, the uses of various acidulents appear to be very stable. That is, the demand for acidulents tends to grow with the demand for the foods and beverages in which they are mixed. The largest use of citric acid is in soft drinks of all kinds (*Chemical Market Reporter* June 3, 1991).

become an Italian monopoly by the turn of the century.[2] U.S. production by chemical synthesis began around 1880 by the firm Charles Pfizer, Inc., the predecessor of today's Pfizer, Inc.

The dislocation of Italian citric acid production caused by World War I forced prices to very high levels in the early 1920s. The high prices provided an incentive to search for a new method of production that would not require calcium citrate as a feedstock. Chemical experiments in the late 19th century had already shown that traces of citric acid were produced when the *Penicillin* mold was grown in sugar solutions. In 1917, an American chemical scientist published a paper that reported that a different mold, *Aspergillus niger*, produced large amounts of citric acid when it metabolized in a solution of sucrose, salts, and iron. Within six years, this discovery had been put into commercial production by Charles Pfizer, Inc. in its Brooklyn, New York plant. This 1923 manufacturing venture may have been the first commercially successful true biotechnology-based industry. The new technology broke the Italian monopoly on calcium citrate.

Production using the Pfizer fermentation process spread to Europe in the 1930s, starting with a factory in the UK. Fermentation plants using beet sugar molasses were built in Germany, Belgium, and Czechoslovakia. In the post-World War II period, more improvements were made: submerged cultures, higher-yielding yeast strains, and the substitution of glucose for sucrose. Pfizer developed the "shallow pan" fermentation process that had become the industry standard by the 1980s.[3] Production of citric acid spread to China in the early 1970s, utilizing sweet potatoes or cassava in small-scale fermentation units.

Citric acid is sold in two product forms and in two quality grades. The two forms are anhydrous and monohydrate. The anhydrous form consists of sodium citrate, potassium citrate, or other salts of citric acid. Citric salts are ideal for most non-food industrial uses such as detergents, where standards of purity are not as high as citric acid to be used in foods or beverages. Most producers of citric acid salts make both quality grades, but until the 1990s, much of the citric acid being exported from China did not meet food-grade standards. Most citric acid shipped internationally is sent in dry form to save on transportation costs, but some citric acid is sold for delivery in liquid solutions.

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[2] A profile of the development of the citric acid industry appeared in the British newspaper, *The Independent* on March 9, 1992. This source attributes the discovery of chemical synthesis of citric acid from calcium citrate to John and Edmond Sturge, and dates commercial manufacture in their Selby, Yorkshire plant from 1826. Pfizer's early role is given in *Chemical Market Reporter* July 9, 1990.

[3] Miles developed the "deep tank" method in the 1950s. A fourth technology that applied yeast fermentation to petroleum-derived n-alkanes was proved to be technologically feasible in the 1960s. In 1975, Miles Laboratories formed a joint venture with Liquichemica Biointensi, but the venture was never profitable. (*Chemical Week*, November 12, 1975).

Market Size and Growth

Market size can be measured at least four ways (see Box). In this section, the focus is on consumption of citric acid and on growth in its demand. The next section discusses industry capacity and supply figures.

Market Size

The total size of a market is indicated by *industry capacity*, *production*, *product demanded* or *consumed*, or *sales*. The first three concepts of size are measured in physical units of weight or volume such as pounds, kilograms, or tons. Sales are the summation of buyer-seller transactions over a period of time, measured in monetary units. Capacity and production are supply-side concepts, whereas consumption views a market from the buyers' perspectives. Sales can be either the total revenues of sellers in a market or the total procurement expenses of buyers.

In manufacturing industries capacity is measured by the maximum or optimal production possible from all plants in a given time period. The most common measure is the annual engineering-design capacity of a plant sometimes called nameplate capacity. This ideal notion of capacity assumes that a plant will operate 24 hours a day for 365 days per year at the maximum levels envisioned by the plant's designers. In practice, plants being operated at full capacity normally require at least 15 to 30 days of down time each year for cleaning or repairs. Thus, maximum feasible production is typically 90 to 95% of nameplate capacity. Moreover, the most profitable level of production for a plant (i.e., optimal capacity) is usually somewhat lower than the maximum feasible levels of operation. In most manufacturing industries, during periods of strong demand, plants optimally utilize about 80 to 90% of their nameplate capacity.

For a non-storable commodity, global production will be equal to global consumption. Citric acid, lysine, and vitamins are storable products, so production will exceed consumption only if manufacturers or buyers are building up their inventories. On an annual basis, global production and consumption are likely to be virtually identical. However, regional production and consumption frequently diverge because some regions are net exporters and other regions are net importers.

Global sales are typically the most difficult indicator of market size to measure accurately because of corporate secrecy and multiple national price levels and currencies. In many markets only list prices are public knowledge. List prices rarely equal the transaction prices needed to calculate accurate sales figures. Moreover, sales figures are highly sensitive to the price levels used. Prices may be f.o.b. plant, delivered prices by manufacturers; prices charged by wholesale distributors, or retail prices.

Manufacturers of specialty chemicals like citric acid often have only vague notions about the amount of aggregate production or consumption in their industry. Industry trade magazines faithfully report press releases of plant constructions and expansions, national trade data, or other indicators of industry size, but these publications rarely take the trouble to resolve contradictory information. Proprietary reports by management consultants on an industry's size or growth are sold to a limited number of clients, sometimes summarized for public consumption. Where they exist, national industry trade associations often collect their members' production figures to arrive at national industry totals. However, these efforts often vary widely in terms of reliability and are of limited use when the industry is global in scope. Moreover, when a national industry consists of only two or three producers, a national trade association is unlikely to be established. In short, manufacturers themselves are often in the dark about their national or global market shares, changes in those shares, and rates of growth in consumption or production.

The trade press contains only about a half dozen references to the amounts of citric acid consumed by industrial buyers in the United States and only a couple of estimates of global consumption (Connor 1999b). More reliable and comprehensive sales and capacity data can be found in EC (2002) and USITC (2002).

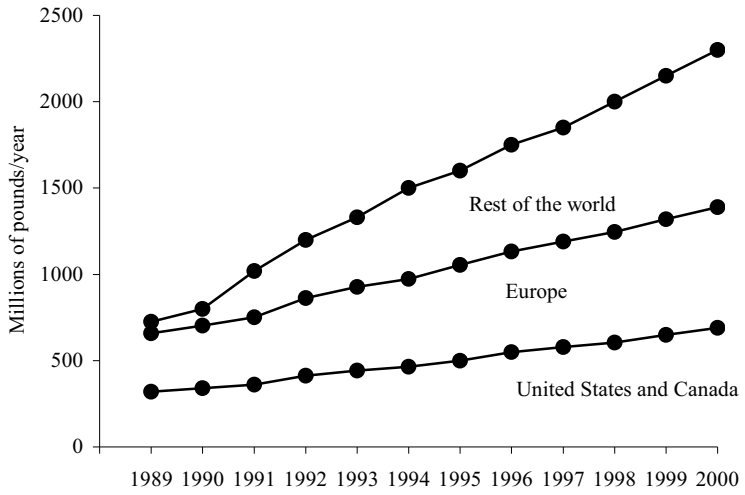

Figure 4.1 Global Consumption of Anhydrous Citric Acid, 1989-2000

Taking 1989 as the base year, U.S. consumption of citric acid was almost 300 million pounds (Figure 4.1). By 1996, U.S. demand reached 435 million pounds. Thus, demand was growing by about 6 percent per year in the early 1990s. That is about three times faster than the volume growth of the average food ingredient industry. This high rate of growth was being propelled by new uses in food and beverages and by the substitution of citric acid for phosphates by detergent makers.

The North American market was a large, but declining proportion of global demand for citric acid. U.S. and Canadian consumption of citric acid accounted for about 41% of global purchases in 1989 and 31% in 1996 (Connor 2001: Table 4.A.2). Europe was an equally large market for citric acid, accounting for 47% in 1989 and 28% in 1996. Global growth in citric acid demand was 10% per year in the 1990s. Growth of demand was slowest in Europe and in the United States but well above average in Asia and Latin America. Differences in demand growth are largely attributable to regional differences in consumer demand for beverages.

The Structure of Production

The North American Market

Until 1989, production of citric acid had been for decades a duopoly in the United States. The oldest American manufacturer, Pfizer, Inc., had long before closed its original Brooklyn plant and replaced it with a medium-size plant in Groton, Connecticut. Pfizer's most modern plant was located in Southport, North Carolina. This plant had a rated citric acid capacity of 80 million pounds per year. Pfizer also operated two small citric acid facilities in Canada and Ireland.

Pfizer's only domestic rival in the North American market was Miles Laboratories, which was headquartered in Elkhart, Indiana and was owned by Bayer Corporation. In terms of production characteristics, Miles was nearly a twin of Pfizer. Miles too had two U.S. citric acid plants, one in Elkhart that was rated at 90 million pounds and a smaller facility rated at 35 million pounds in Dayton, Ohio (Anon. 2001). Pfizer's U.S. plants were *finishing* facilities only. That is, they purchased their feedstock (dextrose) from independent producers. On the other hand, Bayer's Elkhart facility made its own dextrose and the Dayton, Ohio plant was supplied by a co-located Cargill corn wet milling plant.

Table 4.1 U.S. Market Shares of Leading Citric Acid Suppliers, Selected Years 1988-1998.

Sources of Supply	1988	1991	1995	1998
U.S. Manufacturing Capacity:		*Percent*		
Bayer/Haarmann & Reimer	42	41	28E	0
Pfizer or ADM	42	38	34E	40
Cargill	0	12E	30E	29
Tate & Lyle/A.E. Staley	0	0	0	12
U.S. Imports:[a]				
Hoffmann-La Roche	4	3	2	5
Jungbunzlauer	4	3	3	5
Other importers	6E	3E	3E	10
Subtotal of Top 5 Companies	94	97	97	90
Total Supply [b]	100	100	100	100

Source: Tables 1 and 2 of Connor (1998) and HRA (1992).
E = Estimates by author.
[a] Assumed that Roche accounted for all imports from Belgium and Jungbunzlauer from Germany and Austria where their plants were located. Other imports originated mainly from Italy, Israel, and China.
[b] The total of nameplate finishing capacities of plants located in the United States and U.S. import quantities. A small share of U.S. production was exported to Canada, so the shares shown correspond to U.S. and Canadian shares. Pfizer had a small plant in Canada, not included in the table that was closed by 1990.

Pfizer's and Miles' U.S. plants gave each of them slightly more than 40% of the U.S. supply of citric acid (Table 4.1). "U.S. supply" refers to the theoretical maximum production capacities of the four U.S. plants plus net imports of citric acid. In fact, a small share of U.S. production (about 5 to 10% in most years) was exported, to Canada primarily. Taking into account these exports and the fact that U.S. production was less than rated plant capacities, Pfizer and Miles each had U.S. *sales* shares of about 38% in 1988, with the remaining quantity sold (23%) being supplied by importers. The two largest importers were the large diversified chemical company Hoffmann-La Roche and the more specialized Jungbunzlauer. Roche operated a large citric acid plant in Tienen, Belgium from which it exported to the North American market. In citric acid Jungbunzlauer was even larger than Roche; it operated two or three large facilities in Germany, France and Austria. The remaining U.S. imports came from a number of countries, primarily China, Italy, and Israel.

In 1990, two important changes in the U.S. industry took place. The largest U.S. agribusiness firm, Cargill, began production of citric acid from a new plant that it had built at its existing corn wet milling plant at Eddyville, Iowa. Cargill had announced its intention to construct the new finishing facility in November 1987. The highly automated plant required merely 25 to 30 new employees and yet had a rated design capacity of 55 million pounds. What was unusual about Cargill's new plant was the fact that it was physically integrated with Cargill's existing corn wet milling plant. The add-on finishing facility reportedly cost only $40 million to build. When production began in the spring of 1990, the plant added 17% to the existing capacity of U.S. production. Cargill's substantial financial resources allowed it to expand its Iowa plant to 80 million pounds in 1991 and to 160 million in 1993.

The second important event in 1990 was ADM's entry into the industry. First signaling its intention to enter with a new plant in early 1990 about the time Cargill's plant was coming on stream, ADM then surprised the industry by announcing in August 1990 that it had agreed to purchase Pfizer's citric acid plants and technology instead of building a new plant. The purchase included Pfizer's Irish and North Carolina plants, with rated capacities of 20 and 100 million pounds. In addition, Pfizer agreed to sell to ADM exclusively up to 40 million pounds of citric acid from its Groton plant for three years. The acquisition of Pfizer's assets in December 1990 ended Pfizer's 110-year history of leadership in the U.S. industry.

ADM's decision to enter citric acid production was almost inevitable once Cargill's move into the industry was known. The history of the two firms is replete with examples of duplication of product lines, though it was more common for Cargill to follow ADM's bold incursions into new fields than the reverse. Both companies had made entry into new biotechnology-based industrial products a high strategic priority beginning in the late 1980s. This strategic direction was partly a response to the sharp retardation of growth in their sales of high fructose corn syrup around 1986 and partly a response to new low cost starch fermentation techniques for making various organic chemicals traditionally synthesized chemically.

Pfizer's decision to exit the industry it had pioneered in America was doubtless spurred by the appearance of two formidable rivals with reputations for aggressive, growth-oriented tactics. Pfizer may have outfoxed another fox. The profit-and-loss statements of Pfizer's citric acid department examined by ADM before purchase may have shown a high rate of return despite its aging plants because prices had been propped up by a cartel in the late 1980's in which Pfizer had participated. Perhaps more important a factor in Pfizer's decision was the fact that ADM and Cargill were the two largest manufacturers of dextrose and other corn sweeteners. Had ADM built a new citric acid plant in 1990, Pfizer would have gone from being one of two manufacturers to one of four U.S. producers,

a structure likely to have led to more price competition in citric acid. After entering citric acid manufacturing, Cargill and ADM would have become unwilling suppliers of dextrose to competing citric acid producers, and the number of alternative sources of dextrose was small. Therefore, Pfizer might have been squeezed by higher dextrose prices. Finally, Pfizer was probably aware that backward vertical integration of citric acid manufacturing brought down the cost by several cents per pound.[4] With access to high-yield microorganisms, Cargill would become the low cost producer in North America, allowing it to expand its market share at Pfizer's expense.[5] Faced with the likelihood of lower product prices and higher input prices after Cargill's and ADM's entry, Pfizer's decision to withdraw seems eminently sensible in retrospect. ADM's entry left Bayer's U.S. subsidiary alone exposed to this new competitive environment.

In the early 1990s, Cargill's share of the U.S. market grew quickly (Table 4.1). Cargill's new Iowa plant reportedly reached nearly full capacity within a year of its start up, so Cargill tripled its by 1993 (*Chemical Market Reporter* March 30, 1992). As a result of these investments, Cargill pulled ahead of Bayer/Miles in the U.S. market by 1995. However, ADM had meanwhile become the largest U.S. citric acid manufacturer by expanding its North Carolina plant from 100 million to 180 million pounds in late 1992. A few years later, ADM again expanded its North Carolina plant to 220 million pounds, thus solidifying its dominance in the U.S. market. By 1998, ADM accounted for about 40% of U.S. supply, and Cargill was not far behind it (Table 4.1). Bayer had been forced to cede its formidable position as dual leader in 1988, shrinking to a dismal 12% share of U.S. supply ten years later.

The Global Market

At the end of the 1980s, three of the world's top four manufacturers were European companies. In 1978, Miles Laboratories was acquired by the German pharmaceutical manufacturer, Bayer AG. Bayer later reorganized its U.S. operations by placing the responsibility for marketing citric acid under its fine-chemicals subsidiary Haarmann & Reimer. Although

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4 On-site production of liquid dextrose permits pipeline delivery to the citric acid finishing plant. At a typical $0.15 to $0.25 per pound, rail delivery of dextrose was expensive, especially to Pfizer's two East Coast plants located hundreds of miles from the Corn Belt.

5 Jungbunzlauer in Europe also produced its feedstock at the same location it made citric acid, at least at its newer plants. ADM seems not to make dextrose at its North Carolina plant, but enjoys some economies in supplying its plant with its own dextrose. Bayer's six plants (one in the UK, two in the U.S., and three in Latin America) were not vertically integrated.

Bayer's headquarters are in Germany, it was in turn owned by a holding company organized under the laws of Switzerland. Similarly, Jungbunzlauer is an Austrian firm with its original headquarters in Vienna. Around 1994 Jungbunzlauer moved its operational center to Basel. Majority control of Jungbunzlauer is vested in the Swiss holding company Montana AG. Roche is a thoroughly Swiss company headquartered in Basel, Switzerland. Thus, at times it will be convenient to refer to the big three European manufacturers of citric acid as "the Swiss firms."

Bayer was the leader in the industry in 1989. In addition to the two plants it acquired in the United States in the late 1970s, Bayer bought a small UK citric acid plant in 1990. It had an annual capacity of 46 million pounds, but in a few years was de-bottlenecked to 72 million pounds. Bayer dominated citric acid production in Latin America with joint ventures in Mexico, Columbia, and Brazil (*Chemical Week,* August 1990). All told, Bayer controlled some 230 million pounds of citric acid plant capacity in 1989-1990, which was about 25% of global capacity at that time (Table 4.2). However, in the mid-1990s Bayer neglected to make many investments to expand its plants, so its share slipped.

By 1993 and for the rest of the 1990s, the leading producer in the world was Jungbunzlauer, with plants in Austria, Germany, and France. In 1991, it began to invest in a series of Asian joint ventures to make citric acid, the first in Sumatra, Indonesia. From one large plant in the early 1990s, the company operated four by 1993. Jungbunzlauer's newest plant in Alsace, France was the vertically integrated type, making both citric acid and its primary feedstock from corn in the same location. Its four production facilities gave Jungbunzlauer about 300 million pounds of capacity in 1993, which was almost one-third of estimated global consumption and about equal to Cargill and ADM's combined capacities. By the late 1990s, Jungbunzlauer's citric acid capacity had reached 500 million pounds.

Europe's third-largest manufacturer of citric acid in the early 1990s was the huge Swiss chemical maker Hoffmann-La Roche (Table 4.2). Roche operated a single large plant in Belgium that in 1990 had a capacity larger than Jungbunzlauer's. However, capacity at Roche's Belgian plant did not expand much in the early 1990s, while Jungbunzlauer was investing heavily in its new plant in Alsace as well as upgrading two

Table 4.2 Global Capacity Shares of Leading Citric Acid Suppliers, 1988-1998.

Sources of Supply	1988	1992	1996	1998
		Percent		
U.S. Manufacturers:	32	30	20	20
Bayer/Miles[a]	16	10	6	0

(*continued*)

Table 4.2 (*continued*)

Pfizer	16	0	0	0
Cargill	0	6	7	7
Archer Daniels Midland	0	10	7	8
Tate & Lyle/A.E. Staley	0	0	0	5
European Manufacturers:	40	38	43	38
Hoffmann-La Roche	9	11	6	6
Jungbunzlauer	15	17	19	17
Biocor	6	4	4	3
Bayer (outside U.S.)[b]	10	9	7	6
Palma Group	0	0	3	3
Asian Manufacturers[c]	22	25	33	39
Total[d]	100	100	100	100

Source: Connor (2001b: Tables 4.A.1 and 4.A.2)
[a] Bayer reorganized its U.S. operations during this period. Miles continued to manufacture citric acid, but overall marketing responsibility was granted to Bayer's fine-chemicals subsidiary Haarmann & Reimer.
[b] Includes three plants in Latin America and one UK plant sold to Tate & Lyle in 1998.
[c] Mostly Chinese production, but also one Israeli and two Indian plants.
[d] Excludes plants in the former Soviet Union.

older plants in Germany and Austria. As a result, Roche's share of citric acid capacity in Europe fell to about one-third of Jungbunzlauer's by 1996 and was about half of that of Bayer. Thus, while the three Swiss firms each had market shares of 10 to 15% in 1989, by 1996 Jungbunzlauer accounted for half of Europe's citric acid capacity and Bayer and Roche only about one-sixth each.[6]

Plants owned by the three Swiss and two smaller Italian firms gave Europe about 45% of global production capacity in the early 1990s, but Europe consumed less than 40% of the world's citric acid. Thus, unlike the North American companies, Europe's producers were export-oriented, shipping up to one-third of production to North America and other parts of the world. Roche and Jungbunzlauer were the two largest exporters to the United States in the late 1980s and early 1990s.

Although ranking third in the size of its citric acid industry, the fastest growth in production and consumption was occurring in Asia, particularly

6 Two relatively small Italian plants accounted for the rest of Europe's citric acid production. The older plant located near Pavia was operated by Biocor. This plant was sold by its UK owner in March 1990 and resold in late 1991 to Ferruzzi-Montedison, now called Eridania Beghin-Say. Italy's second citric acid plant began production in Calitri in early 1993.

in China. In 1989, Chinese citric acid capacity was about 150 million pounds, or about half as large as U.S. capacity. By 1995 Chinese production capacity had surpassed that of the United States, and by the year 2000 Chinese and European capacity was of equal size (roughly 1 billion pounds each). Production in China was scattered across 120 small-scale facilities owned by one sort of government entity or another. More than half of China's citric acid output was exported, at prices that were substantially below those in Europe or North America. The low prices reflected both low quality and low production costs. It appears that the Chinese government provided export subsidies to citric acid exporters at a rate of about 5 to 10 cents per pound until about 1994. With annual growth exceeding 20% per year, by the early 1990s China was a looming threat to existing Western manufacturers, especially European exporters.

Members of the Cartel

Four companies joined the price-fixing conspiracy that their managers came to call the G-4 or "the club." As will be related in the next chapter, the G-4 was formed one day in March 1991 and fell apart sometime in early 1995. From November 1992 until April 1994 a fifth firm, Cerestar Bioproducts NV, was a member of the cartel. Cerestar is a subsidiary of Eridania Beghin-Say, a very large French-Italian agribusiness firm. While Cerestar remained in the cartel, it called itself the G-5.

Normally the structure of the market (many sellers, easy entry, or heterogeneous products) or fear of contravening the antitrust laws prevents the formation of a cartel. However, acting in concert, the G-4 was able to perform a feat that most business people can only dream about – moving the global market for its product in a direction that generated profits several times higher than the level in the pre-cartel period. This magical intervention into the normally all-powerful market mechanism by the G-4 was akin to a ship sailing against the wind.

Archer Daniels Midland Co. (ADM) was the G-4's prime mover. The trip made by the company's top two citric acid executives, Wilson and Cox, in January 1991 was the initial contact among the four. Doubtless, ADM's peace offering to the three Swiss firms was well received. Wilson probably explained in subtle ways ADM's corporate philosophy: friendly relations among competitors to achieve the joint exploitation of their customers.

It is useful to digress at this point to provide quick portraits of ADM, Cargill, and the three Swiss companies before moving on to the conspiracy story. These profiles will sketch each of the companies' strategies and financial conditions when the cartel was formed and active. They

will focus on organizational or management characteristics that may have made the companies susceptible to opting for an overt conspiracy.

Archer Daniels Midland Co.

ADM is the largest publicly traded agribusiness company in the United States and second largest in the world.[7] For three decades beginning in 1965, when Dwayne O. Andreas was appointed its CEO, ADM had enjoyed a long period of rapid growth, diversification, and profitability. Andreas was a colorful, outspoken agribusiness leader known for his bold strategic moves into new ventures, big international deals, and carefully cultivated political friendships. ADM was Andreas' creature. Its management structure had few layers, investment decisions were quick, and it benefited from numerous government contracts and subsidies (Figure 4.2). Until the lysine price-fixing scandal broke in 1995, ADM was one of the most admired American manufacturers.

In fiscal year 1995, ADM reported consolidated net sales of $12.7 billion (ADM**).** However, gross sales, which include the total sales of merchandised grain and oilseeds, and the sales of unconsolidated joint ventures, were approximately $70 billion. During the decade up to 1995 ADM's net sales increased by 10.1% per year. ADM's earnings per dollar of sales were about double those earned by most agribusiness firms, but they were quite variable. In the late 1980s net earnings had risen by 20% per year, but from 1990 to 1994 ADM's growth in net earnings stalled.

ADM has four major product divisions: oilseed products, corn starch products, bioproducts, and other grains; in 1995 the four divisions contributed about 60, 20, 5, and 15% of net sales, respectively. The cornstarch division produces corn sweeteners, cornstarch, alcohols, malt, and a host of biotechnology food ingredients (monosodium glutamate, citric acid, ascorbic acid, biotin, lactic acid, sorbitol, and xanthan gum). Four amino acids (lysine, methionine, trytophan, and threonine) were made by the Bioproducts Division and sold to manufacturers of animal feeds. Within the corn products division, corn sweeteners and ethanol had become mature products with slow growth and narrowing margins; however, the other bioproducts from corn generate much higher margins and represented ADM's hope for the future.

For a company of its size and diversity, ADM was managed by a remarkably small number of managers. Dwayne Andreas and three or four other top managers made all major decisions, largely unfettered by ADM's

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[7] Agribusinesses" are companies that primarily trade in or process agricultural commodities, buying from and selling to agricultural producers or other food processors.

subservient board of directors. Until late 1996, the highly paid Board contained a large majority of current and former company officers, relatives of Andreas, long standing close friends of Andreas, or officers of companies that supply goods and services to ADM (agricultural cooperatives or legal services). Strictly speaking, at most two of the Board's 17 members were independent of ADM or Andreas.

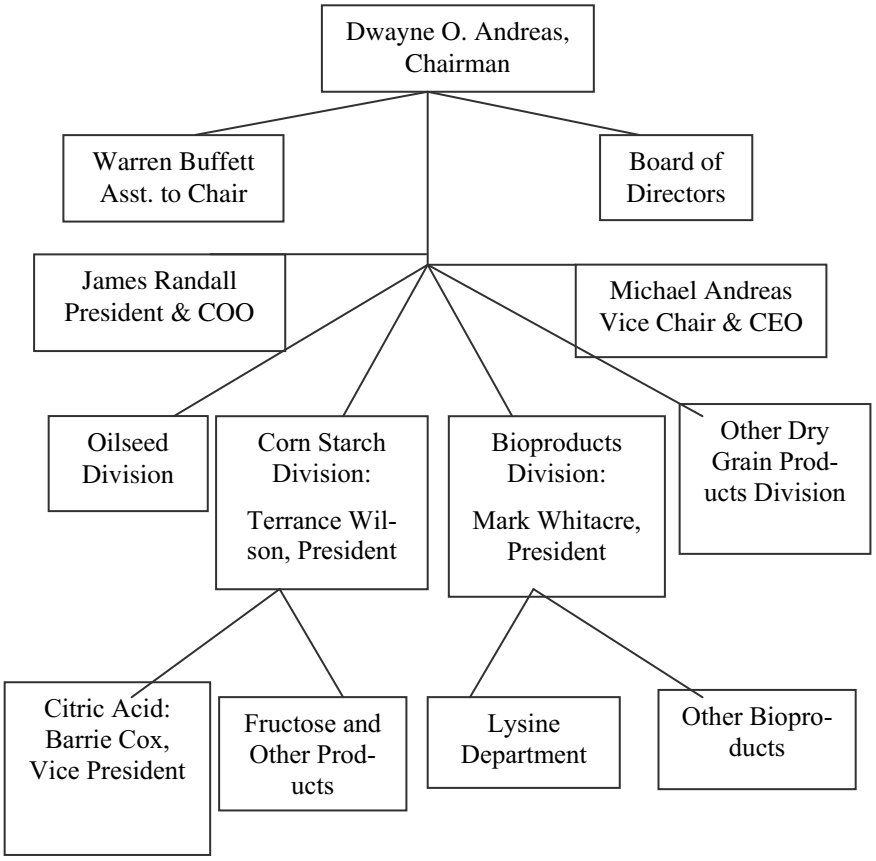

Figure 4.2 ADM's Management Structure, 1991-1995.

Note: May not correspond to the company's formal reporting structure, but reflects the actual decision-making structure of the company.

By 1990, Dwayne's son Michael had become the anointed successor to his aging father. Michael had effectively become the company's Chief Executive Officer, while Dwayne concentrated most of his time on

broad strategic decisions and external relations. The company was famously unconcerned about public and investor relations. Members of the press or stock analysts almost never had open contact with ADM officers except rarely with D. Andreas himself. ADM's flexible management style was so admired by multi-billionaire investor Warren Buffett that he sent his son Howard to spend several years as a special assistant to Dwayne Andreas in the early 1990s.

An October 1995 profile of Dwayne Andreas and ADM by the *Wall Street Journal* emphasized the CEO's extraordinary grip on the company. Although he personally owned less than 5% of ADM's stock

> ". . . Andreas has gained near total control with the help of family members, loyal executives and directors whose combined stakes is nearly 15%. He collaborates with his biggest competitors, spends prodigiously to influence the media and public opinion, and spreads large sums among politicians of all stripes." (p.A1).

Unusual among agribusiness companies, ADM has many collaborative arrangements with parties that normally would be considered rivals. Andreas often said, "Keep your friends close and your enemies closer." So, in 1992, ADM built a 3.5-mile pipeline from its Decatur plant to its rival A.E. Staley's plant just before Staley was threatened by a labor strike. ADM owns significant shares in Staley's parent, Tate & Lyle, and has a fructose joint venture with Staley in Mexico.

Andreas cultivated the image of an international statesman with strong concerns about environmental matters, world hunger, and national food security. His official biography gives him undue credit as one of the major forces behind the U.S. Government's PL 480 Program that ships excess farm commodities to poor countries (Kahn). He was often identified as the U.S. capitalist with the closest relationship with Kremlin and other Eastern Bloc leaders going back to Joseph Stalin in the 1950s. Andreas built a legendary network of powerful business and government contacts. He was close friends with and contributor to a wide array of farm-state politicians and spent a good deal of his time sponsoring political fundraising events.[8] ADM has benefited greatly from the U.S. sugar program

[8] Andreas made deft use of his wealth. "Andreas, his family, and ADM are by far the largest political contributors in the country" (Hollis). These contributions resulted in adverse publicity for Andreas at least four times. He wrote a $25,000 check that was given to B.L. Barker, one of the convicted "Watergate Burglars," and a bundle of $100,000 in cash given by Andreas was found in Richard Nixon's White House safe; Andreas avoided testifying about these gifts. Later, Andreas was prosecuted but not convicted for an illegal $100,000 corporate contribution to Hubert Humphrey. In 1993, Andreas and his wife were fined $8,000 by the Federal Election Commission for making excess political contributions.

and from federal ethanol subsidies and usage requirements (Bovard 1995). Lobbying by ADM through its trade associations for these and other government favors is intense and well documented.

There are several ADM management practices that bear the Andreas stamp and that could have made ADM prone to price fixing. ADM made quick and aggressive investment decisions. To enter the citric acid business, ADM paid top dollar for two aging Pfizer plants primarily to obtain the production technology. In both lysine and citric acid, very large capital expenditures were incurred to expand plants to the largest feasible scales. When production problems occurred with lysine, ADM hired away engineers from their primary competitor, Ajinomoto. Former ADM vice president Mark Whitacre claimed that "stealing technology" was common practice at ADM. The technological leader in the lysine industry, Ajinomoto, successfully sued ADM in late 1996 for patent infringement on production methods for lysine and threonine.

Whitacre was of the opinion that a culture that fostered or permitted price fixing permeated ADM. Dwayne Andreas dismissed the idea of "free markets," an idea he considers to be a figment of politicians' imaginations (Bovard 1995). That is, Andreas tended to view agricultural markets, both in the U.S. and trade among nations, as the products of personal negotiation between powerful leaders. Markets, he testified, are essentially creatures of government regulation and power. ADM's participation in five cartels tends to support some of Whitacre's charges.

Among people familiar with agribusiness, ADM ". . . long had a reputation for business practices that were close to the edge" (Nicol and Ferguson 1999:50). In 1978, ADM pleaded "no contest" to charges that it had colluded to fix prices on food sold by USDA for international relief programs. In 1992 and 1994, the company paid $2 million to settle civil antitrust suits alleging that ADM had conspired to fix prices on carbon dioxide, a by-product of its corn fermentation processes. As is typical in such civil settlements, the defendants do not admit their guilt in a formal legal sense. Yet, the impression is conveyed that the defendant judged that there was a good chance that in court the preponderance of the evidence might have turned against them. These precursors merely hint at the massive price-fixing activities pursued by ADM's top management from 1991 to 1995.

Cargill Corporation

Cargill is the world's largest agribusiness company, but because it is privately owned by a couple hundred members of the founding families, many details of the company's operations, organization, and finances remain hidden from public view. In 1986, Cargill had sales of $32 billion, which were four times the size of ADM's consolidated sales in that year. By 1999, Cargill's total sales were $46 billion, making it the largest privately owned industrial company in the United States (Connor 2000: Appendix F).

In terms of sales growth, the 1970s were a high point for Cargill. The combination of volume growth, acquisitions, and commodity price inflation raised the company's sales by 1,200% from 1971 to 1981. However, after completing a major purchase in the meatpacking industry in 1987, a five-year period of financial stress plagued Cargill. One major reason was the sharp slowdown in the growth of its corn wet milling business. Following ADM's lead, Cargill had invested heavily in a couple of huge corn refineries that made starch, oil, sweeteners, and other products. Growth of the most profitable product line, high fructose corn syrup (HFCS), hit a wall around 1987 as the opportunities for further substitution for sucrose dried up.

Like ADM, Cargill began to explore opportunities to utilize its large supplies of cheap corn sweeteners to make further-processed, high-value-added agrichemicals by means of advanced fermentation technologies. One of its first biotechnology ventures was citric acid. It was around 1987 that Cargill decided to build finishing capacity to make citric acid from dextrose produced at its newest corn-refining plant in Nebraska. Production of citric acid began in 1991, and after several expansions of capacity in the early 1990s, Cargill became a strong second in the U.S. industry behind arch-rival ADM. Cargill's April 1998 announcement of a new Iowa lysine plant was almost immediately countered by an ADM press release about construction of its *second* lysine facility. A few months later Cargill held a groundbreaking ceremony for its new lysine plant, with a capacity quite a bit bigger than the original announcement. Cargill had formed a partnership with Degussa, the world's leading manufacturer of amino acids, and the company that ADM had prevented from entering the U.S. industry by its preemptive strike in 1989. The Degussa partnership is only one of several that Cargill has formed in order to move decisively into the high-margin bioproducts area.

Bayer AG

Bayer has title to being the world's largest chemical company. In the late 1990s, Bayer's sales were only slightly below those of BASF, but in terms of numbers of employees or profit it was well ahead of BASF. In the late 1980s and early 1990s, it was Hoechst that had the number-one spot, so it is best to think of the big three German chemical firms as jockeying for primacy in the 1990s. All three firms were carved out of the infamous 1925-1947 I.G. Farben chemical monopoly that is best remembered for its collaboration with the Nazi regime and the conviction of its directors for crimes against humanity at the Nuremberg trials (Connor 1999: Appendix F).

In 1954, Bayer began investing in the United States. One of its largest foreign investments was the acquisition of Indiana-based Miles Laboratories in 1978. Among Miles' assets were two citric acid plants that gave Bayer half of the U.S. plant capacity for citric acid and about 40% of market sales. Testimony at a 1998 antitrust trial revealed that during the 1980s, Miles conspired to fix the U.S. prices of bulk citric acid with the only other U.S. manufacturer, Pfizer Corp. of New York City.[9]

Bayer enjoyed decades of nearly uninterrupted growth until about 1988, but then hit a plateau of financial performance that lasted several years. Bayer responded to this crisis by severe cost cutting (including large layoffs of employees in its European plants), an increase in foreign direct investment in fast growing markets, and restructuring of assets. It became the sole producer of citric acid in Latin America, with three or four small plants there. In 1994 Bayer's considerable U.S. assets were grouped under a new U.S. subsidiary named Bayer Corporation.

Hoffmann-La Roche AG

Roche Holdings, Ltd., a Swiss holding company, is often better known by the name of its principal operating company, F. Hoffmann-La Roche AG. Headquartered in Basel, Roche has been focused on nutritional and pharmaceutical products from its beginnings in the late 19th century. During the 1920s and 1930s, Roche moved away from its early reliance on medicinal extraction and increasingly applied its extensive R&D resources to chemical synthesis. Among its greatest early successes were the discoveries of synthetic processes for making vitamins C, A, and E. By the early 1970s, Roche controlled 50 to 70% of the world market for bulk vitamins. In the 1960s Roche profited greatly by becoming the first firm to

[9] The conspiracy was revealed by a former Pfizer employee in 1996 to the FBI. Bayer and Pfizer could not be prosecuted for price-fixing because of the statute of limitations.

market tranquillizers. However, failure to find profitable replacements for its tranquillizers, the patents on which expired in 1985, placed Roche under some profit pressures in the late 1980s.

In the 1990s Roche responded to its reduced prospects for profitability by redirecting its capital investments toward biotechnology ventures. In 1997, Roche had global sales of $12.9 billion and employed 51,600 persons. Almost two-thirds of its sales consist of pharmaceuticals, but it was also a world leader in flavors, fragrances, vitamins, carotenoids, and genetic-engineering products. In that year, Roche's net income was an enviable $2.9 billion or 22.8% of sales. Its major U.S. subsidiary, Hoffmann-La Roche Inc., had sales of almost $1 billion.

Jungbunzlauer AG

Jungbunzlauer International AG was by far the smallest member of the citric acid conspiracy. In its 1991 annual report, the company stated that it had 243 employees generating a mere $96 million in sales. But because it was highly specialized in making citric acid, it had one of the highest market shares in the citric acid cartel.

This company traces its roots to an alcohol distillery built in Jungbunzlau, Bohemia in 1895. It moved its registered office from Prague to Vienna in 1902. Jungbunzlauer diversified into the production of citric acid in 1962 from its single plant in Pernhofen, Austria, but soon became heavily indebted. A capital infusion from the Swiss holding company, Montana AG, took place in 1967. This holding company obtained a majority interest in Jungbunzlauer by the early 1990s. Sometime around 1994, Jungbunzlauer's headquarters was moved to Basel, Switzerland.

A stock prospectus issued by Jungbunzlauer in 1985 purported to show that the company was fairly profitable, making before-tax profits of 10% of sales in the preceding years. However, from 1986 to 1991, Jungbunzlauer's profits and its stock performance were quite unstable. Its average of profitability was moving down sharply. Despite its perilous financial condition, Jungbunzlauer made a large investment in a second citric acid plant located in Ladenberg, Germany. That purchase in 1989 made the company the world's third largest manufacturer of citric acid. Moreover, in 1990 Jungbunzlauer began to build a very large citric acid facility on the Rhine River in Alsace, France. The company also invested heavily in upgrading and expanding its Austrian and German plants. These projects raised Jungbunzlauer's production capacity to 310 million pounds by

1993, about 20% of the world's total, vaulting Jungbunzlauer past Bayer into first place (Connor 2001: Table 4.A.2).

Jungbunzlauer looks like a small player hell bent on aggressive growth to become and stay the biggest in citric acid. Its 1991 financial report stated that its main products were citric acid, gluconates, and xanthan gum – all made by fermentation. By 1997, Jungbunzlauer reported having 428 employees in its Austrian and German plants with total sales of $300 million – triple its 1991 sales.

International Trade Patterns

International trade provides information that helps in understanding the operation and economic impacts of the global dimensions of the citric acid conspiracy. Citric acid is a storable commodity and in its dry forms (citric salts) sells at a price high enough to justify being shipped internationally. As soon as the price differences between two continents widen to at least five or ten cents per pound, there is sufficient profit incentive for manufacturers or wholesalers to sell abroad, an activity dubbed "geographic arbitrage" by economists.

When a group of sellers tries to form a purely national price-fixing conspiracy, unless trade barriers exist, the sellers are limited in their ability to raise prices because at some price level imports will flood the national market. When a cartel is formed that aims at controlling intercontinental prices, it must set those prices at levels that will not permit geographic arbitrageurs to undermine the desired geographic price levels. Because currency exchange rates are uncontrollable and somewhat unpredictable, global price fixing is more complicated than a domestic conspiracy. The daily fluctuations in exchange rates among most major currencies compel would-be price fixers to alter their local prices at frequent intervals. The lysine cartel began by setting target prices only using the U.S. dollar, but with experience eventually set prices in a dozen national currencies. Price quotes were usually kept constant between meetings. As will be seen, the managers of the citric acid and lysine cartels believe that formal quarterly meetings were necessary, supplemented by frequent telephone communication between those meetings.

From 1981 to 1989, the United States imported between 20 million and 65 million pounds of citric acid, with the amount increasing nearly every year (Connor 1998: Figure 2). The imports were responding to relatively high U.S. domestic prices. Most U.S. imports originated from Jungbunzlauer's German plant and Roche's Belgian plant. Most U.S. exports

went to Canada and were by comparison quite modest, in the 10 to 20 million pound range. Thus, the U.S. trade balance became increasingly negative from 1981 to 1988.

However, the trade balance made a remarkable turn-around in 1989 and 1990. In response to the impending opening of Cargill's new citric acid plant in Iowa, U.S. prices began to fall in late 1989. List prices had been in the $0.81 to $0.84 per pound range in 1988 and early 1989 (Connor 1998: Appendix Table 1). However, in anticipation of the large additional quantities that Cargill would bring to the market in the spring of 1990, list contract prices suddenly fell to $0.75 per pound in late 1989 and continued to be cut quarterly during 1990. Prices fell precipitously throughout 1990. Transactions prices for citric acid fell from $0.81 per pound in late 1989 to as low as $0.62 at the end of 1990. Cargill began sales from its new plant in June 1990 and probably cut prices to win over new customers. Moreover, ADM's takeover of Pfizer's plants in late 1990 and its announced intention to expand capacity further depressed U.S. prices. Transaction prices remained low ($0.60 - $0.65 per pound) through June 1991.

As a result of these lower prices, U.S. imports fell by 10 million pounds in 1990 compared with 1989, and exports rose by 25 million pounds. In 1990, U.S. citric acid trade was virtually in balance for the first time in more than a decade. Moreover, exports climbed again in 1991 by nearly 30 million pounds, aided by the expansions of both ADM's and Cargill's plants and prompted by excess production capacity. In 1991, the U.S. experienced its first trade surplus in citric acid for more than a decade.

What was good news for the United States' balance of trade must have been viewed with dismay by the Swiss firms. As American exports began to flow to destinations other than Canada, they would have displaced European exports to those countries. Continuing export expansion by Chinese producers merely added to their woes. It is likely that Jungbunzlauer's and Roche's plants in Europe experienced notable declines in capacity utilization, a factor that typically causes production costs to increase. Moreover, these firms probably were being forced to cut prices on the one-fourth to one-third of their production that was historically exported. This was particularly bad news for Jungbunzlauer, which depended on citric acid sales to a greater extent than Roche or Bayer and which was in the midst of a large expansion program. It is also likely that Bayer's Latin American operations were facing a similar squeeze on margins.

Although the newly competitive U.S. industry may have been a temporary phenomenon occasioned by Cargill's large-scale entry, the Swiss firms were very likely in a precarious financial position with respect

to their citric acid businesses in the spring of 1991. ADM's peace offering could not have come at a better time.

Costs of Production

Specific information on costs of producing and marketing citric acid by various major sellers is not revealed in the record, but certain inferences can be made from other information. Some idea of cost of production is useful in assessing the strategic behavior of the leading firms and in measuring the economic performance of firms and markets (see Box).

Based upon the trade patterns in the 1980s, it seems quite likely that the costs of producing citric acid in Europe were lower than those in North America. In late 1990 and early 1991, when Cargill's new integrated plant had been up and running for some time, trade patterns reversed in such a way as to suggest that U.S. costs had achieved parity with European costs. However, the low U.S. selling prices may have been a transitory phenomenon, suggesting that U.S. producers may have only been covering their short-run costs at that time. Moreover, one cannot discount the possibility that Cargill might have been willing to sell at a price below long run average total costs in its first year to quickly grab a market share sufficient to achieve the low costs associated with higher levels of plant capacity utilization.

A couple of articles in the trade press provide hints of industry views on production costs (*Chemical Marketing Reporter* June 3, 1991 and July 22, 1991). In late 1990, some buyers were reporting heavily discounted transactions as low as $0.55 per pound, and this price was said to be only slightly above "production costs," which is probably the average total costs of manufacturing alone. When prices were in the $0.60 to $0.65 range, unnamed sources indicated that sales were unprofitable for all U.S. manufacturers, Cargill included. Thus, average total costs in the early 1990s may have been as high as $0.70 to $0.75. In the late 1990s U.S. manufacturers were profitable at prices of $0.61 to 0.69 (USITC 2002).

In 1988 manufacturing costs at Bayer's two U.S. plants were $0.42 to $0.48 per pound (Anon. 2001). Adding a generous allowance for central office expenses, selling costs, and a normal return on investment, Bayer's total average costs were $0.52 to $0.58. At an average selling price of $0.74 per pound, Bayer's gross profit margin was 25% of sales. During the collusive years 1994-1995 costs rose by 20 to 30%.

Costs of production abroad can provide some information about competitive prices in Europe or America. In December 1998, Mitsubishi

Costs of Production

Economic theory places great weight on costs of production as a determinant of a firm's decision to find its profit-maximizing level of production or for a firm with market power to set its optimal selling price. It is important to distinguish between long-run and short-run costs and between marginal and average costs.

The *short run* is a period of production too short for a new capital investment to make a difference in output. In the context of manufacturing the *long run* is the length of time necessary to plan, design, build, equip and debug a new plant – about two to three years for the citric acid industry. In the short run a company can ignore capital costs when setting prices or output levels (possibly incurring losses in net revenues), but in the long run all costs must be covered.

Firms consider only their marginal costs when optimizing production. However, marginal costs, the incremental costs associated with a one-unit increase in output, are difficult to measure precisely with accounting data. In practical analyses of company or industry performance, accounting data must be utilized. Accounting total costs consist of *variable* costs (costs that change with levels of output) and *fixed* costs. Variable costs include the labor, materials, and energy needed for manufacturing; costs of packaging, delivery, and storage; and selling costs. Fixed costs include such items as capital depreciation, insurance, interest payments on long-term debt, and a reasonable return to the owners of the company's equity. Roughly speaking, in the short run a firm must receive a price sufficient to cover its average variable costs. In the long run, price must cover average total costs.

A very common finding in studies of manufacturing industries is that average variable costs of small plants are higher than medium-size plants. Similarly, new plants operating at low utilization levels have higher costs than plants operating close to optimal levels with experienced personnel. However, the differences in average variable costs of mature medium-size plants and larger plants tend to be negligible. This is important because it implies that over this medium-large size range, long run marginal cost will be equal to average variable costs.

Corporation of Japan announced that it would be building a new plant to make citric acid in Thailand. The plant would use inexpensive local supplies of tapioca meal as the principal feedstock for fermentation. What was unusual about this announcement was Mitsubishi's revealing the fact that its marketing plan was based on a cost of production, insurance, and freight (the CIF price) of citric acid to Europe or the United States would

be $0.58 per pound.[10] Allowing some additional costs for sales brokers and domestic transportation charges suggests an average U.S. delivered price of about $0.65 per pound, well within the range of average total costs from other sources.

One final indicator of costs in the U.S. is what happened to prices after the citric acid cartel ceased operating in early 1995. During 1996 and early 1997, citric acid transactions prices hovered in the narrow range of $0.69 to $0.73 (Connor 1998: Appendix Table 1). On the assumption that this was a relatively competitive period, this price may approximate average total economic costs. Thus, the evidence available suggests that in the early 1990s average total costs were very likely between $0.65 and $0.75 per pound.

Selling Practices

Most citric acid was sold under annual supply contracts directly by the manufacturers or their agents to food and detergent manufacturers. The contracts would specify the product form (food grade or industrial grade, liquid or anhydrous), the quantity to be purchased during the upcoming quarter or calendar year, method of delivery, and payment terms. Most large buyers negotiated their contracts in the final quarter of the year. The contract would specify the price to be paid, but sellers had the option of announcing price changes "effective immediately" or at short notice at any time during the life of the contract. However, buyers usually had the option of buying extra product (often a month's supply) at the old price if a price increase was made; this is referred to as a "price-protection clause."

Citric acid manufacturers sent notices to the press and their customers of changes in their "list" price. These were starting points for price negotiations that took place in secret between manufacturers' sales representatives and purchasing managers. The most common list price referred to large lots (full truck loads or tanker-car loads) of anhydrous USP food grade citric acid, delivered to customers near the plant.[11] Standard premiums applied to partial truckloads (four to eight cents per pound) and to deliveries west of Denver (three cents). Once the terms of the contract were

[10] That is, the cost of production in Thailand would seem to be $0.50 per pound, and might fall as the small plant (15 million pounds per year) expanded.

[11] USP is an abbreviation for United States Pharmacopeia, one of the standard references for the technical standards required for a food or pharmaceutical product to be sold as suitable for human use.

set and the types of premiums were known, the only item to be negotiated was the price. The largest and oldest customers often expected discounts in the form of rebates when they signed contracts. Contract customers could request additional quantities during the year, but the price of these supplementary purchases would be renegotiated separately.

In addition to contract sales, manufacturers sold product on a "spot" basis. Spot sales were for immediate delivery and frequently for partial truckloads. Like groceries purchased at a convenience store, such fill-in shopping behavior usually meant paying a premium over contract prices. In early 1990, for example, contract prices were 3% lower than list while spot prices were slightly higher than list. In 1995, perhaps a more typical year, contract prices averaged 10% below list and spot prices 8% below.

There are no organized markets for citric acid with attendant public reporting of transaction prices. Although list prices were faithfully reported by the trade press, fitful articles on transaction prices were normally untrustworthy. Methods of exchange such as those just described for citric acid tilt price information in favor of the few sellers as opposed to the many buyers. The hidden nature of the negotiations makes it difficult for buyers to perform price checks and makes it easy for sellers to bluff about what alternative buyers are paying. Such methods of exchange are highly compatible with and may facilitate price fixing.

Chapter 5: The Citric Acid Conspiracy

Introduction

In January 1991, Terrance Wilson and Barrie Cox, two top-level officers of the large U.S. agribusiness firm Archer Daniels Midland Company, flew to Europe to meet with representatives of the three largest European manufacturers of citric acid. The two men were unlikely companions. Wilson was a Corporate Vice President and the President of ADM's big corn products division. He had joined ADM decades before, straight from the U.S. Marine Corps, and had worked his way up from near the bottom of the corporate ladder to be only one step removed from the giant company's powerful chairman, Dwayne O. Andreas. Although Wilson lacked a college education, his fierce loyalty to the Chairman and dogged pursuit of ADM's interests had yielded him a position of power and responsibility in ADM unmatched by all but three other officers.

If Wilson by all accounts was untutored, blunt, and profane, British born Barrie Cox was his opposite. Cox was urbane, educated, and knew languages. Unlike Wilson, he had spent nearly his whole career in the citric acid industry, but he had been employed by ADM for only a few weeks. The month before, ADM had acquired Pfizer Company's citric acid business, including two of its three citric acid manufacturing plants. Pfizer had pioneered the manufacturing of citric acid in the United States seventy years earlier. Barrie Cox had worked in marketing citric acid for 21 years in Pfizer's New York headquarters and was among the few of Pfizer's employees selected to keep their jobs and to move to ADM's headquarters in Decatur, Illinois. Among his assets was his personal acquaintance with the managers of the citric acid businesses owned by the leading European chemical manufacturers. In fact, during his late-1999 job interview with Michael Andreas, Cox had been quizzed about the extensiveness of his personal contacts in the European industry. In Cox's first month on the job, his boss Wilson had asked him to set up meetings with

the world's three largest citric acid makers: Hoffmann-La Roche; Jungbunzlauer, and Bayer (Tr. 2624).[1]

Wilson and Cox met with the top managers in charge of citric acid at the three companies near their respective headquarters: Andreas Hauri of Hoffmann-La Roche in Basel, Switzerland; Hans Hartmann of Bayer in Hanover, Germany and Rainer Bilchbauer, President of Jungbunzlauer in Vienna, Austria. Years later Cox would describe these January 1991 meetings as simply introductory, get acquainted sessions for Wilson, who was new to the industry. Very likely, Wilson described ADM's intention to modernize and expand Pfizer's biggest plant and to reduce costs by vertically integrating citric acid manufacturing with ADM's production of liquid dextrose, the primary ingredient in the manufacturing process. Wilson also probably attempted to allay any fears the Europeans might have had about ADM's well-earned reputation for hard-ball marketing tactics by saying that ADM should be a "friendly competitor" in the citric acid industry. ADM's policy in the citric acid market would be more like cooperation than confrontation.

Wilson made quick use of his new contacts. Within a month of the European trip, Wilson had arranged a meeting of the four largest makers of citric acid in the world, a group they would jokingly refer to as the G-4 (Tr. 2626).[2] Wilson, Cox and six other top managers of the G-4 met in Basel, Switzerland on March 6, 1991 to discuss a long list of agenda items, among them how to go about raising prices globally. The citric acid cartel was off and running.

Triggering Events

The seminal decision in the history of the citric acid cartel was Cargill's commitment of investment funds for a new high-tech finishing plant in Eddyville, Iowa. What factors prompted that shift in corporate strategy may never be known, but the fact that it was taken in 1987 provides a few clues.

Cargill, like ADM, was a leading manufacturer of sweeteners made from fermentation of corn. Glucose corn syrup and dextrose were

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[1] In this book, the transcript of the 1998 trial *U.S. vs. Michael Andreas et al*. is a frequently cited source. The abbreviation "Tr." will be used as a quick reference to this source and its pages. Except for a few major books, and articles, the hundreds of published sources used to write this chapter can be found in Appendix B of Connor (2000).

[2] The moniker G-4 is a conscious imitation of the annual meetings of the heads of the seven largest industrial countries, the G-7. A couple of years later, a fifth company joined the cartel (Cerestar Bioproducts, NV) whereupon the cartel rechristened itself the G-5. The term G-4 will be employed throughout this chapter to describe the citric acid cartel.

mature and slow growing product lines, but high fructose corn syrup (HFCS) was altogether different. HCFS was a miracle of modern science, a cheap process for converting abundant cornstarch into fructose, the sugar found in honey and fruits. Until commercial production of HFCS began in the United States in the late 1960s, fructose that approached and eventually exceeded the sweetness level of sucrose from cane sugar had never been available for purchase by the food processing industries. While its production cost in the 1980s of $0.08 to $0.10 per pound did not make it quite cost competitive with the cheapest imported cane sugar, the prospect of near self-sufficiency in sweeteners prompted Congress to oblige the industry by continuing to keep in place import barriers on foreign sugar.[3] The resulting domestic wholesale price of sugar (about $0.16 per pound in most years of the 1970s and 1980s) guaranteed high profits for HFCS manufacturers. Continued lobbying of Congress ensured periodic renewal of this sweet deal.

From its inception, the HFCS industry enjoyed exceedingly rapid volume growth (20 to 40% per year) as industries converted from sucrose to fructose. The high point in this substitution process was the decision of the major soft drink makers to allow their bottlers to convert from sucrose to HFCS in the mid-1980s. The high growth of HFCS came to a sudden end in 1986 as the last big buyer of sucrose completed its conversion to fructose. ADM, Cargill, and the other five or six producers faced a serious crisis. HFCS would no longer grow any faster than the food processing industries as a whole (only 2 or 3% per year) after two decades of heavy growth.

Both ADM and Cargill decided to use their corn refining capacities and expertise to branch out into new sweetener-based, fast growing organic chemicals.[4] Adding fermentors and related equipment to create finishing capacity for new products was less expensive than building stand-alone facilities and yielded production efficiencies as well. Cargill's decision to enter citric acid manufacturing was simply one of the first of a large number of food-and-feed ingredients compatible with its biotechnology thrust. In retrospect, citric acid may have been a fairly obvious first choice among the array of possibilities. Citric acid enjoyed relatively large sales and solid volume

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[3] The so-called sugar program was originally designed to protect U.S. cane and beet sugar producers from low-cost foreign production. HFCS manufacturers joined forces with the U.S. sugar interests to lobby for trade barriers so as to guarantee high profits at the expense of the U.S. consumers. The program was briefly abandoned in the mid 1970's. Without the help of the HFCS industry, lobbying by sugar-beet and sugar-cane interests might not have been enough to reinstate the program.

[4] A partial list of such products made from corn-sweetener feedstock includes methionine, threonine, tryptophan, sorbitol, lactic acid, gluconates, monosodium gluconates, vitamins (C,E, and biotin), lysine, and citric acid. All of these products were bulk ingredients sold to food or animal-feed manufacturers, ADM and Cargill's tradition consumers.

growth in the U.S. market of 6% per year. At prices near $0.80 per pound, citric acid sales held out the prospect of a very healthy profit margin, probably between 10 and 25% of sales, well above the company's usual returns. It is also likely that Cargill saw the two established U.S. manufacturers, Pfizer and Haarmann & Reimer, as soft targets because their lack of vertical integration imposed higher cost structures. Finally, unlike some of the other possibilities like amino acids or xanthan gum, the technology for producing citric acid from dextrose was more accessible for a newcomer. All in all, citric acid must have looked like a winner to Cargill in 1987.

There is no doubt that Cargill intended to develop a leading position in the citric acid industry. Its Iowa plant when it came on stream in mid-1990 expanded North American production capacity by 17%. The new plant took a little more than two years to build. Significant capacity expansions took place at regular intervals: 1991, 1993, and 1995. Cargill's initial U.S. capacity share eventually doubled to 33% in 1995, despite parallel expansions at ADM's North Carolina plant. Cargill was proved right in the end about Pfizer and Haarmann & Reimer. Pfizer exited the industry as soon as Cargill entered on the scene. Despite investments to improve costs up through the late 1990s, Bayer quickly lost its number one position and later exited the industry.

In an unusual reversal of their usual roles, ADM in 1990 imitated Cargill's move. ADM announced its intention to enter the citric acid industry three years after Cargill, but took over ownership of Pfizer's plants six months before Cargill began production. How much ADM paid for Pfizer's plants and technology is not known, but the bold decision put ADM well ahead of its long-time principal rival in the contest for production capacity. Due to Cargill's expansions, ADM's initial 49% of U.S. capacity declined to about 37% by 1995, but it held on to the number-one position throughout the 1990s by significant plant expansions. ADM's behavior was symptomatic of its oft-stated goal to be at least equal in size to the largest firm in all its industries. Not only did it pull ahead of Cargill in the U.S. but by the mid-1990's ADM was in solid third place globally, behind Jungbunzlauer and Bayer.

Two legal events may have contributed to ADM's decision to initiate the conspiracy in early 1991. Any price fixer must weigh the expected extra profits from creating or joining a cartel against the possible costs of being caught and punished by the antitrust authorities. There is no doubt that the conspiracy netted substantial illicit profits for all the companies involved; how large will be analyzed later. Two legal episodes probably lowered the perception about the chances of being sanctioned.[5] First, after

[5] More accurately, firms must have some subjective perception of the chance of being discovered and sanctioned. What this subjective probability is much debated by economists. Perhaps a consensus figure might oscillate around 10%.

nearly ten years in federal court, the judge dismissed a federal civil prosecution against ADM that alleged ADM had made an anti-competitive acquisition in the HFCS industry. Second, in the early 1990s the Department of Justice was having practical difficulties in prosecuting international cartels (Daniel *et al.* 1997). Thus, many would-be global price fixers may have got the impression that agreements and meetings conducted offshore were less likely to be sanctioned than domestic conspiracies. The citric acid cartel assiduously avoided meeting on U.S. territory.

Meeting and Methods

The opening event in the conspiracy was when Terrance Wilson and Barrie Cox flew to Europe in January 1991 to pay what was ostensibly a "courtesy call" on their big three rivals.[6] To the European managers, ADM's friendly overtures must have seemed like welcome news indeed. Falling U.S. citric acid prices were having negative repercussions on their business worldwide, and the expected future expansions of Cargill and ADM seemed to promise only more grim news. ADM was probably unaware that the companies being contacted had previously colluded with Pfizer in this market and that the breakup of the previous cartel was one reason for falling prices. ADM's hints at its readiness to cooperate would not have gone unnoticed. Wilson also expressed ADM's interest in joining the European Citric Acid Manufacturer's Association (ECAMA), a trade association that was to play a key facilitating role in the conspiracy. ECAMA's parent organization is the European Chemical Industry Council, an officially recognized unit of the European Commission.

With handshakes all around and business cards exchanged, the two ADM executives returned to Decatur. Unbeknownst to Cox, Wilson afterward quickly contacted the European citric acid managers, informing them of his desire to cooperate in raising citric acid prices. Wilson set up a meeting of all four companies for March 6, 1991 in Basel, Switzerland and instructed Cox to accompany and assist him (EC 2002).[7]

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6 Cox later testified that the two met Mr. Hauri of Hoffmann-La Roche, Hans Hartmann, of Bayer's subsidiary Haarmann & Reimer, and Bilchbauer, Lutz, and Kahane of Jungbunzlauer (Tr. 2625).

7 It is highly unlikely that Wilson did not seek approval from his boss, Michael Andreas, before initiating the conspiracy. At any rate, Andreas was heard on tape discussing the conspiracy at ADM's headquarters. Cox later testified that he was unaware of Pfizer's involvement in fixing critical prices in the late 1980s. Cox may have had little choice, other than resigning. An ADM employee named Wayne Brasser was fired for refusing to cooperate with the scheme.

This was the first of many meetings of the G-4 (Table 5.1). There were eight men present at the meeting, two from each company of the G-4.[8] Based on the severity of their sentences, it is clear that the prosecutors of the cartel considered Terrance Wilson and Hans Hartmann of Bayer/H&R to be the group's ringleaders. Hauri of Roche was eventually to take on the role of G-4's executive director. The leading role of Hans Hartmann is not hard to understand. He had been a Bayer employee for almost 40 years and president or executive vice president of Bayer's citric acid business for more than a decade. With his long industry experience, German citizenship, and residence in New Jersey, Hartmann was ideally qualified to act as a liaison between Wilson and the other German-speaking managers. Also, his subsidiary, Haarmann & Reimer, had the most to lose if an effective cartel did not emerge because it was becoming the highest-cost producer in the U.S. market.

Table 5.1 Major Meetings of the Citric Acid Cartel, 1991-1995.

Date	Location	Notes
March 6, 1991	Basel, Switzerland	G-4 formed
May 14, 1991	Vienna, Austria (ECAMA)	
November 14, 1991	Brussels, Belgium (ECAMA)	
May 20, 1992	Jerusalem, Israel (ECAMA)	
November 18, 1992	Brussels (ECAMA)	Cerestar joins
June 1, 1993	Kildare Island, Ireland (ECAMA)	
October 27, 1993	Bruges, Belgium (ECAMA)	
May 18, 1994	London, England (ECAMA)	
November 2, 1994	Brussels (ECAMA)	Wilson's last
May, 1995	Brittenau, Switzerland	

Note: This table lists only the nine meetings that both Terrance Wilson and Barrie Cox of ADM attended and one other. At least eight of these meetings, and possibly all ten, occurred in parallel with official meetings of the European Citric Acid Manufacturers' Association (ECAMA). There were about 25 face-to-face meetings of the whole group and about a dozen bilateral meetings (Tr. 2614-2801).

The agenda for the Basel meeting included several general topics such as the reason for such low prices and the role played by surging Chinese output. The chief representative from Hoffmann-La Roche congratulated

8 Besides Wilson and Cox, present were Hartmann and Yamashita from Haarmann & Reimer, Hauri and Marti from Roche, and Bilchbauer and Hummer from Jungbunzlauer. Bilchbauer was president and CEO of Jungbunzlauer; Hartmann was president of H & R; Wilson was president of ADM's corn productions division.

ADM on its recent announcement of a U.S. list price increase from $0.65 per pound to $0.68. However, the talk at the Basel meeting soon veered into clearly illegal territory. Violations of the Sherman Act occur if two or more individuals from independent companies knowingly and intentionally attempt to restrain a market's output or prices; it is the agreement to do so that is the crime, not any effects the agreement may have on the market (see Chapter 3). At the Basel meeting, the managers of the four companies agreed to raise their list prices in all regions of the world.[9] Price discussions focused on anhydrous acid, knowing that monohydrate would sell for 4 to 5% below (EC 2002). They also agreed to allow each company to grant 3% price discounts to their five largest customers.

A sales quota was established for each member of the cartel for its global sales as well as for three regions (North America, Europe, and the rest of the world). Each company was allocated a 1991 tonnage target based on its 1988-1990 actual sales volume, with an adjustment for anticipated growth. To monitor the volume agreement, each company agreed to submit monthly sale volumes by region to Hauri at Roche's Basel headquarters. Hauri's office would then compile totals and market shares and report the information back to each company. With this information, each cartel member could gauge the adherence of each other member to the allocation agreement. At the end of the year, a buy-back system would be implemented to even out discrepancies between "budgeted" and actual sales. Companies that came in over target would sell citric acid at cost to members that were under target volumes. This arrangement was kept almost perfectly by the four companies from 1991 to 1994 (EC 2002).

Finally, they agreed to meet secretly at least twice a year using the official ECAMA meetings as a cover (Table 5.1). In fact, Cox said that the cartel had about 25 formal meetings from 1991 to 1995, plus a dozen or so bilateral meetings. In addition, when things were quiet Cox had at least two telephone calls per week about cartel matters: when there was a lot of activity, calls would occur daily.

The rapidity with which such a complex agreement was hammered out is remarkable. Perhaps a surprising bit of information passed on at the Basel meeting explains why a plan emerged so quickly. Cox learned that his former employer, Pfizer, had been involved in a price-fixing scheme in the 1980's. He was not aware of it at the time and believes that it ended before the ADM takeover in December 1990.[10] The fact that Cox was informed

9 The G-4 had an immediate effect on list prices, but because of the impending start of production by Cargill, U.S. transaction prices did not rise for a few months after the Basel meeting.

10 The two employees responsible for price-fixing at Pfizer were named Hunter and Moriarty. The conspiracy of the 1980s involved Bayer's U.S. subsidiary Miles Laboratories. The European producers were aware of the earlier price-fixing and may well have

earlier about the price-fixing scheme by the Swiss managers suggests that both Pfizer and the Swiss firms had been co-conspirators. Thus, in a sense, the 1991-1995 citric acid cartel was *re-formed* in 1991 rather than *de novo*.

The official meetings of ECAMA took place at ECAMA's headquarters in Brussels every November and every spring at a different location chosen by one of the member companies. At the open "official" meetings, speeches were made by experts on various subjects, the ECAMA secretary presided and took the minutes and industry data collected by ECAMA were discussed. These open meetings were attended by representatives of manufacturers and buyers alike. In other words, ECAMA had all the trappings of the legitimate trade association that it was.

However, at the parallel "unofficial" conspiracy meetings of the G-4, there were no agendas, no minutes, and no customer representatives present. The manufacturers' representatives at the conspiracy meetings took pains to cover up their activities by destroying any documentary evidence of their conspiracy.[11] These actions reveal that the conspirators knew their "unofficial" meetings were illegal. In fact, Cox testified that Wilson warned him that if the price-fixing were ever discovered, Cox would be "on his own," that is ADM would not pay for Cox's legal expenses should Cox be prosecuted (Tr.2681).[12]

The secret meetings of the G-4 soon became fairly routine events. Full-scale meetings were scheduled on average every eight weeks. A standard format evolved. First, the group would discuss the latest cartel sales reports, which provided information on growth and company market shares. The group then discussed price levels and trends around the world and decided whether to raise prices or keep them firm. Information about competition by companies outside the G-4 was shared. Finally, the group considered "problems affecting the group." This was a euphemism for heated debates about cheating accusations, a psychological phenomenon that afflicts nearly all nonbinding cartel organizations (Scherer and Ross

been active participants. The prior conspiracy cannot be prosecuted because there is a four-year statute of limitations for price-fixing.

11 Nevertheless, considerable evidence was available to prosecutors after the cartel was exposed. Only three ADM employees were supposed to be informed about the conspiracy (M. Andreas, Wilson, and Cox). Andreas and Wilson never cooperated by giving evidence to prosecutors, but Cox divulged his involvement to an old friend at ADM, VP of Operations Roger Dawson, who also came from Pfizer. Dawson was able to confirm most of Cox's testimony. Documentary evidence survived in the form of travel and expense records of participants at the meetings (travel to non-ECAMA G-4 meetings was damaging), faxes of monthly sales reports, and telephone records. More importantly, tape recordings of Wilson talking about the citric acid cartel were made at meetings of the lysine cartel. Just after both cartels were exposed, Wilson was taped saying that there was "bad stuff" on those lysine tapes (Tr. 2683-2685).

12 ADM paid for the legal defense of Andreas and Wilson.

1990:236-248).[13] Eventually, by late 1994, or early 1995 cheating on their volume agreements became so rampant that the G-4 effectively fell apart. However, for almost four years, the group displayed enough discipline and harmony to have a strong effect on raising prices, the principal aim of the G-4.

Citric Acid Price Movements

U.S. and global prices reached their nadir in the winter of 1990-1991 as Cargill's new plant ramped up its production (Figure 5.1). For three years (1987-1989) U.S. list prices for the most popular form of citric acid had remained unchanged at $0.81 per pound. In anticipation of the vast new supplies from Cargill's plant, by late 1989 buyers began to hold off on their purchases. With their inventories ballooning, the two U.S. manufacturers were forced to cut their list prices four times starting in December 1989 to $0.75. The last list price decrease occurred in July 1990 when Cargill's began sales of citric acid. Cargill announced a list price of $0.63 per pound, a dramatic $0.10 lower than the reigning industry price and 22% lower than the price at the end of 1989. Other producers were forced to match Cargill's low-ball price.

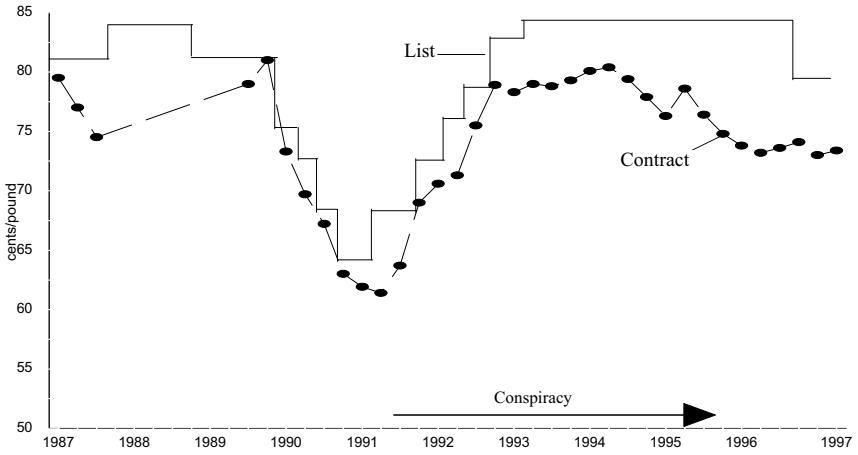

Figure 5.1 List and Contract Prices of Anhydrous Citric Acid, 1987-1997

Source: Connor (1999:Table 3 and Appendix Table 1)
Note: List prices are bulk purchase delivered to Midwest points. Contract prices are for bulk orders covering at least 3 months supply needs of the buyers, f.o.b. plant transactions, average for the quarter.

13 "Nonbinding" means privately enforced by the cartel members themselves. Many cartels are government sponsored and therefore binding.

By the end of 1990, Cargill's plant was reportedly producing at close to its optimal level of utilization. In February, Cargill announced a 5-cent list price increase, and its two U.S. rivals (ADM and Haarmann & Reimer) matched Cargill's price initiative.[14] Late winter or early spring is a good time to raise prices in any case because demand for citric acid by beverage makers peaks at that time in anticipation of peak summer beverage sales. In August 1991, Cargill again pushed through a 5-cent price increase, just as annual contract negotiations were about to commence. All the other manufacturers followed Cargill's lead. By this time, the G-4 had begun its price-fixing discussions. As Cargill was not a formal member of the G-4, its leading role in initiating the August price increase is a bit puzzling. Cargill was doing just what the newly formed cartel wished to do, but there is no evidence that Cargill raised its list price by agreements with the G-4 itself.

What is clear is that the cartel took over the responsibility of raising prices after 1991. Beginning in January 1992 and ending in October 1993, Bayer's Haarmann & Riemer subsidiary led four list price increases, each of them for 3 cents. Within a few weeks of Haarmann & Reimer's action, all other major manufacturers matched the increases. For three years, October 1993 to late 1996, the citric acid cartel achieved its central objective: raising and keeping list prices at $0.85 per pound. Because this 35% list price increase was followed by a similar increase in transaction prices, profits rose sharply for all producers, whether members of the cartel or not (see Figure 5.1). It is perhaps significant that Haarmann & Reimer was designated to be the firm that initiated the price increases in the U.S. citric acid market. Haarmann & Reimer was probably the highest-cost producer in the U.S. industry because it ran the smallest, oldest plants. Moreover, most of Haarmann & Reimer's citric acid returns were dissipated by noncompetitive, elevated dextrose prices it had to pay to sellers in a corn-sweeteners conspiracy. Cargill was totally vertically integrated from the time it entered production, and ADM achieved the benefits of quasi-integration through optimal scheduling of rail shipments of dextrose.[15] Moreover, both Cargill

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[14] This was the price increase for which Hauri praised Wilson and Cox when they first met in March 1991. ADM's willingness to follow Cargill's lead in raising prices would be interpreted as a tangible sign of ADM's friendly, cooperative intentions. Cargill's action too must be interpreted as a friendly signal to its rivals. Cargill was reaching full capacity and thus had if anything lower production costs than in 1990, and in February was a few months early for the seasonal beverage demand increase to be felt on spot purchases.

[15] ADM also operated a new corn wet milling plant in eastern Tennessee that was quite close to its North Carolina citric acid plant. Cargill and ADM were members of the alleged conspiracy to raise prices of corn sweeteners during 1989 to 1995. Thus, from 1991 to 1995 ADM and Cargill may have earned monopoly profits on both citric acid and on sales of its primary input, dextrose.

and ADM had expanded their U.S. plants to a size larger than Haarmann & Reimer's biggest plant by 1993 (Connor 2001: Table 4.A.1). Thus, prices that generated merely above average profits for Haarmann & Reimer would generate extraordinarily high profits for ADM and Cargill. Even if there had been no cartel deciding on a collective price level, simply independent price leadership by Haarmann & Reimer would have resulted in the most monopoly-like prices for Cargill and ADM as price followers (Scherer and Ross 1990: 260-261).

In the United States and Europe, both spot and contract prices fell and rose in sympathy with the list price announcements. Increases in transaction prices took a month or two to take effect after a price list change, partly because of contractual price-protection clauses. From 1987 to the end of 1994, contract prices were from zero to five cents lower than list prices. Cox testified that all the increases in 1992 and 1993 were by agreement of the members of the cartel. The cartel believed that its changes in list prices and effectiveness in restraining the volume sold by the G-4, which controlled 65 to 70% of world production, was sufficient to cause transaction prices to rise. However, the cartel might not have been successful if the two largest non-cartel sources of supply – Cargill and Chinese producers – had failed to cooperate.

The Role of Cargill

In sworn testimony in federal court, Barrie Cox stated without qualification that neither Cargill nor the numerous Chinese producers were members of the G-4 (Tr. 2674-2676). Hans Hartmann also testified as to Cargill's innocence. While these statements are literally true, the point made about Cargill is at best misleading. Later in the trial, while being cross-examined by Wilson's lawyer, Cox admitted that sometime during 1991-1995 he had "price discussions" with an individual at Cargill (TR.2750). Some of those discussions involved agreeing about the prices Cargill and ADM would bid for certain citric acid accounts.[16] Bid-rigging is, of course, one method of fixing prices.

Almost a year after the Chicago trial, press reports clarified Cargill's role in the citric acid conspiracy (Guebert 1999, *New York Times* June 17, 1999). On October 12, 1996, Barrie Cox was interviewed by the FBI. At the same time, he had been offered immunity from prosecution in return for his complete and truthful cooperation in the FBI's investigation

16 Why Mark Hulkower, Wilson's lawyer, chose to explore this topic is baffling. Why prosecutor Scott Lassar, in his closing argument, ignored the testimony and praised Cargill for its ethical behavior is equally baffling.

of the citric acid conspiracy. (Perjury during the interview would be grounds for removing Cox's immunity). Cox stated that he had held more than a dozen conversations with William Gruber, his counterpart at Cargill. The conversations dealt with Cargill's plans to raise prices and rig bids to certain customers. Cox said that he agreed to "go along" with Cargill's plan to raise the price of citric acid and restrain ADM's sales volume. Thus, it appears that Cargill and ADM had a bilateral price-fixing agreement separate from the G-4 cartel. Cox informed his boss Wilson about his conversations with Cargill.[17] The three Swiss firms may not have been explicitly informed about the Cox-Gruber conspiracy, though they might easily have inferred it. Cox says that the Swiss firms were aware of his Cargill talks. It is possible that Gruber's actions may not have been known or sanctioned at Cargill.[18]

The import of these facts concerns Cargill's frequent protestations that the company was innocent of price fixing in citric acid and corn sweeteners. In June 1999, Cargill's lawyer denied that the Cox-Gruber conversations ever happened. He also recalled Cox's trial testimony exonerating Cargill:

> "In fact, later in the trial, the government all but held Cargill up as a poster child for good corporate citizenship" (Guebert, 1999).

Indeed, anonymous sources at the Department of Justice confirmed that neither Cargill nor Gruber were targets of the G-4 investigation. Nevertheless, Cox's trial testimony was never rebutted in any way by the defendants, even though Cox's testimony was devastating to Terrance Wilson's case (Lieber 2000).

If, as seem likely at this point, the Cox-Gruber conversations were overt price fixing, then Cargill is liable for some of the effects on prices in the U.S. market. Whether top management was aware of Gruber's actions is irrelevant for civil antitrust liability in the United States. However, because Cargill was not directly engaged with the G-4, it may not be liable for non-U.S. price effects.[19]

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17 He said Wilson showed no surprise at the news, as if Wilson pre-arranged the bilateral deal. The Cargill-initiated price increase must be the August 1991 action. Cox told the FBI that in 1992 or 1993, the G-4 discussed ". . . how to get messages to Cargill, how to control them . . ." Wilson offered to undertake this task..

18 Michael Andreas was caught on tape saying that Cargill would be unlikely to join "the club" (the G-4) at the beginning, but that it might want to do so later.

19 It is known that Cargill joined ECAMA at some point during the conspiracy and supplied ECAMA with its monthly sales volumes. It is not clear whether Cargill gave its monthly volume to the G-4 directly. If the ADM-Cargill side deal aided in the propping

Even if the Cox-Gruber conversations were not illegal, then Cargill was the legal beneficiary of monopoly profits that carry no antitrust liability. Cargill could have made more than $100 million in excess profits during 1992-1995 from its citric acid business. Cargill is entitled to keep these profits even though the G-4 may be required to pay injured parties triple the citric acid overcharges, those resulting from sales by G-4 members as well as nonmembers.[20]

The China Problem

The citric acid cartel controlled at most two-thirds of the world's supply of citric acid. Even with Cargill's passive acceptance of the cartel's pricing decisions, one set of producers appeared ready to spoil the cartel's effectiveness. Those producers were located in China, and they were intent upon the most rapid expansion of their exports by any means possible, including deep price cuts.

Production of citric acid in China began in the early 1970s. The U.S. trade press began to take notice of Chinese imports in the late 1980s, but China's official news service had begun trumpeting the rapid expansion of its citric acid industry in the early 1980s. By 1988, the Xinhua News Service claimed that citric acid plants in China had 100 million pounds of capacity, or about 10% of world capacity. Three years later, the Chinese capacity share approached 20%. Interest in Chinese joint ventures by Western citric acid manufacturers is noted as early as 1991 and accelerated in the early 1990s. (Foreign investment would also occur in India, Indonesia, and Taiwan in the early 1990s). In 1994, Xinhua reported that actual production in China in 1993 had reached 360 million pounds, but more important for the citric acid cartel was the claim that an astonishing 240 million pounds was exported. If true, these data suggested that in a remarkably short time China had moved into second place behind the United States in terms of national production (third place if one regards the European Union a single market). Most Chinese exports were destined for other Asian countries, but increasingly they were penetrating Europe and North America.

Import data confirm the looming importance of China as a source of citric acid. In 1991, when citric acid prices were at their lowest level, only 50 million pounds were imported. But when the cartel-induced prices had risen to near $0.80 per pound in 1993, the volume of U.S. imports

up prices or allocating volume shares of the G-4 abroad, then Cargill could be sanctioned by the European Commission, Canada, Mexico, and other competition-law agencies.

[20] Compensation for non-member overcharges varies across federal court districts.

increased by 90%. Most of the increase in imports came from Chinese producers. In 1994 one-third of U.S. imports of citric acid originated from China. By 1996 imports accounted for 15% of U.S. supply (USITC 2002). In the EU Chinese imports alone rose from 7% of consumption in 1991 to 24% in 1994 (EC 2002).

Production capacity and exports of citric acid from China was growing at an unsustainable pace. Chinese volume of exports grew by 34% per year from 1977 to 1994. In 1996, national production capacity reached 660 million pounds, which implies that expansion since the late 1980s was 15% per year. This was double the rate of capacity expansion by members of the G-4.

The impressive growth of China's citric acid industry is part of a larger story of the tremendous industrial growth in China that resulted from a relaxation of centralized planning and socialist economic principles. Production costs are quite low by international standards in most of China's manufacturing industries, and the citric acid industry had three cost advantages worth noting. First, construction costs for new plants in China are significantly lower than plants of comparable size in the West, a feature not lost on the leading European manufacturers when they began forming joint ventures in China in the late 1990s. Second, the starchy raw materials available for fermentation were very low in cost, probably lower than corn in the United States. The major raw material in China was sweet potatoes; some used cassava. Both raw materials are abundant in China. Third, up to at least 1995, China's central government provided export subsidies for many chemical industries, including citric acid. These subsidies may have lowered the price of Chinese citric acid exports by as much as 10%.

Chinese citric acid was also cheap because of a reputation for poor quality. The proportion of impurities in much of China's exported citric acid was too high to qualify it for use in foods and beverages, though it may have been acceptable as an ingredient in detergents. Chinese exports to the United States were probably from their best factories that had more advanced filtration equipment, yet trade reports showed the Chinese citric acid sold in the United States at a 5 to 15% discount below European imports (Connor 1998: Appendix Table 3). Chinese citric acid plants tended to be tiny by Western standards. In the mid-1990's, 95% of its more than 100 plants had capacities of less than 22 million pounds. These smaller plants had to export their citric acid at prices 30 to 40% below major Western exporters. In the late 1990s only eight Chinese joint ventures met U.S. quality standards (USITC 2002). Consolidation of production, continuing foreign investment, and upgrading of equipment has raised the quality of Chinese citric acid over time.

The 1992-1994 surge in Chinese exports put the G-4 in a bind. The more successful the cartel became in raising prices, the more Chinese imports flooded into North America and Europe. The cartel's solution to this problem was a masterful political move.

In 1993 and 1994, the United States was embroiled in a dispute with China on the issue of protection of intellectual property rights. The U.S. film, music, and publishing industries were losing millions of dollars of royalties because of widespread and officially tolerated pirating. Press reports told of lobbying of the office of the U.S. Trade Representative by one of the two U.S.-owned manufacturers of citric acid. The lobbying had the desired effect. On February 4, 1995, the U.S. Government announced that it would impose prohibitive 100% tariffs on $1.1 billion of goods imported from China in retaliation for Chinese government intransigence. Prominent on the list of imported goods was citric acid. Although last-minute Chinese concessions prevented final imposition of the prohibitive tariffs, the mere threat had the desired effect. In 1995, Chinese exports of citric acid to the United States fell substantially from 1994 levels. Among the Chinese concessions was the removal of the export subsidies that had kept Chinese export prices low. As a result, downward pressure on cartel prices was muted, if not prevented.

The European producers attempted to apply similar pressures on Chinese exporters. Acting as though it was some sort of official government unit, in January 1995 ECAMA officials traveled to China to meet with representatives of China's National Fermentation Association. Their purpose was to warn the citric acid producers to reduce their exports to Europe, otherwise they would initiate an anti-dumping investigation with the European Commission. This threat may have had some credence with the Chinese producers because ECAMA had its secretariat located in Brussels and was affiliated indirectly with the Agriculture Directorate of the European Commission. However, no such investigation was ever publicly announced by the EC.

The Cartel Is Unmasked

On the night of June 27th 1995, approximately 70 FBI agents served subpoenas and exercised search warrants on startled ADM officials, an action popularly known as a "raid."[21] Tiny Decatur, Illinois had never seen any-

[21] Many prosecutors find the term "raid" pejorative because of its connotation of an undisciplined, savage attack. They prefer the blander expression "serving subpoenas and exercising search warrants." The temptation to yield to the concise if colorful term is irresistible.

thing like it before. The subpoenas were issued by a federal grand jury in Chicago that had been secretly investigating allegations of global price fixing in lysine, citric acid, and corn sweeteners. The FBI interviews initially yielded no useful admissions of illegal activity, but the files at ADM's headquarters contained lots of incriminating evidence of price fixing. FBI raids were repeated at the headquarters of Cargill in Minneapolis, Haarmann & Reimer in New Jersey, and about ten other companies suspected of participating in one of the three alleged cartels.

Knowledge about the citric acid cartel came to the attention of antitrust officials at the U.S. Department of Justice indirectly as a result of its undercover investigation of the lysine cartel. Unbeknownst to Michael Andreas, Terrance Wilson, Barrie Cox, and other top officials at ADM, many of their private business discussions were being recorded on tape recorders provided by the FBI to its "mole." The FBI informant was Mark Whitacre, president of ADM's Biotechnology Division and rising star at ADM. Whitacre had been cooperating since November 1992. In addition to Whitacre's own audio tapes, his information allowed the FBI to set up video cameras in hotels where some of the conspiratorial meetings were held. This videotaped evidence is an historic first in the annals of antitrust investigations.

Whitacre attempted to obtain audio tapes about the citric acid cartel by visiting Barrie Cox's office and trying to engage Cox in discussions that might have revealed inculpatory information about the operations of the G-4. Cox rebuffed Whitacre, much to the latter's disappointment (Tr. 2736-2737). Cox testified that he disliked Whitacre. He considered Whitacre "unnecessarily curious" about ADM's citric acid affairs. Citric acid was one of the few fermentation products that were not part of the Biotechnology Division, so Whitacre had no management responsibility for the product.

The FBI became aware of the citric acid cartel because Wilson repeatedly talked about it when conspiring with ADM's lysine coconspirators. At several meetings of the lysine cartel, he urged the conspirators to form a trade association for amino-acid manufacturers that would operate just like ECAMA. For example, in June 1992 Wilson explained how the citric acid association used both formal and informal methods for tracking members' sales figures. These figures were used to allocate volume shares among the G-4 participants and confirm adherence to the share agreements. Wilson argued that the share agreements were one way that the cartel instilled cooperation and discipline among its members (Lassar and Griffin: 22-23). At later lysine meetings Wilson touted the advantage of ECAMA in providing a cover for illegal activities. He also urged the lysine producers to choose an accounting firm to independently

calculate members' sales volume so as to confirm the accuracy of monthly sales reports, just as ECAMA did.

The day after the June 27th raid, the *Wall Street Journal* and dozens of other major newspapers carried prominently placed articles on the investigation, targeted firms, and alleged illegal price fixing. Formal collusion by the G-4 had stopped a month earlier. There was an "unplanned" meeting of the G-4 in Switzerland in May 1995 in which the companies tried to put the cartel back on track, but that effort was unsuccessful.

Chapter 6: Economic Impacts of the Citric Acid Cartel

Market forces usually overwhelm any attempts by a firm to deviate from its assigned role in an industry. With a given plant in place, once a seller in a competitive market observes the market price and input costs, it passively sets its output level at the profit-maximizing point. If, as was the case in the global market for citric acid, food-grade product made by alternative sellers was viewed by buyers as perfect substitutes, sellers had few strategic options to try to improve their profitability. Efforts by a firm to distinguish itself on the basis of delivery terms or after-sales service can easily be imitated by rivals. Investing in a lower cost production technology might yield better profits for a few years but carries the danger of operating at inefficiently low levels of utilization or betting on the wrong technology. Price cuts can be quickly matched by other sellers and can lead to a price war that hurts everyone until it is abandoned. Price increases will simply lead to an erosion of a firm's market share and a build up in excess capacity that further squeezes margins.

While single-firm actions contrary to market forces are doomed to failure in most commodity markets, joint actions by a group of sellers large enough to dominate supply are another matter. For millennia, sellers have realized that collective action on prices or output levels can raise the profits of all suppliers in a market. The citric acid cartel met these criteria. It chose to raise selling prices simultaneously around the globe. With control of about two-thirds of the world's supply and a system for detecting and compensating for cheating by its members, the cartel clearly was efficacious in raising prices in North America, South America, and Europe. In this section, the effects of the cartel's collusive behavior on prices, international trade, profits, and consumer welfare in the U.S. market are detailed as precisely as possible.

Price Effects

When the G-4 began meeting in 1991, they made agreements to raise their list prices. In some industries, like retail grocery stores, the price listed on the item or shelf is the actual price a buyer will pay at check-out. However, in many other industries, like automobiles, most consumers regard the list price as simply the highest price a seller hopes to get for the product, whereas after searching for alternative offer prices most buyers will purchase an automobile at a negotiated discount. List prices for most industrial commodities like citric acid follow the automobile model of pricing.[1]

Citric acid prices are hard to find. Chemical-industry magazines occasionally published announcements of list prices of citric acid, particularly when fairly large increases were initiated and when all the major suppliers followed the movement in prices. Somewhat less frequently these magazines would summarize the transaction prices that buyers claimed to be paying (Connor 1998:55).[2] In December 1988, U.S. list prices of the most common type of citric acid were $0.81 per pound (i.e., full truckloads of acid delivered east of the Rockies at a 100% active-content strength). A year later, the list price had dropped to $0.75 per pound and kept falling to the summer and fall quarters of 1990 when it reached a low of $0.63 (see Figure 5.1). Press reports attributed this reduction in list prices by Pfizer and Haarmann & Reimer to the expectation that Cargill's new plant would pour vast quantities of citric acid onto the market. Throughout the latter half of 1990, Cargill fulfilled these expectations. Indeed, Cargill initiated the late 1990 price cuts as a way of quickly attracting new customers. A couple of trade magazine articles asserted that the largest buyers of citric acid were paying 6 to 10 cents per pound less than list price during this period. That is, by late 1990, U.S. manufacturers were selling citric acid to their most favored customers at $0.53 to $0.57 per pound. At those prices even Cargill's efficient operation was probably losing money.

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1 Technically, supermarket shelf prices are *posted* prices. A posted pricing system guarantees buyers can purchase all the supply available at the listed, nonnegotiable price. In the citric acid market, most sales were by contracts that were *private treaties*. The transaction price was privately negotiated with the list price simply the starting point of the negotiation. Actual prices varied according to the amount purchased and the bargaining abilities of the two parties (Marion *et al*. 1987).

2 Reports of prices paid by procurement managers must be treated with caution. Knowing that their remarks are likely to be printed, these managers would be tempted to understate their prices out of pride or in order to place pressure on sellers to lower their transaction prices. Alternately, procurement managers may inflate reported prices if they believe they received an extraordinary discount so as to hide the fact from other buyers who would be tempted to demand such discounts for themselves.

By early 1991 conditions had changed. Pfizer had retreated from the industry, only to be replaced by Cargill's old nemesis, ADM, which was busy learning the new business and upgrading its acquired plant. More importantly, Cargill's plant was approaching its optimal level of utilization, so attracting a lot more market share was no longer such a high priority.[3] Thus, Cargill successfully led a list-price increase in February 1991 and another in August 1991. After that the cartel took over arranging price increases. List prices spiraled upward from February 1991 to October 1993, rising on average every six months by 3 cents per pound. From late 1993 to late 1996, U.S. list prices remained stuck at $0.85 per pound. The cartel was responsible for all the price changes during 1992-1993, and it was responsible for keeping the list price at $0.85 for a couple of years beyond that. Reported transaction prices were not far below list at this time, despite what the trade press called "ample supplies."

Conditions in Europe were similar (EC 2002). Transaction prices fell from DM3.7 per kg. in 1985 to DM2.0 in 1990 – a tumble of 45%. With Cargill's entry, prices fell a further 45% in the first six months of 1991 to DM1.1 per kg. The G-4 boldly announced an increase in European list prices that was 12.5% above 1990 levels. After two more increases, list prices remained at DM2.8 from June 1992 to June 1995 – 40% above pre-cartel prices.

Although the citric acid cartel's crime was the agreement to fix *list* prices, the economic injuries inflicted on buyers must be assessed using *transaction* prices.[4] In a market like citric acid where there is no public price reporting, often only the sellers themselves know for sure what transaction prices really are. Fortunately, a quasi-public source of quarterly average transaction prices was obtained, and there are good reasons to believe that these prices closely track the proprietary price information known to the sellers. U.S. transaction prices for contract buyers of citric acid are shown in Figure 5.1.

The relationship between (delivered) list prices and (f.o.b.) transaction prices is just what would be expected. Contract prices are equal to or below list prices in every quarter from 1987 to 1997. When list prices fell during November 1989 to July 1990, contract prices fell below list prices within four months, and usually quicker. When list prices climbed

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3 In addition to press reports to this effect, the fact that Cargill increased its plant size by 45% in 1991 confirms that it was approaching full utilization in early 1991.

4 The courtroom testimony by Barrie Cox confirms that the list prices reported by the trade press were also ADM's list prices and that the G-4 was responsible for all but the first two increases (Tr. 2679-2685). Of course, the cartel knew that changes in transaction prices would follow their agreements to fix list prices. The agreements on volume shares and discount policies reinforced the tendency of transaction prices to follow the lead of list prices.

from their low in January 1991 to the $0.85 plateau beginning October 1993, contract prices duly responded in the same direction with a short time lag. During the peak period of the cartel's operation in 1994, contract transaction prices hovered just 5 to 7 cents below list, just as had been previously reported by the trade press. The DOJ indictment specifies June 1995 as the end of formal collusion. Although transaction prices slipped slightly in the first quarter of 1995 (to $0.76 or 9 cents below list), they recovered in the second quarter (to $0.79 per pound). However, after June 1995, transaction prices slid slowly downward through 1997 as the power of the cartel faded.

It seems unrebuttable that from some time in 1991 (probably the summer) to at least as late as June 1995, the G-4 had its way with U.S. citric acid prices. Given the large amount of international trade in citric acid, prices in Canada, Mexico, and Western Europe responded closely in sympathy with those in the United States. The G-4 set EU target prices at DM2.25/kg. in April 1991, a 12.5% increase from 1990 prices; from June 1992 to June 1995 list prices were 40% above the 1990 price (EC 2002). Bayer was the sole manufacturer of citric acid in Latin America, and U.S. exports supplied much of the continent's needs, so it seems highly likely that the cartel was able to effectively raise prices to Latin American buyers as well. The situation in Asian markets is murkier. Here, China was a strong, low cost, and growing source of supply for citric acid, and no Chinese producers were cooperating with the G-4. It is unlikely that buyers in Asia were much affected by the cartel-induced high prices in North America and Europe, save for a few food manufacturers concerned about the levels of impurities found in some citric acid made in Asia.

There is one more price effect that seems to confirm the cartel's grip on market prices during 1991-1995. Recall that there are two kinds of transaction prices, spot and contract. During periods of normal competition, sellers are under pressure to give price concessions to contract buyers because they have time to shop around and because they buy in larger quantities than spot purchasers. That is, competition causes a significant gap between spot and contract prices while collusion shrinks the gap. In citric acid, this is precisely the case. During every quarter of the preconspiracy period in 1990 and early 1991, spot buyers paid 4% more than contract buyers (Connor 1998:11). However, as soon as the cartel had begun exercising its collective power, the gap between the two prices practically disappeared. That is, contract buyers stopped getting discounts compared to spot buyers. Cartel discipline was such that searching for a lower price was a fruitless enterprise from late 1991 to early 1995. After the cartel stopped affecting prices, contract prices fell below spot once again.

The cartel lost control of prices in June 1995. The precise causes for the failure to cooperate are not known, but rising Chinese imports and

disagreements about volume allocations are good guesses.[5] U.S. contract prices briefly rose to $0.82 in November 1994; this was peak monthly cartel price. Basically, prices slowly declined each quarter starting in late 1994, reaching $0.70 by early 1997. How long the effects of the cartel's price increases lingered beyond the end of formal collusion is a matter of debate, but the effects seem to have diminished throughout 1995 and vanished by late 1996.

The G-4 accomplished what it set out to do. Instead of observing a highly dispersed pattern in citric acid prices as one expects in a competitive market, the monopoly power of the cartel raised prices above competitive levels and made price movements over time immune to the forces of demand and supply (Connor 2004c). List prices were held fixed in the U.S. and EU markets for an unprecedented 37 months, and contract prices hovered closely below list for much of that time. Instead of equally balanced contest of bargaining power over price, buyers were emasculated because the outcome was rigged.[6]

Effects on Production

When a monopolistic group is successful in raising selling prices, most buyers bite their lips and continue buying at the higher prices. Buyers who remain in the market at the elevated price levels simply transfer income they would have earned themselves to the sellers. Most continue to buy because the quantities used of citric acid are relatively fixed. While no published studies of the elasticity of demand can be found, it stands to reason that after price increase for a minor ingredient among many food inputs is likely to continue to be purchased by food processors, particularly as citric acid helps preserve foods. Because demand is highly inelastic, the effects of monopoly pricing on industry efficiency are very small compared to the income-transfer effects (Chapter 2). Analyses of monopoly pricing in the food industries show that effects of power over price are typically at least ten times bigger than the effects on allocative efficiency (Connor and Peterson 1996).

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5 Jungbunzlauer in particular must have chaffed at the restrictions placed on its sales by the cartel. The company, it will be recalled, had the most ambitious expansion in the G-4 in the early 1990s, and as a result was probably operating at the lowest utilization rate. Moreover, by 1993, its new vertically integrated plant in France was producing low cost feedstock for all of its European plants. Typically, the lowest cost member of a cartel if it has some excess capacity, will have the greatest incentive to cheat or leave a cartel

6 My apologies to modern professional women for apparently sexist terminology. However, I am not aware of a gender-neutral term with comparable emotive connotations.

Production was affected by the volume quotas allocated to each member of the G-4. The effective monthly monitoring of sales volumes by Mr. Huari of Hoffmann-La Roche, coupled with annual checking by independent Swiss auditors, left little room for cheating by the conspirators. In May 1991, each member of the G-4 agreed to accept an annual tonnage quota expressed by percentage of global sales volume by the cartel. Bayer/Haarmann & Reimer was awarded the largest share of 34%. The other three companies got 27.5% (ADM), 24% (Jungbunzlauer), and 14.5% (Hoffmann-La Roche) of total cartel sales.[7] Actual production by each member adhered very closely to the cartel's planned production (EC 2002, Tr. 2642-2645). Inefficiencies result with fixed quotas of this kind, because lower cost members of the cartel are unable to expand their shares over time at the expense of their less-efficient co-conspirators.

Using percentages of global sales volume as an allocative device was clever from the point of view of preserving cartel harmony. By assigning market shares on a global level, the cartel avoided the discord that would arise from having to negotiate national or regional shares. Any producer is likely to react negatively to an invasion of its traditional home markets by an outsider. Such actions by a fellow member of a cartel would be even more intolerable. However, the G-4 explicitly avoided assigning such territorial shares. Not only was needless friction avoided, but also the chance of detection by national antitrust authorities was reduced. With exclusive territories, buyers are more likely to complain about refusals to deal by suppliers that had reached their cartel-granted regional limits.

Finally, the pattern of capacity expansions suggests that the cartel's members decided to slow down their rates of investments during 1991-1995.[8] In the U.S. industry, both ADM and Bayer essentially froze in their capacities. Even Cargill's capacity investments were modest. In Europe, Jungbunzlauer implemented at most one expansion project among its three plants; Bayer may have slightly raised the capacity of one of its six plants; and Hoffmann-La Roche stood pat. To summarize, the four cartel members expanded capacity by about 20% from 1993-1997, whereas all other producers of citric acid in the world expanded by 67% (of which Chinese companies grew by 110%). As often happens to companies in monopolized industries, they grow fat on profits but lose their dynamism and agility. Moreover, unable to blockade entry, the high cartel-induced prices prompt hungry outsiders to do more than merely nibble from the crumbs that fall from the cartel's table.

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7 When Ferruzzi (now Eridania) joined the cartel, it was given a 5% share and the G-4 members' shares were reduced accordingly.

8 Allowing for the usual two-year lag between the start of capacity expansion and production, this shows up in annual capacities during 1993-1997.

Effects on International Trade

The pattern of trade among nations was notably altered by the cartel's operations. In the United States, just before the cartel was launched the drop in citric acid prices surrounding Cargill's entry in 1990 caused a long-term upward trend in imports to be reversed. At the same time, the vast expansion of capacity created production in excess of domestic needs and prices favorable to a marked jump in exports. However, during the heyday of the cartel, the brief export surplus turned to a huge export deficit for the United States. The deficit was much larger than would have occurred in the absence of the cartel. In addition, there is some evidence that the cartel divided export markets between the European and North American producers and extended their power by price discriminating among destinations for exports. The G-4's attempt to cow Chinese producers into voluntarily reducing exports to the West seems to have had only a temporary impact. The demise of the cartel in early 1995 led to a restoration of pre-cartel trends in overall imports and exports.

One reason for dwelling on trade patterns is because they are among the few truly transparent pieces of economic activity consistently available before, during, and after the conspiracy. Governments dutifully collect data on traded quantities and values of goods and publish these data even if only one company is responsible for all the imports into or exports out of the country. Sellers in concentrated industries usually follow trade trends carefully to alert them to changes in the locations of production, in pricing policies of rivals, or cheating on quota allocations.

Imports

Imports of bulk citric chemicals (citric acid, sodium citrate, potassium citrate, and other citric salts) rose throughout the 1980s (Figure 6.1). The two domestic producers continuously lost market share to imports, partly because Pfizer and Bayer's U.S. subsidiary were collusively raising domestic prices during the decade. By 1989, the last year that the U.S. industry was a duopoly, imports accounted for 22% of U.S. demand (Connor 2001: Table 4.A.1).

In 1988, for example, imports were arriving at U.S. ports from nine major countries. Imports were undercutting U.S. producers by selling at $0.30 per pound (Connor 2001: Table 4.A.2). However, 90% of imported citric acid was imported from five companies with plants located in eight countries. The Chinese challenge became a major problem when the G-4 successfully raised prices in North America and Europe. High U.S. prices were a bonanza for exporters to the United States. The volume of Chinese

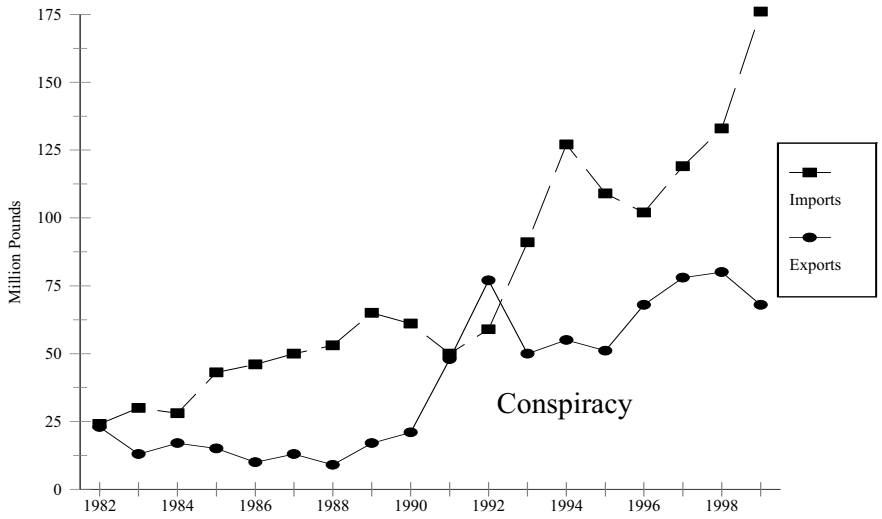

Figure 6.1 U.S. Imports and Exports of Citric Acid and Its Salts, 1982-1999

imports exploded, rising by 150% from 1988 to 1994. In 1994, Chinese imports were selling at prices 19 cents lower than imports from the cartel. The share of U.S. imports accounted for by cartel members' plants shrank to less than 45% in 1994 from over 70% in 1988.

As recounted earlier in this chapter, one of the cartel's U.S. members lobbied the office of the U.S. Trade Representative, which announced proposed prohibitive tariffs on Chinese imports of citric acid. Last minute concessions by the Chinese government prevented final implementation of this punishment, among which was cancellation of export subsidies for its citric acid makers. The mere threat of tariffs may have been enough because Chinese imports fell substantially from 1994 to 1996.

Exports

The effects of the cartel on U.S. exports of citric acid and salts were even more profound than its impact on imports. The last "normal" year for the U.S. industry seems to be 1990, the first year of operation for Cargill's new plant and the last year before collusion began. In 1992, the United States enjoyed its first export surplus in citric acid and salts (Figure 6.1). However, this renaissance of American international competitiveness was

cut short by the G-4's success in raising prices. U.S. exports during 1992-1995 dropped back to the same quantity as the base year 1990.

As soon as the cartel ceased to operate, U.S. exports once again took off. Export volume during 1996-1998 was *six times* higher than the volume during 1993-1995. Thus, through its indisputable impact on U.S. prices, the citric acid conspiracy restrained the volume of exports and artificially stimulated imports. Without the cartel its seems that during the years 1992-1995 the U.S. balance of trade was adversely affected to the tune of about $200 million (Connor 1998:24). This was a significant additional burden on the chronic U.S. merchandise trade deficit.

Additionally, U.S. exports may have been distorted. The geographic pattern of trade is consistent with the idea that U.S. producers reduced exports to areas historically supplied by Bayer and Jungbunzlauer from their European plant locations. In 1990, at least 21% of the U.S. exported volume of citric acid destined to Western Europe. However, during the three high years of the cartel, only 1% of U.S. exports ended up in Western Europe; moreover, the small amounts of citric acid that did dribble into Germany, France, and the Netherlands were priced way above the average export price, as though U.S. companies were imposing some kind of private export tariff. As soon as the cartel died, exports to Western Europe resumed forcefully.[9]

The Customer Overcharge

The principal measure of economic harm caused by an effective price-fixing conspiracy is the consumer (or customer) overcharge. This is a monetary measure of the extra costs incurred by buyers as a direct result of the actions of the conspiratorial group. The overcharge is conceptually identical to the extra profits generated for all sellers in the affected market, save for any extra costs incurred by sellers in operating the cartel. It is doubtful that the managerial costs of operating the cartel amounted to more than a couple of million dollars. Note that the overcharge essentially equals the additional profits of *all cooperating suppliers in the market*, not just those that were in the cartel.[10] As mentioned in Chapter 3 calculating

9 African exports also fit the pattern of export-forbearance behavior. In 1990, Africa was destination of 7.5% of U.S. citric acid exports. During the conspiracy years, they dropped to less than one-tenth of 1% of the total exported, but after 1995, African exports bounced back to measurable levels.

10 Under U.S. antitrust law in some U.S. court districts, guilty conspirators are legally liable for their own ill-gotten gains as well as the monopoly profits of non-conspirators who merely followed the cartel's lead by raising prices independently of any agreement. In the case of the U.S. citric acid market the monopoly profits of Cargill are part of the injury caused to buyers, even if it was not part of the conspiracy.

the size of monopoly overcharges requires accurate information on the volume sold in the relevant market, the length of the conspiracy-effects period, actual selling prices, and the price that would have reigned "but-for" the actions of the conspirators. These data are subject to estimation errors.

Data on the size of the U.S. citric acid market are consistent. The last survey of the U.S. International Trade Commission on the organic chemical industry reported that total 1994 sales of the three domestic manufacturers were 312 million pounds that generated f.o.b. manufacturers' revenues of $251 million (USITC 1996). Adjusting for international trade, these data imply a U.S. buyers' purchase value of $304 million total. Alternative 1994 consumption estimates report 390 million pounds (EC 2002). At average transaction prices in 1994, U.S. buyers paid $310 million for citric acid and its salts.

For the seven months prior to the cartel's formation, the contract prices for citric acid ranged from $0.60 to $0.62/pound. Cargill's new plant was already operating nearly at full capacity, so the period January-June 1991 seems like a reasonable one to choose to find a pre-cartel equilibrium price. The post-cartel period prices suggest that the but-for price could have been as high as $0.68/lb. At $0.68, the overcharges would be a bit over half of the estimates made using $0.60. Under an array of full economic cost assumptions, the citric overcharge estimates vary from $161 to $309 million, or 12% to 26% of purchase value (Table 6.1).

The dates of the conspiracy are also important in determining the extent of overcharges imposed on buyers of citric products. In ADM's negotiated plea agreement, the period is vaguely identified as commencing "at least as early as January 1993" and ending June 1995 or a minimum of 2.5 years.[11] However, in DOJ indictments later (1997) filed against ADM's three Swiss co-conspirators, the beginning date for the conspiracy is given to be July 1991. Moreover, the EC concluded that collusion by the G-4 began in March 1991 and continued to May 1995. All in all, factoring in lags, the longer period July 1991 to December 1995 seems more reasonable.

[11] This claim allowed ADM *et al*. to assert that the pre-conspiracy price in December 1992 (hence, arguably the but-for price) was $0.79 per pound. With transaction prices averaging around $0.82 per pound and volume sold out of about 1.3 billion pounds, the ADM overcharge would be only $39 million – which is exactly what ADM offered to pay civil plaintiffs in September 1996! Because civil procedures do not allow plaintiffs access to DOJ files and the plea agreement is considered unimpeachable evidence in a civil trial for damages, the members of the federal class action suit (accounting for two-thirds of purchases) had little choice but to accept the settlement offered by ATM *et al*.

Table 6.1 Estimates of Citric Acid Overcharges in the U.S. Market.

Alternative Conspiracy Periods	"But-For Price" (Competitive Price Assumption)			Implicit Overcharge from DOJ's Criminal Fines [a]
	$0.60	$0.64	$0.68	
	Million dollars [b]			
Short (1/93-6/95)	205	160	116	180-250
Long (7/91-12/95)	309	233	161	180-250
	Percent of Sales			
Short	26	21	15	23-32
Long	23	17	12	13-18

Source: Connor (2001: Table 4.A.2)
[a] Based on fines paid by the most uncooperative cartel members, Hoffmann-La Roche and Jungbunzlauer. The DOJ probably used the short cartel period.
[b] Range is due to uncertainty about the effective cartel period assumed by the DOJ and the existence of discounts on criminal fines awarded to "cooperating" members of the cartel.

The likely U.S. overcharge then is from $161 to $309 million. The criminal fines paid by the conspirators result in similar magnitudes. In sum, the citric acid cartel imposed a monopoly tax on buyers that caused prices to rise from 12 to 23% of sales.

Conclusions

The story of the legal battles that erupted when the citric acid cartel was unmasked is the subject of Chapters 13, 14 and 16. However, the economic side of the story told in this chapter provides a number of important lessons.

First, the citric acid cartel was able to be formed and to operate undetected for three or four years because its members were leading firms in highly concentrated homogeneous-product oligopolies with substantial entry barriers into the relevant markets. Despite the failure of the citric acid cartel to secure the *direct* participation of the newest U.S. manufacturer, Cargill's indirect cooperation contributed to the cartel's ability to sustain monopolistic U.S. prices. Overcharges imposed on U.S. buyers of citric acid were at least $116 million but could have reached as high as $309 million. Market structure matters.

Second, the effectiveness of the cartel came about in spite of significant differences in geographic location and business cultures. Bayer's U.S. subsidiary doubtless smoothed such differences when forming the citric acid cartel. Geographic and cultural propinquity may well facilitate joint profit maximization, but it should not be regarded as a necessary condition.

Third, in the late 1990s there were ample signs that the world citric acid industry was becoming less concentrated. While the producers that had been members of the conspiracy continue to announce expansion of capacity in their home markets in North America and Western Europe, the rate of expansion is higher elsewhere (Connor 1999a). The greatest rates of growth in production of citric acid are now being observed in the larger, newly industrializing countries: Brazil, India, Indonesia, Thailand, and above all China. In a few cases these new plants are being constructed with leading Western firms as partners. However, in the majority of cases the investors are new players. Thus, both the location of production and the ownership of capacity are slowly becoming more dispersed. The formation of naked cartels in the global citric acid industry is becoming correspondingly less likely.

Chapter 7: The World Lysine Industry[1]

The modern lysine industry developed as a result of basic scientific discoveries in biochemistry in the late 1950s. The now dominant method of industrial production of lysine is based on fermentation of liquid sweeteners derived from sugar cane or starches of many kinds. Since being commercially introduced around 1960, manufacturers of mixed animal feeds have grown to view lysine as an essential ingredient. In the last four decades of the 20th century, lysine grew and developed into a major biochemical product market, attracting more and more biotech companies from Asia, North America, and Europe to the industry. The purpose of this chapter is to sketch the uses, methods of production, market size, and structure of supply of the global lysine market.

The Product and Its Uses

Lysine is an amino acid, an organic chemical essential for the growth of muscle tissue in humans and animals. There are about 20 amino acids manufactured in commercial quantities worldwide. Lysine is one of three amino acids that dominate sales of these types of organic chemicals.[2]

Most animals produce some lysine *in vivo,* but to sustain optimal growth supplies of lysine must be obtained from ingested foods or feeds. Grains and grasses are low in lysine content. Humans and pets usually obtain sufficient amounts of lysine from consuming marine or animal products, but certain vegetables, soybeans in particular, are also good sources of amino acids. During famines when the consumption of seafood, poultry, or meat declines, symptoms of amino-acid deficiency can be observed.

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1 Most of the facts mentioned in this chapter are from sources cited in (Connor 2000); its Appendix A is an extensive chronology of events in the lysine industry. A later study focusing on the lysine overcharge can be found in *The Review of Industrial Organization* (Connor 2000a). The development of the industry is discussed in (Connor 1999b).

2 The other two are monosodium glutamate (MSG), a food flavoring, and methionine, another essential amino acid bought mainly by feed manufacturers.

The principal use of food-grade lysine in high-income countries today is by body-builders aiming to increase muscle mass.

More than 90% of the volume of lysine manufactured in the 1990s was purchased by producers of mixed animal feed. Lysine is one of the major ingredients included in the concentrates that are added to rough grains and oilseed meals to make balanced feeds for farm animals.[3] The amino acids in balanced feeds help to stimulate the rate of growth and lean muscle development of poultry, swine, fish, and other monogastric animals.[4] Animal breeders have been developing varieties of swine and poultry that can absorb higher levels of lysine, which allows for shorter growing cycles and brings to market animals with lower fat and higher proportions of muscle tissue. Consumer desires for low-fat meats and farm-raised seafood in high-income countries, coupled with the increased demand for high-protein foods generally in middle-income countries, is ultimately responsible for the rapid growth in demand for lysine and other feed additives.

Feed-grade lysine, the focus of this chapter, is sold in two forms. The original and still dominant product form is a brownish powder sold in bags. For swine, this dry form of lysine is mixed at a rate of about 12 to 24 pounds per short ton. Dry lysine is storable for at least several months and, because it is so concentrated, is nearly the only type seen in long distance shipments such as international trade. A second type of lysine that was sold in small quantities in the mid 1990s is liquid lysine. This type of lysine was actually an intermediate product of lysine manufacturing that was cheaper to make (on a 100-percent-active basis) because it avoided the extra costs of drying and bagging.[5] However, customers needed special equipment to store and spray the liquid lysine on the animal feed, and the high water content made shipping costs prohibitive for customers more than a couple of hundred miles removed from a lysine factory. Although the liquid form of lysine was growing faster than dry lysine, in 1994 aqueous lysine accounted for less than 2.5% of global lysine production volume.

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[3] Concentrates consist of vitamins, minerals, salts, trace metals, flavorings, and amino acids tailored to the age, sex, and species of fish or animals being raised. For example, a mature pig of about 100 kg. requires about 0.6% lysine in its ration for ideal growth and development, whereas a piglet of 10 to 20 kg. needs feed that is 1.0 to 1.2% lysine by weight.

[4] Multi-gastric animals such as cattle have digestive systems that destroy lysine in feed before it can be absorbed. However, lysine makers have recently developed coated pellets that survive and pass through the rumen (the first stomach of ruminants), thus allowing lysine to have a positive nutritional effect.

[5] One experienced Japanese manager testified that only Ajinomoto and ADM sold liquid lysine in 1994 (Tr. 4212-4216). Because of the special holding tanks and spraying equipment required, only 3 or 4 customers were large enough and close enough to the points of manufacture to benefit from lower prices of liquid lysine.

The distinction between dry and liquid feed-grade lysine became an issue during the prosecution of the cartel.[6]

Lysine is an organic chemical with a unique molecular structure. Nevertheless, manufactured lysine does have some practically perfect substitutes as additives in animal feeds. Two commonly used high-protein enrichments to feed grains are fish meal and oilseed meals. Both meals are naturally high in lysine. Fish meal is a popular feed additive in Japan and northern Europe. However, because animal and fish products can cause human health problems and indirectly degrade surface water and groundwater supplies, farm producers have been moderating their use of such proteins. In North America soybean cake, a by-product of vegetable-oil processing, is the principal high-protein feed additive. As a general rule, 97 pounds of corn mixed with 3 pounds of manufactured lysine is nutritionally equivalent to 100 pounds of soybean meal as a lysine supplement. So, from the point of view of a swine or poultry producer, if the price of soymeal dips low enough (or if the price of the complementary feed grain rises high enough), the producer will cease buying lysine and switch to soymeal, fishmeal, or another high protein substitute. Thus, grain and oilseed prices at times placed a ceiling on how high lysine prices could go.

Technology of Production

Before 1960, lysine was extracted from vegetable proteins by means of chemical hydrolysis. This process yielded natural lysine that organic chemical companies sold for $3 to $5 per pound. This is still the method employed to make most pharmaceutical-grade lysine, but the selling price makes such lysine too costly to be used by feed manufacturers on a regular basis.

In 1956, a Japanese biochemist (Professor Yoshio Okada of Osaka University) discovered that the metabolic processes of certain strains of bacteria produced an amino acid (glutamic acid). Within four years, the Japanese food and drug manufacturer Kyowa Hakko were selling commercial quantities of monosodium glutamate (MSG) using this new fermentation process. Kyowa Hakko's technology used sucrose in the form of inexpensive molasses as the feedstock to produce glutamic acid (one of the amino acids) which was then converted into the salt sodium glutamate. By

6 In the Chicago criminal trial, defense counsel used the testimony of ADM's comptroller to try to show confusion about the alleged cheating on the cartel's volume agreement by ADM (Tr. 4883-4893). The agreement solely concerned dry lysine.

1958, Kyowa Hakko had developed another commercially viable technology to make lysine from fermentation (Connor 2000: Appendix E).

Working on a parallel scientific track, the larger Japanese food processing company Ajinomoto also exploited the newly discovered fermentation technologies. Ajinomoto had become the world's first manufacturer of MSG soon after the compound was discovered by a scientist at the University of Tokyo in 1908. Between the two world wars, Ajinomoto consolidated its near monopoly on MSG by setting up a vast network of international sales offices. By the late 1950s, Ajinomoto was manufacturing both MSG and pharmaceutical-grade lysine with a process that used dextrose as the feedstock for bacterial fermentation. Because the new technology yielded amino acids at considerably lower costs than the traditional chemical-extraction method, sales of lysine for animal feeds became economical. By 1960, Ajinomoto had begun selling feed-grade lysine in the domestic market. Exports of feed-grade lysine from Japan began before 1970.

Both Kyowa Hakko and Ajinomoto have continued to be leaders in basic and applied research in fermentation processes, genetic engineering, and other biotechnologies that have led to improved methods of manufacturing amino acids, most of which are consumed by the feeds industry. Both companies benefited from substantial research and development (R&D) subsidies for biotech companies organized by Japan's Ministry of International Trade and Industry in the early 1980s. They both own patents on the most efficient microbial strains, and many of the exact details of the lysine production process continue to be protected by company secrecy. For example, the contents of the sweet soup that is fed to the microorganisms may have 20 or more components. Moreover, several of the best genetically modified microbial strains are now zealously protected by patents.

History of the Industry

Lysine is one of many products of the industry known internationally as the starch industry. Starch is extracted from cereals, tubers, and roots by mechanical, chemical, and biological processes that separate these raw materials' fibers from their proteins (Sansivini and Verzoni 1998). The major types of products of the starch industry included unmodified starches (potato starch, corn starch, tapioca, etc.), sweeteners (fructose, glucose, dextrose, etc.), proteins (corn gluten), vegetable oils, and modified starches. Vitamins and amino acids are the principal examples of modified starches, though they can also be made from other carbohydrates such as sucrose (cane or beet sugar), manioc, or potatoes. The world starch industry

produced approximately 33 million metric tonnes of starch products in 1992.[7] The manufacturing-level value of global production was roughly $14 billion, of which half originated in the United States.

The U.S. starch industry is so highly dependant on maize as its raw material that it is called the corn-wet-milling or corn-refining industry. The U.S. corn-wet-milling industry began as early as the 1840s using chemical separation methods (Connor and Scheik 1997). In addition to corn starch and corn oil, early products dextrose and glucose syrup. Around 1967, the industry entered a period of explosive growth that would last almost two decades. The principal cause of the high growth in corn wet milling from 1968 to about 1986 was the introduction of one new product: high fructose corn syrup (HFCS). The value of shipments of corn sweeteners increased ten-fold from 1967 to 1987 (*ibid.* 487). The volume growth of HFCS was about 10% per year, much of it due to substitution of fructose for sucrose, a process that came to a sudden halt about 1986 or 1987.[8] After 1987, volume growth of HFCS slowed to about 3% annually.

The Lysine Industry Up to 1990

Ajinomoto and Kyowa Hakko both began manufacturing lysine in Japan around 1960 (Connor 1999b:8-11). Ajinomoto's plant in Saga Prefecture near the city of Fukuoka used dextrose as its principal intermediate material; Kyowa's plant in Hofu near the western tip of Honshu Island utilized molasses.

Increased global demand for lysine soon outstripped the capacity of the two pioneering plants in Japan, so both companies invested abroad in the decade of the 1970s. First, Ajinomoto established a joint venture in France named Eurolysine in 1974. Ostensibly a 50-50 joint venture between Ajinomoto and Orsan, Eurolysine's plant near Amiens came on stream a few years later.[9] Eurolysine's plant utilized sugar beets as its primary raw material. This plant was expanded at least four times in the 1980s, making it the largest lysine plant in the world from 1980 to 1990. Second, Kyowa Hakko set up a lysine joint venture in Mexico in the late 1970s with Mexican government participation called Fermentaciones

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[7] By convention, the word "tonne" will represent the metric ton of 2205 pounds and "ton" a weight of 2000 pounds.

[8] In 1985 and 1986, the largest buyers of HFCS permitted their bottlers to substitute 100% fructose for sugar.

[9] Orsan is short for Les Produits Organiques du Santerre, SA. Orsan was mostly owned by the Lafarge group, a French conglomerate with cement as its primary product. Because Ajinomoto owned a majority share in Orsan, Ajinomoto in effect had a controlling interest in Eurolysine from the beginning.

Mexicanos (or Fermex). Fermex began production at this Veracruz-area plant on a very small scale in 1980. Two expansions in the 1980s brought the plant up to medium size by 1990.

Thus, until 1980 the world lysine industry was a duopoly consisting of two Japanese firms, each with two plants.[10] Both companies were recognized as leaders in Japan's highly advanced biotechnology industry, indeed both subsequently claimed to have first commercialized the production of lysine via fermentation of sugars. Both were food and beverage manufacturers with sidelines in pharmaceuticals and amino acids. Ajinomoto was larger in terms of sales and employment and was also about twice the size of Kyowa in terms of global lysine market share.

The duopoly became a triopoly in 1980 with the entry of the Miwon Group of South Korea. Miwon (later renamed Sewon) was an industrial-financial conglomerate of several operating companies with minority interests in each other but under the ultimate control of one family, the Lims (Connor 2000:Appendix E). These are called *chaebols.* Miwon ranked only somewhere between 25th and 30th largest among the country's *chaebols.* The conglomerate was somewhat specialized in consumer processed foods and agri-products processing. In the late 1970s, Sewon believed itself to be the third largest Asian manufacturer of animal feeds, starch, and related products. The two largest were Japanese firms.

Sewon built a moderate-size lysine plant in Busan, South Korea in the late 1970s which came on stream in early 1980. The type and source of Sewon's technology of production is unknown. It is apparent from its subsequent behavior that Sewon was implementing a marketing strategy fairly common among South Korean manufacturers. Sewon aimed at steadily increasing its global market share by exporting from a single plant in Korea that would be relentlessly expanded through massive borrowing. By 1990, Sewon's plant had been significantly expanded on three occasions to six times its original capacity, and all but a tiny portion of its production was being exported.

The estimated size of lysine plant capacity is shown for the years 1980 to 1990 in Figure 7.1. Size is measured by the announced annual designed finishing capacity for each plant. Nameplate capacity typically overstates the economically most efficient rate of production by 10 to 20%. However, in the long run a company's share of capacity closely tracks its share of production and sales.

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10 This statement requires a slight but inconsequential amendment. Toray Industries built a small Japanese plant that was expanded to 18 million pounds in 1982. It seems quite likely that Toray had withdrawn from lysine production by the early 1990s, if not earlier.

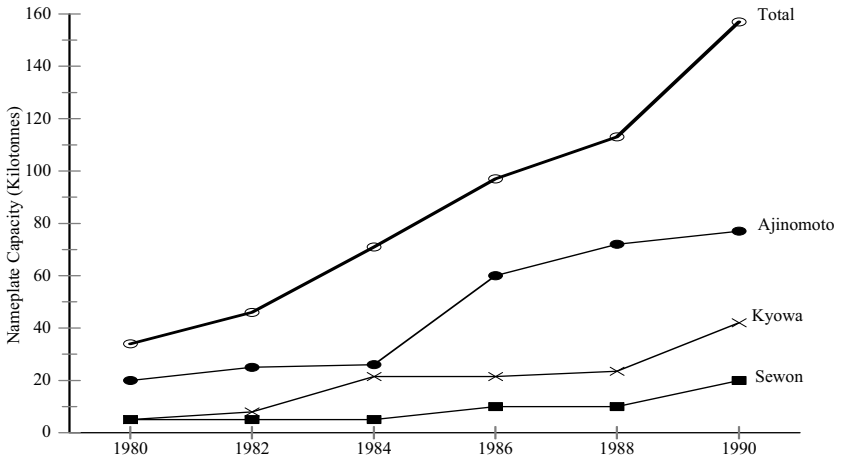

Figure 7.1 The Evolution of Global Lysine Production Capacity, 1980-1990.

Source: (Connor 2001b:Tables 7.A.1 and 7.A.2)

In 1980, Ajinomoto's two production units gave it about 60% of the global production potential. Large capital expenditures for expansions of its Japanese and French plants as well as new plants in Thailand and the United States, allowed Ajinomoto to hold on to its dominant global position throughout the 1980s. Kyowa built the first plants in North America, beginning with a small plant in Mexico that opened in 1980. Kyowa's U.S. plant was located in Missouri on the Mississippi River. Run by Kyowa's U.S. subsidiary Biokyowa, it came on stream in 1984. Ajinomoto's similarly sized plant in Iowa began production two years later; this plant used dextrose piped to it from an adjacent corn refinery operated by Cargill. Ajinomoto's global capacity increased rapidly, yet the other producers were building so quickly that Ajinomoto's share peaked in the late 1980s, slipping to just below 50% by 1990. Kyowa Hakko's rose from 15 to 27% in the 1980s. Finally, Sewon's expansions in South Korea raised its global share from 15% in 1980 to 19% by 1990.

Early Price-Fixing Episodes

The 1980s were a heady period for the lysine industry: lysine demand grew on an average annual clip of 16%. By anyone's standards, that's a roaring market. With lysine producers scrambling in the 1980s to respond to the strong pressures of robust demand, one might think that market forces would have generated pleasingly high profits. However, more was possible through collective action.

The structure of the industry favored price fixing in the 1980s. The only three sellers in the world were located fairly close to one another. The small number of plant locations (five plants in four countries in 1980, up to eight plants in 1990) made monitoring of production and exports by each firm feasible. Ajinomoto and Kyowa had very similar business cultures; Miwon Group, like most South Korean conglomerates, demonstrated its abiding respect for Japanese business methods by copying many of them. Lysine is a homogeneous product, an organic chemical with a unique molecular structure and biological function. Until the late 1980s, the threat of entry by new producers seemed unlikely to be realized, partly because of technical barriers reinforced by the Japanese companies' R&D prowess. Antitrust enforcement in Japan is weak, while the newly formed Korean antitrust agency was too new to be effective.

The three Asian manufacturers of lysine participated in at least three price-fixing schemes before 1991. These conspiracies affected the Japanese, European and U.S. markets.[11] The first admitted price-fixing episode began in Europe in 1975 and continued until at least 1992. Eurolysine was established in 1974 and acted as the sales agent for Ajinomoto's Japanese-made lysine. In order to set European lysine prices at its desired level, Eurolysine entered into an agreement with Miwon to limit exports to Europe from South Korea. An excerpt from a memorandum of a 1992 meeting summarized a Miwon manager's response to an accusation by Ajinomoto that Miwon had not been "sufficiently loyal:"

> "When your company, Eurolysine, started the lysine production, that is, from 1975 until the present time, we have cooperated by restricting/inhibiting [our exports] to 5 to 10% level . . . of the European demand. Such cooperation that has been extended between the two companies

[11] These conspiracies were revealed in unrebutted courtroom testimony of two Ajinomoto top managers (Kanji Mimoto, Tr. 908-909, and Hirozaku Ikeda, Tr. 1670-1894), the former CEO of Eurolysine (Alain Crouy, Tr. 2198-2522), and Kyowa Hakko senior manager Masaru Yamamoto (Tr. 4259-4341). A memorandum written by a Miwon manager (in English) to his counterpart at Ajinomoto in November 1992 contains explicit reference to 17 years of export restraints by Miwon to Europe (Tr. 5915-5916).

> for at least 17 years is, I think, a true cooperation." (Tr. 5915-5916).

Although not specifically mentioned, for the European conspiracy to be successful, Kyowa's exports from Japan or Mexico would also have had to be restrained. The companies limited the volume of European imports and local production. With its dominant European market share, the practice at Eurolysine in the 1980s was to raise lysine prices as high as the price of substitutes for lysine would permit.

The second price-fixing conspiracy covered the Japanese market for lysine. One Ajinomoto manager admitted to occasional price fixing when he worked in Tokyo during 1970-1975. Possibly a continuation of the earlier conspiracy, three top managers of Ajinomoto and Kyowa Hakko provided detailed and consistent testimony concerning a more recent period 1986-1990. The conspiracy was preceded by a price war in 1984 that brought Japanese lysine prices down to an historic low of $0.70 per pound (Tr. 4341). However, when Ajinomoto and Kyowa got over their spat in late 1985, they fixed Japanese lysine prices between themselves every month for at least four years (1986-1990). Sewon also joined the conspiracy. This scheme did not involve negotiations over market shares.

Finally, the two Japanese firms admitted to price fixing and to agreeing on territorial market areas in the United States in the late 1980s, a period during which each operated one U.S. lysine plant. Precise dates on the U.S. conspiracy are not given, but the years 1986-1990 seem to be the most likely ones. Ajinomoto was allocated 55% of United States' lysine sales while Kyowa was allocated the remaining 45%. In addition, Ajinomoto agreed not to export to Mexico (where Kyowa operated a plant) in return for Kyowa's refraining to export to Thailand (where Ajinomoto had a similar plant). U.S. delivered prices of feed-grade lysine during the conspiracy were above $1.40 per pound, peaking at $3.23 per pound in late 1988.

New Entry

Two large European chemical manufacturers attempted to enter the lysine industry before 1990, but neither was successful. In 1975, chemical-industry magazines carried the announcement that France's largest chemical company, Rhône-Poulenc, was going to build a lysine factory in Lyon, France. Kyowa Hakko was to be a minority partner. This plant was to have begun production in 1978, but for reasons that are not clear this plant was never built. It is likely that Ajinomoto's plans for Eurolysine were well enough advanced that the Rhône-Kyowa joint venture was pre-empted.

The second firm to express an interest in manufacturing lysine was the German metals and chemicals company Degussa. Sometime around 1986-1988, Degussa developed a plan to build a lysine plant in the United States.[12] Degussa had significant expertise in manufacturing some other amino acids and had a good R&D base to exploit. Degussa approached ADM to get a bid on a long-term supply contract for dextrose, the intended feedstock for Degussa's new venture. This turned out to be a big mistake for Degussa, because its request simply alerted ADM to an opportunity for itself. ADM decided to take a look at the lysine market itself, liked the high prices and rapid growth it saw, and launched its own feasibility study.[13]

ADM made a firm commitment to enter lysine manufacturing in July 1989. Besides Degussa's expression of interest, ADM had figured out why Japan was importing such large amounts of dextrose. It was the feedstock being purchased by Ajinomoto to make lysine, some of which was then exported from Japan back to the United States (Whitacre 1995). It appeared that selling lysine in the United States was profitable even with considerable long distance freight costs. This fact helped convince ADM's management of a U.S. plant's economic feasibility.

Technical feasibility was another test that had to be satisfied. In April 1988, ADM hired a new research scientist to find an efficient commercial process to make lysine from corn sweeteners.[14] He recommended that ADM purchase the rights to use a patented bacterial strain developed by the Genencor biotechnology division of Eastman Kodak Company. ADM did buy that technology in July 1989, and from August 1989 to November 1990 its R&D laboratory in Clinton, Iowa made lysine on a pilot scale. ADM committed $150 million to build the world's largest lysine manufacturing plant in its home base at Decatur, Illinois. This plant was to become by far the largest in the world with an annual capacity of 250 million pounds, almost three times the size of the largest plant then in existence.

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12 Mark Whitacre was a new employee of Degussa in those years. In fact, he was Degussa's chief negotiator with ADM, which proposed a U.S. joint venture in lysine to Degussa in late 1988. Degussa declined the offer.

13 ADM may have been thinking about lysine as a possible expansion area as early as the early 1980s when one of its scientists performed a literature search on lysine R&D. Notes of a conspiracy meeting in June 1992 made by an Ajinomoto participant quote Wilson saying that Rhône-Poulenc and Degussa were prevented from entering lysine production by ADM's swift announcement of its intention to build huge capacity (Tr. 2333-2348).

14 Much of this information is drawn from a decision in U.S. Patent Court by Judge Sue Robinson (1998). Kodak sold a strain that yielded 37 grams of lysine per liter of dextrose under laboratory conditions. However, Ajinomoto's patented strains of bacteria yielded up to 41 grams (Robinson 1998:4). As dextrose accounted for one-third of ADM's total manufacturing costs (Tr. Ex. 64), Ajinomoto's superior yield translates into about 4% cost advantage. Later ADM's president tried to steal Ajinomoto's superior technology.

Contrary to its usual secretiveness, ADM made sure its new bold investment was well publicized, all the better to discourage any would-be interlopers.

In November 1989, ADM hired a brilliant new manager to run its Bioproducts Division. Mark Whitacre was only 30 years old and just a few years beyond finishing his Ph.D. in nutritional biochemistry at Cornell University. He worked a few years with Degussa, the very firm that had been blocked from entering the U.S. lysine industry by ADM's quick announcement about its own lysine plant.[15] Over the next four years, Whitacre would hire several of his former Degussa colleagues to work for him at ADM. Working closely with ADM President James Randall, Whitacre oversaw the construction of the new lysine plant in record time. Previously, smaller lysine facilities had taken ADM's rivals up to four years to complete, but ADM's lysine plant from groundbreaking to production start-up in February 1991 took only 17 months. Randall had a well known tendency to build ADM's plants with copious capacity, partly to scare off potential rivals and partly to exploit the lower costs often accompanying large scales of production. A lot was riding on the success of the lysine venture for ADM because lysine was to be the first of several new products that ADM planned on making with corn fermentation technology.[16]

Almost simultaneously with ADM, a small lysine plant came into production on the island of Java, Indonesia. The plant was owned by a joint venture formally named Cheil Samsung Astra (CSA). CSA was established in mid-1989 to build a combined MSG and lysine plant. Although the joint venture had the obligatory local ownership of friends of then President Suharto (Astra Group), the great majority of CSA's stock was controlled by Cheil Food and Chemicals Co. of South Korea. Cheil (a/k/a Cheil Jedang) was then part of the huge Samsung Group, South Korea's second largest *chaebol* in the late 1980s. However, Cheil split off to form its own *chaebol* in 1993. Although Cheil has some expertise in starch and chemical manufacturing, the source of its lysine technology is unknown.

Cheil would remain the smallest of the five companies, but would relentlessly expand production throughout the 1990s no less than five times. Like its compatriot Sewon, Cheil would aggressively seek increases in its global market share. Unlike Sewon, it had little experience

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15 In fact, in 1988-1989, Whitacre was Degussa's vice president in charge of negotiating a joint venture with ADM. Shortly after, negotiations failed, Whitacre was hired by ADM. in early the 1990s (Eichenwald 2000).

16 By the mid 1990s, ADM was manufacturing several more organic chemicals based on dextrose: methionine, threonine, tryptophan, lactic acid, citric acid, bacitracin, sodium gluconate, monosodium glutamate, xanthan gum, and vitamins D, E, and biotin.

in cooperating with the world's leading producers. In the end Cheil would become a thorn in the side of the cartel.

Market Size and Growth

The lysine industry had no formal producers' association to collect and publish aggregate sales or consumption data. Few governmental organizations published international trade or production data on lysine or even amino acids as a group. Chemical-industry magazines provided only spotty, unattributable, and often inconsistent estimates of national or global market indicators. Lysine manufacturers tended to be secretive in order to protect their technological leads. Thus, when the conspirators first began to meet in 1992, they held many inconsistent notions of the size of the market and, hence, their own market shares. Different beliefs about market size and company shares hindered the formation of the cartel and contributed to distrust among the conspirators until late 1993.

Global demand for lysine in 1980 was 31 million pounds (Figure 7.2). During the decade of the 1980s the volume of purchased lysine grew at an annual average of 17%, reaching 145 million pounds by 1990. Growth in demand was mostly smooth from year to year except when brief price wars broke out. However, when lysine buyers knew that major plant expansions would be coming on line, in anticipation of lower selling prices they would often hold off on making purchases for six months or more and consume previously purchased inventories instead. The temporary suspension of purchases typically caused regional prices to drop some 6 to 12 months before new capacity came on stream, only to rise again a year or so later as the new plant capacity became more fully utilized. Sellers with excess capacity exacerbated these cycles by offering low prices temporarily in order to bring their plant utilization levels up to more efficient levels of production. Three of these temporary price breaks can be discerned from reports in the trade press in the decade of the 1980s: first, when Biokyowa's new Missouri plant came on stream in early 1994, second, when Ajinomoto's new Iowa plant began production in 1986, and third in 1990 when ADM's plant was being built.

North American consumption accounted for almost 40% of global consumption in the early 1980s, but drifted down to about one-third by the end of the decade (Figure 7.2). Western Europe accounted for about one-fourth of global sales volume in the late 1980s. Both areas contained highly industrialized poultry and pork subsectors, large-scale farm producers who could appreciate the small boosts in productivity that attended the optimization of feed rations, and high income populations with huge appetites for meat in their diets. Demand for lysine was growing by about 10 to

20% per year in North America, driven mainly by shifts in consumer preferences for poultry over beef and for lower fat pork products. Similar trends in Japan and Europe were responsible for volume growth averaging 8 to 10% per year.

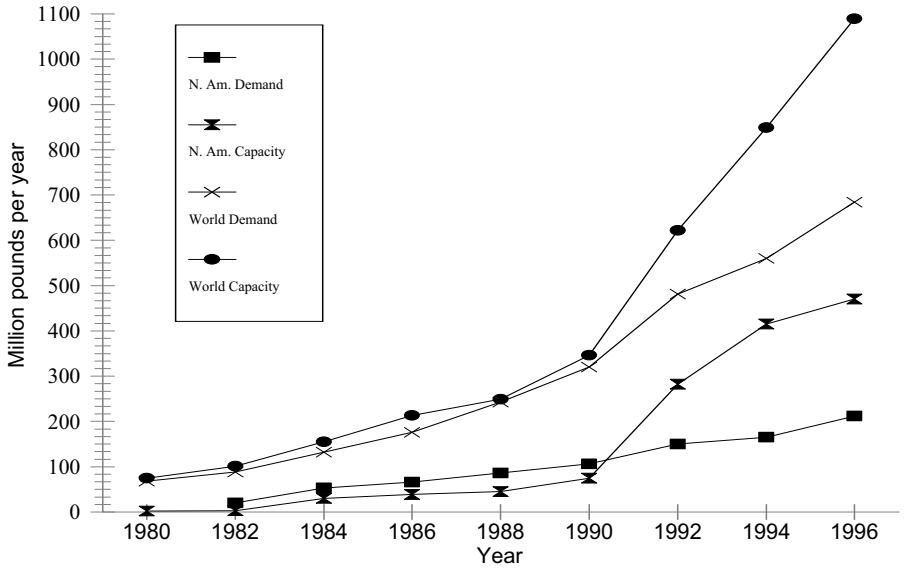

Figure 7.2 Lysine Production Capacity and Consumption, 1980-1996.

Source: Connor (2001b: Tables 7.A.1 and 7.A.4) and EC (2001)

Agricultural producers in both high income regions were early adopters of scientific animal nutrition practices. However, poultry and hog producers in many middle-income countries were just catching on to the benefits of balanced feeds in the 1980s. Moreover, the urban consumers of the many newly industrializing countries of Asia and Latin America were expanding their purchases of meat products far faster than consumers in the industrialized countries. As a result, Asia and Latin America saw demand for lysine grow at far faster rates than Western Europe and North America. In the 1980s, rates of volume growth of lysine in Asia (excluding Japan) and Latin America were in the 15 to 25% per year range.

The rate of growth of global demand slowed somewhat in the 1990s. Growth slowed to 15% per annum in the early 1990s (EC 2001). North America and Western Europe had growth above the global rate, but the rest of the world was only slightly below. However, the rate of expansion

in production capacity far outpaced increases in consumption in the 1990s (Figure 7.2). Consequently, the gap between capacity and production grew in the 1990s. That is, global utilization rates fell to the low 60% range during the mid-1990s. With significant excess capacity developing and plants opening in lower cost areas, the two Japanese lysine manufacturers were placed in the painful position of having to close their first manufacturing facilities.

Structure of Supply in the 1990s

The years 1989-1991 were a major transition period for the global lysine industry. Throughout the 1980s, production had been dominated by Ajinomoto and the other Japanese pioneer, Kyowa Hakko. The Korean upstart, Sewon, borrowed mightily to achieve its goal of controlling about 20% of world supply, but never quite got there. Two new players decided to enter the lysine industry in 1989, and by early 1991 the industry sported five suppliers instead of three. Because ADM's new plant was so huge, it had by far the greatest effect on prices and seller behavior. Little Cheil would not become a nettlesome factor in the industry for a couple of more years.

To recap briefly, there were three lysine plants operating in North America in 1990 (Connor 2001b: Table 7.A.2). The oldest and smallest plant was operated by Kyowa's joint venture in Mexico. Together with its Missouri plant, by 1990 Kyowa Hakko had almost 50 million pounds of lysine production capacity in North America. Kyowa had more than half of its global capacity located in North America. The second U.S. lysine plant was built by Heartland Lysine, Inc., Ajinomoto's U.S. subsidiary, in Eddyville, Iowa. Twice expanded, by 1990 the Iowa plant had reached a nameplate capacity of 26 million pounds.

ADM's huge plant in Decatur began selling its production in February 1991. Small at first, the volume sold by ADM rose exponentially to about 4 million pounds per month in the last quarter of 1991 (Connor 2000: Appendix Table A-2). At that rate by year end, ADM's *annual production* surpassed Kyowa's total U.S. *capacity* in 1990 and was double Ajinomoto's capacity. By the end of 1993, the Decatur plant had reached its planned capacity of 250 million pounds. Up through 1995, ADM's production utilization was typically in the 60 to 70% range.

Ajinomoto's and Kyowa's positions slipped badly as a result of ADM's aggressive expansion. Both companies added new capacity at their North American plants. Ajinomoto's plant in Iowa was expanded by 50% in 1991, 167% in 1993, and another 50% in 1996. Despite these heroic investments, Ajinomoto's share of North American lysine capacity fell from 35% in 1990 to 14% in 1992 and would continue to hover about 20 to 25% through 1998. Kyowa also made substantial investments to expand their plants in Mexico and Missouri almost every year in the decade. However, Kyowa's share also declined from 65% the year before ADM entered to 23% two years later. Kyowa held onto about 15 to 20% of the continent's lysine capacity in the late 1990s.

In the 1990s, most new global plant capacity was created in North America or by additions made to plants already in operation that were owned by Ajinomoto, Kyowa Hakko, Sewon and Cheil. In sum, the combination of new plants and plant expansions gave the five members of the lysine cartel control over 97% of the world's lysine capacity during the years it operated (Figure 7.3). Except for Cargill's plant in Nebraska, there are few instances of entry in the 1990s by companies outside the cartel.

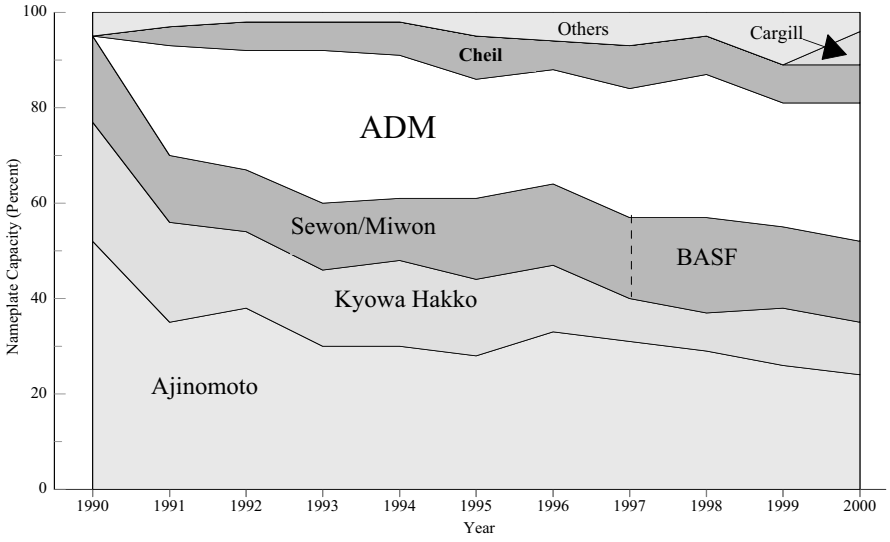

Figure 7.3 Global Capacity Shares of Leading Lysine Producers 1980-2000.

Source: Connor (2001b: Table 7.A.3)

The world lysine industry began to attract lots of new capacity in the late 1990s, but only after the lysine cartel broke up in 1995. Until 1990, the global lysine industry was almost totally owned and controlled by Asian companies. However, the location of production has become more diverse over time (Figure 7.4). In 1991 the North American (and especially U.S.) share jumped to 40% early in the decade and increased to more than 50% by the end. The share of Europe, Japan, and Korea continued to shrink. The biggest change was the increase in other Asian locations since 1990; Thailand, Indonesia, and China are the major countries getting more lysine capacity.

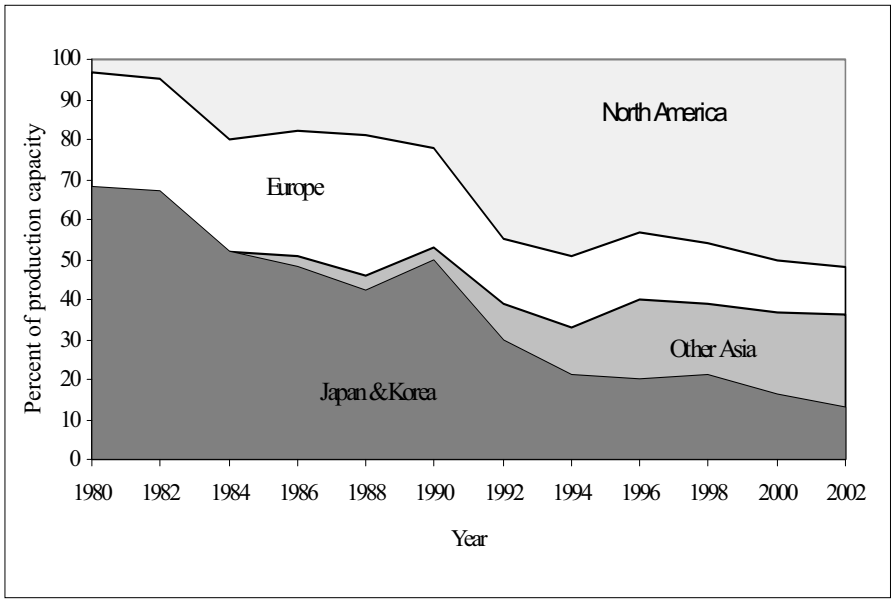

Figure 7.4 Geographic Location of Lysine Production Capacity, 1980-2002.

Source: Connor (2001b: Tables 7.A.1, 7.A.2, 7.A.4, and 7.A.5).

Members of the Cartel

Five companies joined the lysine cartel in 1992. ADM made the initial overtures in early 1992, ostensibly to form an "amino-acid manufacturers' association." ADM, Ajinomoto, and Kyowa were the first three members of the cartel, which held its first price-fixing meeting in June 1992. ADM requested Ajinomoto and Kyowa to cajole or coerce Sewon and Cheil into joining the cartel. By October 1992, all five companies had met to conspire on lysine prices. What follows are sketches of the five lysine manufacturers that constituted the global lysine cartel.

Archer Daniels Midland Company

ADM has been previously profiled in Chapter 4 above because of its role in the citric acid cartel. When the news of ADM's involvement in price fixing broke in June 1995, many unflattering assessments of ADM's corporate life-style appeared in the business and popular press. In these stories journalists were seeking explanations of whether the company's unique management style could be responsible for such serious illegal and unethical behavior.

The *Washington Post* characterized ADM as a secretive company best known for ". . . 35 years of unashamed influence-peddling in Washington . . ." ADM Chairman Dwayne Andreas was described as "… the most politically connected agribusinessman in the U.S." (Carlson 1996). ADM had placed a big bet on the success of its Bioproducts Division; its heavy investment was described as ". . . muscling into market position . . ." and for developing "cozy relationships" with rival companies like Tate & Lyle. "[The ADM board is] handcuffed by company insiders, family members, cronies, and friends of the powerful chairman." More than half of the Board members were 69 or older; and at most four of the 17 were independent of ADM or Andreas.

The bible of the chemical industry, *Chemical Market Reporter,* normally cautious in criticizing major firms in the industry, echoed these themes. *CMR* noted in 1996 that:

> "Since 1989 . . . Archer Daniels Midland Company has entered over half a dozen . . . biochemical businesses using vertical integration, marketing savvy, deep pockets and . . . aggressive market tactics" (p. 3).

As a result, ADM has "ruffled feathers" and "alienated business rivals."

A front page article in the *Wall Street Journal* drew a sharp portrait of Dwayne Andreas, who had gained ". . . near-total control with the help of family members, loyal executives and directors whose combined stake is nearly 15-percent . . . He collaborates with his biggest competitors, spends prodigiously to influence the media and public opinion, and spreads large sums among politicians of all stripes . . . Over the years, he has moved aggressively to neutralize any obstacles to his dominance . . . [at times employing] rough tactics." All major ADM decisions were made at the top by three or four managers. Meetings were informal and paperwork was kept to a minimum.

It is noteworthy that none of the 1995 news analyses suggested that the price fixing scheme was the work of a rogue manager, that the FBI or the Department of Justice was seeking to entrap members of the Andreas family, or that ADM's managers were led astray by foxy Japanese co-conspirators for whom cartels were a way of life – all themes to be sounded by defense counsel in the 1998 criminal trial. While some of the articles are careful to point to ADM's business success, the overall tone is one of wonder or perhaps glee that a master manipulator and his corporate creation had gotten their comeuppance.

Ajinomoto Co., Inc.

Ajinomoto is Japan's largest manufacturer of foods and seasonings (Connor 2000:Appendix E). The fundament of Ajinomoto's fortunes is the flavoring enhancer monosodium glutamate (MSG). The year after it was first isolated by a scientist at the University of Tokyo in 1908, Ajinomoto became the world's first manufacturer of MSG, selling it under the trademark "Aji-No-Moto" ("essence of taste"). The company soon began setting up sales offices in cities all around Asia, and between the world wars extended its sales network to Europe, Latin America, and North America. Ajinomoto's New York sales office was opened in 1917. This office is believed to be the first presence by a Japanese manufacturing company in the United States. Although interrupted by World War II, by the mid-1950s it had reestablished its international sales network.

MSG was at first extracted chemically from soybean protein. However, the company was quick to capitalize on scientific discoveries in

Japan in 1956 that an amino acid (gluconic acid) is a by-product of the metabolism of certain bacteria. Gluconic acid is closely related to the salt sodium glutamate, so within a few years Ajinomoto was manufacturing MSG more cheaply from a proprietary bacterial fermentation process.

Variations on the same process produced several other amino acids, many of them essential for growth and muscle development in humans and animals, such as methionine, tryptophan, and lysine. Optimizing the fermentation process was a difficult technical challenge. The temperature of the nutritive feedstock; the types of sugars, salts, vitamins and other chemicals to add to the mix; and the most productive strains of microbes were the subject of years of research and development. In recent years the microbial strains have been modified by genetic engineering and patented, each improved strain producing a higher yield of an amino acid for a given amount of sweetener. Overcoming technical difficulties Ajinomoto was manufacturing and selling lysine and other amino acids for the human pharmaceutical market by 1958, and by 1960 the company began selling lysine as an additive for animal feeds.

By the 1980s the domestic Japanese market for seasonings and processed foods had grown quite mature. To break this constraint on growth, Ajinomoto targeted two areas as top priorities for new investment, one of which was pharmaceuticals and other life-sciences products. In 1987, Ajinomoto created a new life-sciences products division and stepped up its R&D expenditures. Its life-sciences division sells amino acids, nucleic acids, enzymes, and medical products for human and animal use. By the late 1990s, R&D represented 3.3% of sales, a very high level for a food processing company. Ajinomoto's strategic shift seems to have been moderately successful. Sales in 1990-1998 grew 8% per year, and before-tax income has generally ranged between 2.4 and 4.6% of sales. These profit rates would be considered moderately high for a U.S. food processing company, but low compared to a pharmaceutical company.

Kyowa Hakko Kogyu Co., Ltd.

Kyowa Chemical Research Laboratory was established as a joint venture of three Japanese alcohol distillers before World War II. From the beginning Kyowa specialized in fermentation products, and in 1947 it began manufacturing penicillin. Like Ajinomoto, Kyowa was quick to take advantage of the 1956 discovery that amino acids were produced from certain microbial fermentations. Within two years, Kyowa was making lysine and MSG commercially from a process that produced glucomic acid from fermentation of molasses. In countries with low cost sugar industries, Kyowa's lysine manufacturing process is as equally cheap as Ajinomoto's

dextrose-based process. Since the 1960s, Kyowa has brought to market many new pharmaceutical products and has introduced several improvements in fermentation production processes. In 1983 Kyowa developed one of the first genetically engineered microbes that significantly raised the productivity of fermentation of amino acids. More than 20% of its employees in the late 1990s were involved in R&D. Today, Kyowa Hakko is one of the world's leading firms in research in biotechnologies and genetic engineering and in production of amino acids. Pre-tax income in the 1990s ranged from 6.8 to 8.2% of sales.

Sewon Company

Sewon in the 1980s and 1990s was the second or third largest manufacturer of food and agricultural products in South Korea. Until 1994, Sewon was operated as a part of the South Korean conglomerate or *chaebol* Miwon Group. In that year, Miwon's assets were split into two operating companies. One part, Sewon Co., became an agribusiness-chemicals firm with interests in animal feeds, synthetic resins, lysine, MSG, and other starch products. In November 1997, Miwon and Sewon, after four years apart, were rejoined under Daesang as their holding company.

In 1972, Sewon began making lysine in its plant in Busan, South Korea, but production may have not reached commercially important levels until around 1980. A new and larger plant was built in Kunsan and began production in 1989. By the early 1980s, Sewon had become the dominant starch manufacturer in Korea and the third largest in Asia. Sewon spent prodigiously to expand its sole lysine plant, adding to capacity five times between 1990 and 1995. Sewon and the conglomerate to which it was affiliated were deeply in debt. By mid-1997, Miwon Group could no longer resist the full force of the Asian financial crisis that began in that year and was signaled by huge drops in the value of the Korean won and stock market prices. To reduce the group's debt, in 1998 Daesang Corp. sold Sewon's crown jewel, its lysine business, to Germany's BASF for $600 million.

Cheil Food and Chemicals Co.

Cheil (also called Cheil Jedang) was established as Cheil Sugar in 1953, and it retained its monopoly in sugar refining until the mid 1990s. Cheil was the operating company for the food and agricultural processing businesses of the huge South Korean *chaebol* Samsung until 1993. Samsung began madly diversifying in the mid-1950s and became Korea's largest conglomerate from the mid-1970s to the late 1990s.

Throughout the 1980s, Cheil had focused mainly on sugar and other processed foods. Around 1990 Cheil decided to diversify into pharmaceuticals, household chemicals, and fine chemicals. Cheil split off from Samsung in 1993. By 1997, Cheil's sales had reached $2.1 billion, having grown by 10% per year since 1992. Cheil's debts were modest by international standards and very low by a Korean yardstick.

Cheil decided to enter the lysine business around 1988. In 1989, it joined with its parent group Samsung and Indonesia's Astra Group to form PT Cheil Samsung Astra (CSA) that built a new plant in East Java to manufacture MSG and lysine. Significant increases in capacity were registered six times between its 1991 start-up year and 1999. A prospectus issued in 1999 reports that 1998 sales of MSG and lysine had reached about $155 million and that profits were a striking 17.5% of sales.

Selling Practices

Lysine was customarily sold to U.S. feed manufacturers in much the same way as citric acid. Sellers announced a baseline list price for dry lysine based on delivery of full truckloads to specified points in the Midwest near the lysine factories or ports of import. Prices would be higher for deliveries to more distant locations or in partial truckload sizes; discounts were offered if the buyer arranged for transportation. These premiums and discounts were fairly standard across the industry as were payment terms; that is, they were widely viewed as nonnegotiable.

The asking price was usually just the start of price negotiations unless the buyer was seeking immediate delivery. These so-called spot purchases were often concluded at the list price. However, the vast majority of lysine was sold under supply contracts that typically specified an annual quantity that the buyer was obligated to purchase at some predetermined frequency of delivery. Because quality was essentially the same across all sellers, the delivered price was really the only point of the contract negotiations. Usually around the end of the calendar year, buyers or their agents would shop around and haggle sequentially with lysine sales representatives until the buyers felt that they had found the lowest possible price below list. Transaction prices depended on collecting reliable information and the negotiating skills of the parties. Boasting, bluffing, misinformation, nerves, and friendships might sway prices a penny or two in either direction in normal times. The largest and most loyal buyers expected and usually received a conventional 3% rebate.

Although the price arrived at was binding for the first delivery, sellers had the option of changing their list or contract prices at any time. Buyers usually were given 30 days' price protection; that is, when list

prices increased "effective immediately," contract buyers could buy one-twelfth of their annual contracted volume at the "old price." However, the price on more distant delivery times had to be renegotiated all over again or passively accepted (Tr. 4187).

Most large feed manufacturers dealt directly with the manufacturers' sales representatives. ADM in the mid-1990s maintained three or four sales offices for U.S. transactions, and offices in Miami for Latin American sales, in Singapore for Asian sales, and Germany and the UK for European sales. ADM also sold lysine in some parts of the world through brokers who operated on sales commissions. Merchant wholesalers bought some lysine for resale to smaller customers. Buyers who purchased lysine through wholesalers usually ended up paying several cents above manufacturers' list prices.

The exchange mechanism just described is termed by economists *direct trading,* and the price system is called *private treaty* negotiation. No third parties can observe or record the prices that are used to transfer ownership of the lysine. Specific sales contracts are kept secret between rival buyers and rival sellers, so actual prices paid are subject to misrepresentation and exaggeration. Information about prices is distributed asymmetrically, with the few sellers having the upper hand over buyers that number in the thousands. Such exchange mechanisms are known to foster monopolistic pricing practices (Marion *et al.* 1987:79).

Chapter 8: The Lysine Conspiracy

Two top executives of the giant U.S. agribusiness firm Archer Daniels Midland flew from the company's headquarters in Decatur, Illinois to Tokyo, Japan in April 1992. Terrance Wilson, President of the sprawling corn-products division of ADM, disliked long flights because he reacted badly to the effects of jet lag, but he was epitome of the loyal manager, and this trip could make tens of millions of dollars for his company if everything went according to plan.

Along with Wilson was a brash new ADM vice president, Mark Whitacre, who headed up ADM's new Bioproducts Division. Whitacre was a quickly rising star at ADM. With his Ph.D. in nutritional biochemistry from prestigious Cornell University, he was well equipped to handle the technical side of the high-tech bioproducts business. The product the two men were concerned about was lysine, an essential amino acid that speeds up the formation of lean meat on farm animals. After getting his Ph.D., Whitacre had worked for the German company Degussa that was the world's biggest maker of amino acids, and it was there that Whitacre had discovered he had a flair for salesmanship. It was this rare combination of talents that prompted ADM to depart from company practice and hire him away from Degussa rather than promote from within.

Terry Wilson had come as a young man straight from the U.S. Marine Corps to work for ADM. He loved the company and its charismatic leader, Dwayne O. Andreas, who had several times demonstrated that he personally cared for Wilson and his handicapped son. Wilson applied his tough military ways to his jobs at ADM, so that he rose from near the bottom of the company's organization to very near to its pinnacle in his 25 years with ADM. Although Wilson had never gone to college, he had a thing or two to teach his more polished underling who was twenty years his junior. It was not the sort of thing taught in business schools.

Terry Wilson was going to teach Mark Whitacre how to fix the world price of lysine.

This was a way of doing business that Terry Wilson knew a lot about. Just a year before this trip to Tokyo, Wilson had taken a very similar mission to Europe with his younger colleague Barrie Cox. In a few months under Wilson's tutelage Cox had turned into an accomplished

price fixer of citric acid (see Chapter 5). Now was the time to repeat that highly profitable lesson for Whitacre's Biotechnology Division. Like citric acid, lysine was a high-tech product made by fermentation of the corn sweetener dextrose. Like citric acid, ADM had just entered the industry in a big way but wasn't yet the industry's top dog – ADM's ultimate objective in all its lines of business. Like citric acid, new entry into the industry had precipitated a fierce price war that turned the ink red in all the producer's books.

Now the time was ripe to let ADM's rivals know that it was ready to play ball, to call off their aggressive scramble for market share, and to stanch the outflow of profits precipitated by the bloody yearlong price war. Wilson and Whitacre were on a peace mission to Tokyo to meet their counterparts at Ajinomoto and Kyowa Hakko, the two oldest and still dominant makers of lysine in the world. When the Americans met the Ajinomoto executives for the first time, Wilson made several specific proposals: establishing a lysine trade association, audited sales reports for its members, and a 50% increase in price. The sincerity of ADM's offer to cooperate rather than fight would take a while to sink in, but within a few months the managers of all three companies would be toasting their newly formed partnership in crime.

The lysine cartel held its first formal meeting in June 1992. The event that made the conspiracy possible was ADM's decision in 1989 to build the world's biggest lysine plant. Without the demonstrated power of ADM's large production to disrupt the market and to discipline recalcitrant lysine producers, the cartel would never have formed in the first place. ADM used the carrot of profits for all, the stick of its unused capacity, and diplomacy of a high order to get the others to join and cooperate. For the Asian producers a lengthy price war made them pine for the old days when world pricing was simply a sellers' management decision.

The Price War of 1991-1992

ADM's plant in Decatur had a planned capacity three times larger than the biggest then in existence. It was so large that the Asian manufacturers doubted that it was technically feasible. To demonstrate its prowess, ADM did the unthinkable in an industry rife with technological secrets: it gave unrestricted plant tours to executives and expert industrial engineers of Ajinomoto, Kyowa, and Sewon. When the Asian lysine makers later met and shared their impressions about the size of the Decatur plant, it is clear that skepticism had been replaced by credulity. What they saw was not quite the 250 million pounds of capacity that ADM claimed, but they

agreed that at least 130 million pounds of annual capacity had been installed by early 1992.

What the plant tours had not quite accomplished, the market effects of ADM's entry made crystal clear. As ADM's production ramped up in early 1991, prices plummeted and the sales shares of the three Asian sellers fell dramatically. Indeed, U.S. lysine prices had already fallen throughout 1990 in *anticipation* of ADM's entry. The prospect of lower prices turned out to be a self-fulfilling prophecy. In the three months before ADM's entry, the average U.S. lysine price was $1.32 per pound. Eighteen months later when the price war came to an end, the U.S. transaction price had tumbled to an historic low of $0.68 per pound.[1]

There is little doubt that the vast increases in lysine tonnage from ADM's Decatur plant were the principal reasons for the U.S. price drop. The company sold less than 1 million pounds of lysine in the first quarter of 1991 (Connor 2001: Table 8.A.1). By the end of the year, ADM was selling lysine to U.S. customers at an annual rate of 50 million pounds, which was 39% of U.S. demand, all of it sales taken away from the three Asian manufacturers. ADM's relentless push for market dominance continued through to the summer of 1992, when its U.S. sales reached nearly 80 million pounds on an annual basis, or 71% of U.S. consumption. The only way ADM could have zipped from zero to 71% of the U.S. market in a year and a half was through under-pricing its rivals. Except for three months in late 1992 when regular seasonal demand peaked, prices fell each month from January 1991 to July 1992, a total decline of almost 50%. Demand for lysine did not weaken during this price war. In fact just the opposite occurred: in response to the low prices total U.S. consumption of lysine was 11.3% higher in 1991 than before the price war in 1990.[2] Thus, the downward movement in lysine prices was nearly entirely explained by ADM's vast supply increase.

By the second quarter of 1992, the Decatur plant was pushing out so much lysine that it exceeded *total* U.S. market consumption. Anticipating this looming saturation of the domestic market, ADM began exporting just a few months after start up. By the third quarter of 1991, ADM was exporting one-fifth of its tonnage; by the first half of 1992, exports were more than half of the quantity it sold. ADM's aggressive launch also caused imports of lysine into the United States to decline precipitously in 1991 and 1992. Lysine that might have ended up in the United States but

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[1] In 1984, a price war had brought U.S. prices to $0.70 per pound, but adjusting for general inflation that previous record low was above $0.80 when measured in 1992 dollars.

[2] Quantity demanded in 1992 was up only 1% over 1991, partly because of cartel-induced high prices in late 1992. It was also likely that buyers built up their inventories in 1991 on the expectation that the price war would be shorter than 18 months.

for ADM's production was diverted to other world markets. The combined effects of ADM's exports and the diverted U.S. imports caused lysine prices to fall worldwide.

Ajinomoto had begun developing specific plans to cope with ADM's entry as early as April 1990 (Tr. 840). Neither Ajinomoto nor Kyowa had any success in slowing what appeared to them to be ADM's inexorable drive for global dominance. Credible testimony confirms the obvious: all three Asian lysine manufacturers were extremely worried about ADM's huge impact on lysine prices (Tr. 1776-1801). The price impact was worldwide. In France, Eurolysine saw lysine prices plummet 60% from 1990 to mid-1992 (Tr. 2239-42). Internal financial records of Ajinomoto's Heartland Lysine showed that the affiliate lost $1.9 million in fiscal 1992, which its management board attributed entirely to the ADM juggernaut (Tr. 2065). Desperate to signal their willingness to cooperate, Ajinomoto and Kyowa attempted to raise prices several times in early 1992 (Tr. 841), but ADM seemed committed to inflicting indelible financial pain on its rivals. By early 1992, the three Asian manufacturers were holding talks among themselves that led them to seriously consider asking ADM to join them in a more cooperative arrangement (Tr. 1776-1801). The moment was ripe for collusion.

ADM shortly thereafter signaled its willingness to engage in softer forms of competition. In April 1992, Mark Whitacre and his mentor Terrance Wilson journeyed across the Pacific to meet with top Ajinomoto and Kyowa managers. ADM proposed forming a world lysine association that would meet on a regular basis. The new association would collect and distribute mostly production and market-share information, much like the Corn Refiners Association did for the U.S. corn wet milling products (Tr. 1734-36). Wilson also suggested that, like the European Citric Acid Manufacturers' Association, the new association would provide a convenient cover for illegal price-fixing discussions (Tr. 2186). In a year or two, a lysine association in fact emerged that met quarterly and performed the two functions that Wilson proposed.

Why did ADM initiate these price discussions at this time, and did the discussions cause prices to rise? The answer to the first question revolves around several factors. First, ADM had in early 1992 achieved its strategic goal by accounting for one-third of global sales. Wilson repeatedly assured its Asian rivals that ADM wanted no more than equality with the leading firm (Ajinomoto). Aggressive pricing was no longer necessary to expand its market share beyond this satisfactory level. Second, ADM believed that its rivals were finally convinced that the Decatur plant could crank up output to damaging levels. Third, unknown to the Asian companies, ADM was having considerable difficulties with low yields due to

contamination of its lysine fermenters.[3] Throwing away a bad batch cost ADM millions of dollars each time it happened. Fourth, and perhaps the most pressing reason, ADM had forced prices so low that it was losing money on its lysine operation.[4]

Meetings and Methods

The lysine cartel held ten formal meetings to fix prices. At least three companies were present at these quarterly meetings. Typically, each company sent two or more representatives. In addition, at least 22 other significant face-to-face meetings were held. Eight were bilateral events involving ADM, such as its Decatur plant tours (Connor 2000: Table A4). The remaining 14 bilateral meetings were held in Tokyo or Seoul among two or more of the four Asian lysine producers to develop strategies to cope with ADM's strident insistence on a volume-allocation agreement (Tr. 5018). Finally, there were hundreds of telephone calls made during the conspiracy to coordinate list price changes and to report monthly sales information to the secretary of the lysine association, Kanji Mimoto, head of the feed additives division of Ajinomoto.

The total number of men who attended these various meetings and who were later identified as conspirators in U.S. legal documents was 42.[5] However, this total excludes an unknown number of employees, mostly regional sales managers, who participated in regional price-fixing discussions in Europe, Latin America, and elsewhere later in the conspiracy. At ADM, only ten to 12 men were informed about the lysine conspiracy, of which prosecutors identified three as "cartel managers" or principal coconspirators. There were six principal conspirators who worked for Ajinomoto or Eurolysine, one for Kyowa, two for Sewon, and one for Cheil.

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3 To dispel criticism of his ability to manage the lysine facility, Whitacre concocted a story about a mysterious Mr. Fujiwara who was sabotaging the Decatur plant and was demanding a $10 million ransom. The FBI was called in to investigate the allegation, which led to Whitacre being recruited as a mole for the FBI. See Chapter 13 for details.

4 To overcome initial FBI skepticism about the existence of ADM-related price fixing, Whitacre showed the FBI ADM's financial statements for the lysine department (Tr. 2834-35). Net margins had turned *negative* in the months of July and August 1992 when U.S. lysine prices averaged $0.66 per pound. Equally interesting is the fact that ADM's lysine profits became positive during September and October 1992 when the price jumped up to $0.82 and $0.92, respectively. Whitacre considered this pretty good evidence that the Mexico City Agreement was effective for the cartel. This evidence also supports the notion that ADM's average costs of lysine production were somewhere between $0.68 and $0.82 per pound.

5 The word "men" is used in its strict gender sense. Price-fixing is a boys' game.

Nearly all of the principal co-conspirators were eventually fined or indicted for their illegal activities.

The Cartel Begins Meeting

In late June 1992, the first of many meetings of what was to become the "lysine association" took place. In the Nikko Hotel in Mexico City, seven men representing ADM, Ajinomoto, and Kyowa Hakko discussed raising prices and allocating sales shares across several regions of the world. Wilson led the discussion, often reiterating ADM's creed:

> "The competitor is our friend, and the customer is our enemy."

However, not all competitors were treated as friends. Consistent with its public statements that it was coerced into joining the cartel, federal prosecutors later charged M. Andreas, Wilson and Whitacre with intimidating Sewon (and possibly Cheil Jedang as well). They threatened to dump huge amounts of lysine onto the market unless Sewon and others joined the cartel and ceded significant market share to ADM.

The lysine conspiracy evolved through two distinct phases: the first from November 1992 to March 1993 and the second from about October 1993 to at least July 1995. During the first phase, four conspirators agreed on prices but were never able to agree on market shares. The agreement broke down in the spring of 1993 when trying to get a consensus on production limits. In late 1993, a consensus was reached on market shares, a method for monitoring quotas was implemented, and Chiel joined the cartel. The second episode was the most harmonious and profitable for the cartel.

To calm the fears of Ajinomoto in particular, in Mexico City Wilson explained ADM's overall strategic goal in lysine as well as other product markets. As copied into minutes of that meeting circulated to top Ajinomoto managers:

> "ADM's top management has an extremely clear-cut policy on sales share. Their intent is not to insist on having an absolute majority of the sales share, such as 50% or more, but rather to have the same scope of shares as the largest competitor in that industry . . ." (Tr. Ex. 4-T).

Wilson repeated ADM's stance a few months later at the first Paris meeting. As paraphrased in Eurolysine's minutes of that meeting, "ADM considers over 35-40% world market share crazy" (Tr. Ex. 34).

The Role of Uncertainty

A cartel resembles a joint venture set up by several partners who independently manufacture a product to be sold through the joint venture. However, unlike a conventional joint venture, the lysine cartel had no corps of middle managers to provide continuity and execute the decisions of top management. In effect, the conspirators were a rotating board of directors that had to implement its own decisions about prices and sales quotas. The absence of a cadre of experienced managers monitoring daily developments in the market meant that the cartel faced somewhat greater uncertainties about market conditions than an on-going company would face. Uncertainty is especially important in cartels because cheating on price or volume agreements is usually profitable for the deviant firm. The existence of cheating can to some extent be detected by unexpected short run price declines or increases in the total quantity sold. Knowing this to be the case, cheaters have an incentive to misrepresent their sales quantities or prices.

The difficulty of ascertaining total production or demand is illustrated by the exchanges of such information at various cartel meetings. Presumably, the major global sellers of lysine were the best informed group on the planet, yet each of them harbored significant misapprehensions about the production levels of other sellers, and, therefore, the global size of the market. These inconsistent assumptions were especially evident prior to and at the beginning of the lysine cartel (Connor 2000: Appendix Table A6). For example, immediately before the cartel was formed, the three largest Asian firms estimated ADM's 1991 production to be only 29 million pounds, which was about 20% too low. Two months later, after one collusive meeting, the same group's estimate for ADM in mid-1992 was at least 35% too low. In 1993, Sewon believed that Ajinomoto's and Kyowa's production figures were about 10% lower than those companies claimed. Similarly, in 1992 and 1993, the two Japanese producers believed that production levels professed by both Korean upstarts were quite a bit lower than actual production. ADM initially had greatly underestimated production by its Asian rivals. When ADM first met in Mexico City in June 1992, ADM found that it was off by 16% for world consumption and 37% too low for the Asian region. The conspirators agreed to accept the Japanese numbers.[6]

After pooling their production data in 1993-1995 as part of the quota agreement, a consensus on the size of company production and

[6] A tape of a meeting of Andreas, Wilson, and Whitacre in Decatur on March 18, 1993 reveals that they discovered that the Japanese numbers were understated. When ADM realized the total market was larger than they had formerly believed, they increased sales volume, thus precipitating the spring 1993 price war (Eichenwald 2000: 134-137).

global demand evolved. From mid 1993 to early 1995, disagreement about the size of global demand or company production levels hardly ever erupted. This consensus helped the conspiracy to move forward harmoniously and raise prices to ever higher levels.

Allocating Sales Quotas

Agreeing to raise prices proved to be a much easier decision than agreeing to company-by-company volume quotas. Higher prices lifted everybody's profits, whereas the size of a company's quota was going to determine one company's share of the pool of monopoly profits generated by the conspiracy. The inability to arrive at an apportionment that did not exceed 100% was a major cause of the second price war of early 1993. By June 1993, prices had plunged to an historic low of $0.62, though soon afterwards the usual seasonal forces began to push prices up.

The rift was resolved at an October 1993 meeting in Irvine, California. A compromise reached by M. Andreas and K. Yamada at the October 1993 Irvine meeting gave ADM substantially less than its goal of one-third the global market. Global sales quotas were decided by the two leaders and sold to the rest of the cartel. Later, as the dazzling profits from the scheme began to roll in, the rationalization that made this compromise possible was soon forgotten. ADM and Ajinomoto had agreed to share equally almost all the growth in volume of lysine. Mathematically, the two could never quite achieve equality under such a rule, but after many years they would be quite close to parity. According to a finalized agreement in December 1993 in Tokyo, both Ajinomoto's and ADM's shares were to increase at the expense of the other three companies' shares. It was no time to rock such a profitable boat. In fact, when the time came to apportion expected 1995 global volume among the cartel members, the conspirators' market shares remained exactly the same as their 1994 shares (Tr. Ex. 17-T).

Monitoring the Volume Agreements

Kanji Mimoto of Ajinomoto was assigned the task of preparing monthly "scorecards" for the five members of the cartel as a way of tracking adherence to the volume shares agreed upon. Each month, the five companies telephoned or mailed their lysine volumes of sales to Mimoto, who prepared a running spreadsheet that was handed out and discussed at the quarterly maintenance meetings. Sales volumes were calculated for four regions (North America, Latin America, Europe/Middle East/Africa and Asia/Oceania) and for the world.

A scorecard covering the calendar year 1994 was submitted as Exhibit 16 by the Government in the Chicago criminal trial. This scorecard was used to track monthly progress toward the "budgeted" amount of lysine (that is, each company's agreed-upon quota). Because of seasonal demand patterns, most of the companies were below target during the first six months of the year, but this shortfall was made up for in the late summer and early fall when lysine demand surged. By the end of 1994, sales volume reported by the five companies had reached 254,566 metric tonnes, just 1.4% higher than the targeted amount adopted in December 1993. However, the five companies achieved percentage market shares that were remarkably close to the target shares. Sewon was farthest from its allotted share, selling 14.3% of the world's lysine instead of 14.7%. Had some of the cartel's members been far from their targeted shares, a compensation system had been adopted that involved intra-cartel sales at the elevated monopoly price by deficit firms (Tr. Ex. 142-T).

There were no regional quotas, but because of the locations of their plants, some companies tended to dominate certain regions. In 1994 ADM accounted for 42% of U.S. and Canadian lysine sales volume; Ajinomoto and Kyowa each shared about 25% of that market. In Latin America, Kyowa controlled nearly half of sales. In Europe, Ajinomoto dominated with 45% of sales. The Asian market was more fragmented with Ajinomoto in the lead (34% of sales) followed by Sewon (24%), ADM (27%), Kyowa (19%), and Cheil (11%).

One reason that it took more than a year of negotiations to agree on quotas is because members of the cartel had varying preferences about methods for assigning shares. At an important meeting in Tokyo in May 1993 of the top managers of the three largest Asian producers, the necessity of some sort of volume agreement was accepted, but Ajinomoto and Sewon spoke in favor of exclusive geographic markets as the mechanism (Tr. Ex. 139-T). Sewon proposed that Kyowa be given a monopoly in Japan. Sewon in turn was requested to reduce sales to the U.S. and European markets ". . . upon the principle that a local producer should sell as much as possible in its region" (Tr. Ex. 125-T). The Japanese manufacturers also complained that Sewon had aggressively increased sales in Japan and Mexico, a violation of the principle of home-country hegemony.

There is at first blush an appealing simplicity to assigning exclusive market sales territories to each of the conspirators. Such a system would make monitoring an agreement fairly straightforward, but it raised other contentious issues at the same time. Who would get to sell in the fastest growing markets? No region had supply and demand in balance, so import and export quotas would have had to be devised, a calculus more complicated than that required for a single global quota. Finally, assigning exclusive territories would require four of the companies to refuse to bid

for the business in those areas, possibly tipping off antitrust regulators. For these reasons ADM's plan for global quantity quotas was adopted.

The Problem of Geographic Arbitrage

The lysine cartel colluded on list prices in four world regions. The companies anticipated a degree of downward departure on prices of actual transactions, which was tolerated so long as the discounting was not too severe and did not disrupt progress in achieving the market-share targets. In its December 1993 meeting in Tokyo, the five conspiring companies compared "actual trading price" with the "agreed price" that was to have been charged from November 5, 1993 onward (Tr. Ex. 142-T). Transaction prices were 3% below target in the United States and 6% below in Europe. Such price differences were partly the result of discounts customarily offered to the largest contracting customers. Also, the larger price gap in Europe might have been due to arbitrage conducted by wholesalers taking advantage of lower North American lysine prices. At their previous meeting in Paris in October 1993, an Ajinomoto memorandum stated that:

> "With the [Deutschmark] strong against the $, presently it is 22% higher than in the U.S. If the difference between Europe and the U.S. becomes bigger, ill-reputed dealers will start working and goods will enter Europe from the U.S. and decrease the price" (Tr. Ex. 10-T).

In Asia, Latin America, and Oceania, the conspirators calculated that December 1993 transactions prices were 10% below the target prices set in October. This gap could have been the result of somewhat more price cutting by the manufacturers. But at their Tokyo meeting the consensus was that lags in serving export markets were the main reason. "Price increases up to the agreed price can take around 3 months at least (especially, South America and Asia)" (Tr. Ex. 142-T). Three months is reasonable given the normal 30-day price protection in most contracts, coupled with the delays in ocean shipping to the consuming markets with no local lysine production.

Demand Elasticity

In their pricing decisions, members of the lysine cartel were concerned about the elasticity of demand for lysine. They worried at times that total volume demanded might decline rapidly if the cartel raised its price too high in some regional markets (i.e., the elasticity of own-price was less

than negative one or "inelastic"). Elsewhere, in more mature markets like Japan, the lysine managers believed that volume was unresponsive to price (i.e., the elasticity was close to zero).

The most extensive discussion of the elasticity of demand (though this particular term was not used) took place at the first Paris meeting in October 1992 (Tr. Ex. 10-T and 128-T). In a discussion of the U.S. market Whitacre opined that: "When the price was increased from $0.95/lb. to $1.05/lb., the demand went down by 10%." This statement means that Whitacre implicitly estimated the demand elasticity to be between -0.95 and -1.05, depending on the price level.

However, Whitacre's estimate was contradicted forcefully by a much more experienced Japanese sales manager. Kanji Mimoto, who had been selling lysine for more than 20 years for Ajinomoto, pointed out that Whitacre had failed to consider the regularly seasonality of demand when making his statement. Mimoto estimated that by increasing the U.S. price from $1.05 to $1.15 per pound, the *annual* impact on U.S. demand (ignoring seasonal factors) would be "less than 8,000-10,000 tonnes." At the then current levels of U.S. annual volume (53 to 59 thousand tonnes), Mimoto's implicit estimate of U.S. demand elasticity was in the range -1.4 to –2.0. The group had the opinion that the demand for lysine was more inelastic for poultry-feed buyers than for swine-feed buyers (the larger of the two groups). This observation led them to consider whether price discrimination between the two types of buyers might be feasible. "What about dual price [customer price differentiation]?" Mimoto asked. In a comment that appears to be out of character, Wilson said he thought it was legally impossible. They also considered, but rejected, a more elaborate system of price discrimination based on customer sizes.

The Shadow Price of Lysine

The conspirators were well aware of the fact that the availability of natural lysine in oilseed meals and fish meal provided a constraint on manufactured-lysine pricing. Moreover, corn or other rough feed grains needed to be mixed with synthetic lysine when substituted for natural lysine sources. In the United States, soybean meal was by far the dominant source of natural lysine. Thus, soybean meal was a substitute for lysine made by fermentation, but corn was a complement to lysine. If the price of soybean meal fell far enough and the price of corn was high enough, demand for fermented lysine would disappear.

When the ceiling price was well above the market price, the lysine cartel felt comfortable about raising prices. At the 1992 Paris meeting of the five cartel members, there was discussion of soybean meal quality and

likely price trends (Tr. Ex. 128-T). "That is, this is a threat to the U.S. price increase . . . However, the corn price went down and the shadow price can be estimated up to U.S. $1.50/lb." In other words, the cartel should not increase its selling price so far that it comes close to $1.50 per pound, especially if soybean prices are likely to decline. The cartel's target price at the time was only $1.05, so the shadow price was really only a distant threat to raising prices.

The conspirators paid close attention to the shadow price "spread," that is, the difference between the shadow price and transactions prices. At a June 1993 meeting in Tokyo, the four Asian producers estimated the spread to be a comfortable $0.90 to $1.00 per pound at a time when the lysine price was very low worldwide (Tr. Ex. 131-T and 132-T). The list price was $0.85 per pound, about $1.00 below the shadow price (Figure 8.1).

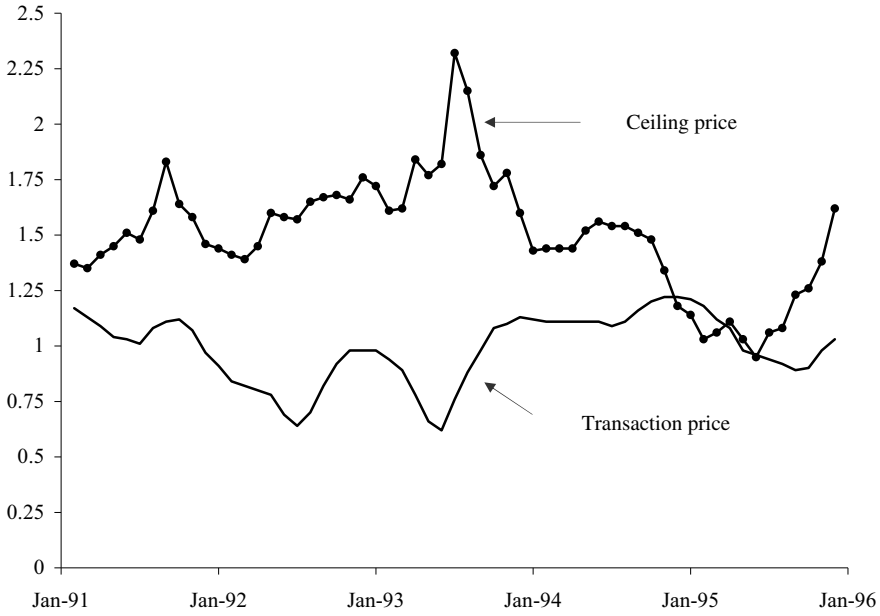

Figure 8.1 Monthly U.S. Transactions and Ceiling Prices of Lysine, 1991-1995.

Sources: Lysine prices supplied by three defendants in a notice to class-action members. Ceiling price based on formula (100 lb. soymeal = 97 lb. corn + 3 lb. lysine) and Illinois cash prices for corn and soybean.

The shadow price continued to receive attention from the conspirators up to the end (Tr. Ex. 17-T). In January, the cartel believed that the shadow price spread was somewhat lower, about $0.60 per pound. Even if

they were using price data a few months old, the true spread in September or October had been only about $0.40 per pound and was declining rapidly. By January, the ceiling price had fallen slightly below the U.S. transactions price and in January the spread was a negative 15 cents or so. Despite the obviously cooperative mood of the cartel in its January meeting, the transactions price of lysine fell a few cents each month from January to a trough in September 1995. The negative spread during the first five months of 1995 eventually made lysine prices fall, the only period in which the ceiling price forced the market price down during 1991-1995.

A more technical analysis of the U.S. lysine market by Morse and Hyde (2000) confirms that the shadow price did indeed affect lysine demand. Using the conventional formula based on animal nutrition principles (100 lb. soy meal = 97 lb. corn + 3 lb. lysine) to calculate the shadow price, their model found that variation in the monthly shadow price was positively related to the quantity of lysine sold during 1990-1995. That is, a combination of U.S. soy meal and corn prices behaved as a substitute in the market for lysine. On average, holding the price of lysine itself constant, if the shadow price rose by 10%, the quantity of lysine sold would rise 3.5%. Thus, the lysine cartel partially adjusted its total sales volume and price in response to movements in the prices of two agricultural products they could not control: soybeans and corn.

Seasonality of Demand

Members of the cartel broadly agreed on the importance of seasonality of demand for lysine. They called it the "winter effect." On-farm use of mixed feeds for swine and poultry operations peaked in the coldest months, January-February in the northern hemisphere.[7] Peak monthly sales of lysine during 1991-1995 was always December (Connor 2000: Table A2). Morse and Hyde (2000) estimated the demand for lysine in the U.S. market during 1990-1995. Taking into account monthly price changes and factors that affect the ultimate demand for meat products, they found that the demand for lysine peaked in the four winter months December through March. This finding would be consistent with the seasonal feed requirements of poultry and hog producers, who would step up the quantities of feed per live animal in the coldest months. U.S. feed manufacturers apparently increase their winter purchases of lysine to prepare mixed feeds for their farm customers and perhaps to build up inventories of prepared feeds

[7] Of course peak demand in Australia, South Africa, and the Southern cone of Latin America would occur six months later, but this effect was slight compared to Northern hemisphere demand. The winter effect was verified for the U.S. market during 1990-1995 by Morse and Hyde (2000).

or feed concentrates for sales later in the year. The quantity of lysine sold to feed manufacturers in the winters of 1990-1995 was 14% above the annual average.[8] For lysine plants serving the U.S. and European markets, seasonal *production* would be elevated in the fall months in order to build inventory for the winter sales peak.

Seasonality of sales in the two largest demand regions would normally cause prices to rise in the last quarter of the calendar year. Because prices in 1991-1995 were not those generated by a stable competitive market, it is difficult to estimate the impact of seasonal demand on prices. Given demand elasticities in the -0.9 to -1.6 range, the typical 14% increase in the volume of demand from the third to fourth quarters would raise prices by 7 to 16% above their summer levels in a completely competitive market.

Seasonality of demand was actually quite useful for the lysine cartel. From the point of view of customer acceptance, the last quarter of the year was an ideal time for the cartel to get its act together. The cartel raised U.S. prices twice by very large amounts. From July to November 1992, transactions prices rose by 53%. From June to December 1993, prices rose by 82%. Thus, it appears that less than one-third of these price increases can be attributed to seasonal demand factors. On the other hand, the failure of prices to decline in early 1994 must have raised customer suspicions that the market price was not altogether free.

Price Fixing Grew in Complexity

The lysine cartel came to price agreements about 25 times, beginning June 1992 in Mexico City and ending in Hong Kong in April 1995. Prices were set every quarter from the summer of 1992 to the spring of 1995, a total of twelve quarters. However, intra-quarter adjustments were made by telephone and sometimes multiple price increases were specified in one meeting. Towards the end of the cartel's existence, regional sales representatives of the companies began to hold separate meetings on local issues.

The price setting procedures became increasingly elaborate as time went on (Connor 2001: Table 8.A.5). At its first meeting the cartel set only one price for North America and Europe combined. However, in plans for a December 1992 price increase, the cartel specified three price zones,

[8] Cartel participants generally believed that the volume of lysine demanded fell 30%, the winter period compared with the peak months (Tr. Ex. 10-T and 128-T). This number seems exaggerated for the U.S. market, and because seasonality is absent in tropical areas, global seasonality ought to be much less pronounced. Also, Southern hemisphere seasonality compensated for some of that in the Northern hemisphere.

with the highest price in North America, the lowest in Asia, and Europe in between. These December prices were superseded by an agreement in October 1992 in Paris. At this meeting eight prices were specified, including four in local currencies. From this point on, the European price was set in Deutschmarks at a relatively high level. Latin America was priced separately and four price zones were created for Asia/Oceania. By January 1995, thirteen different regional prices were specified. The CIF prices assigned to various Asian countries give evidence of considerable geographic price discrimination.

Concerns about Entry into the Industry

Members of the lysine cartel were conscious of the possibility of entry by companies outside the cartel. At the three-company meeting in Mexico City in June 1992, Wilson said that ADM's rapid and large-scale entry in 1991 prevented two large biotechnology companies from entering the lysine industry (Tr. Ex. 4-7).

> ". . . the fact is [ADM's entry] did stop Rhône-Poulenc and Degussa from entering the lysine business. In particular, Degussa was trying to implement plans to build a 20 thousand ton lysine production plant in North America, but due to the announcement of ADM's plans . . . they abandoned those plans . . . and . . . this had the same effect on Rhône-Poulenc's plans" (Tr. Ex. 4-T).

ADM became aware of Degussa's plan when Degussa requested quotes from ADM for a long-term dextrose supply contract. To cope with the Degussa threat, ADM at first proposed to Degussa that they form a lysine joint venture. When Degussa declined, ADM built its own plant with great haste.

The first new capacity for lysine production outside the cartel's control was a plant built in Kaba, Hungary in the late 1980s. The plant, which began production of lysine in 1991, was 13%-owned by Kyowa Hakko. When the lysine cartel was formed in 1992, Kyowa told its co-conspirators that it had no managerial control over the Hungarian facility. This fact, plus the plant's small size (5,000 tonnes) and orientation to the local Hungarian market, convinced the cartel that it could be ignored for pricing decisions in the world lysine market.

The second instance of fringe entry occurred in 1994. In 1992, Degussa quietly formed a joint venture named Fermas with a Slovakian company named Biotika. After an investment of 60 million Deutschmarks, the Fermas plant began production of methionine and lysine in 1994.

ADM and Sewon knew about Fermas as early as June 1992, but believed that it would have major start-up problems (Tr. Ex. 140-T). Because Fermas' lysine capacity was only 3,000 tonnes and it marketed its lysine in Eastern Europe, the cartel could afford to ignore this small player except as a harbinger of things to come. ADM was aware of conditions in Eastern Europe because it had non-controlling equity investments in a small Ukrainian lysine venture through a partnership with Amylum of France.[9]

A third example of small-scale entry into lysine occurred in 1995. A plant built by AECI Corporation in Durban, South Africa with about 11,000 tonnes capacity was significant enough for the cartel to take notice. At its January 1995 meeting in Atlanta, the cartel set 1995 global volume quotas for each of its five members, but only after subtracting 3,000 tonnes of sales for the new AECI facility (Tr. Ex. 17-T). The conspirators knew that AECI was beginning production in the second half of 1995 and that the cartel would be able to capture only residual demand once AECI became a source of global supply.

The Cartel's Production Capacity

More than 90% of new production capacity being created during 1991-1995 was from plants controlled by the five cartel members themselves (Figure 8.2). ADM's initial 1991 capacity in Decatur of 60,000 tonnes was nearly doubled by late 1992 or early 1993. Ajinomoto added 22,000 tonnes of capacity to its Iowa plant in 1992 and began another 20,000-tonne expansion in 1994 or 1995. Kyowa's two North American plants had almost 20,000 tonnes of capacity added on during the early 1990s. All in all, North American lysine production capacity rose from 100,000 tonnes in 1991 to 200,000 tonnes by 1995 or 1996.

Capacity rose abroad as well. Ajinomoto added almost 30,000 tonnes of production capacity at its plants in France, Italy, and Thailand. Kyowa added perhaps 10,000 tonnes to its Japanese plant. But the most assertive companies were the two from Korea. Cheil tripled its Indonesian plant's capacity during the conspiracy, adding 20,000 tonnes. Sewon's expansion efforts at its sole plant in South Korea were even greater: 40,000 tonnes of annual capacity were built during the conspiracy.

Members of the cartel were intensely curious about each other's lysine capacities during its formative stage in 1991-1992, but thereafter showed little interest. In June 1992, at the ADM-Ajinomoto-Kyowa meeting in Mexico City, considerable discussion took place about plant and company manufacturing capacities. ADM presented its estimates for each

[9] Amylum was a joint venture between ADM and Eridania Beghin-Say, but sometime in the early 1990s, Tate & Lyle replaced Eridania.

of the 11 lysine plants around the globe (Connor 2000:Appendix Table A5). However, Ajinomoto and Kyowa both claimed capacities that were 50% higher than ADM's estimates (Tr. Ex. 4-T). In that meeting ADM claimed that its Decatur plant had 113,400 tonnes capacity, but just a few days before a Sewon delegation to Decatur had toured the plant and been told that its capacity was 70,000 tonnes (Tr. Ex.140-T). Even a year later despite another plant tour for Ajinomoto officials, the Asian producers thought that the Decatur plant was only capable of 60 to 100,000 tonnes of output (Tr. Ex. 131). It is very likely that ADM's plant did not reach its planned 113,400-tonne capacity until late 1992 or early 1993.

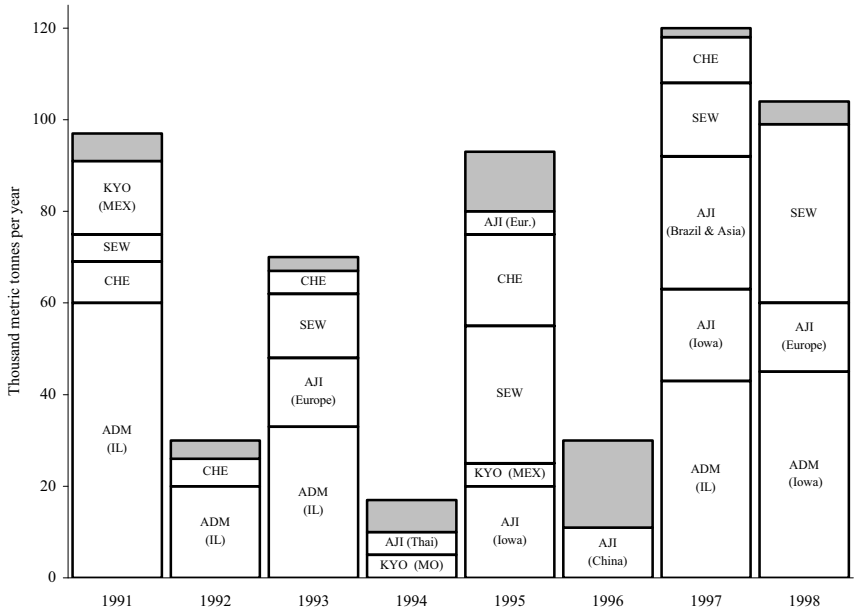

Figure 8.2 Capacity Expansion of Lysine Plants, Completed by Year End 1991-1998.

Source: Connor 1999 (Tables 6 and 7).
Note: Decision to expand or construction normally began about two years prior to completions shown. ADM = Archer Daniels Midland, AJI = Ajinomoto, KYO = Kyowa, SEW = Sewon, CHE = Cheil, and grey = non-cartel. Location follows company name.

In any case, concern about the truthfulness of capacity claims became a moot issue in late 1993 when the cartel came to an agreement on global sales volume quotas for lysine. If the participants adhered to their

assigned sales volumes, then the maintenance of excess production capacities or exaggeration about those capacities was of little concern by the group. In fact, in 1992 and subsequent years, global capacity was more than sufficient to satisfy global demand (Connor 2000: Tables A5 and A6). For example, for December 1992, the best estimate of global capacity is about 300,000 tonnes. This implies that 73% to 76% of plant capacities were being utilized. In 1994, because of plant expansions begun before the cartel had agreed to volume shares utilization actually dropped to 68%. The rise in excess capacity worldwide may have stemmed from the belief that it would be needed to maintain market share when the cartel broke up.

Costs of Lysine Production

Participants in the cartel were intensely curious about each other's costs of production, but costs were a matter of some uncertainty throughout the conspiracy. Some of the uncertainty stemmed from differential access to the most efficient microbes, but there were also big differences in the composition and costs of feedstock (the primary cost of manufacturing) and plant designs. Another source of confusion, and even intentional obfuscation, concerns which concept of costs was being used. In some cases average variable of manufacturing alone seems to be the number articulated. On the other hand, in some contexts the appropriate cost concept was average total costs, inclusive of both manufacturing costs and the costs of storage, shipping, and selling lysine.

Most sellers made statements to each other that exaggerated how low their costs were. When Sewon officials visited the new Decatur plant in 1992, ADM managers claimed that their costs were only $0.60 per pound (presumably average total manufacturing costs) (Tr. Ex. 140-T). Whitacre emphasized the huge size of the plant, low corn costs, extensive power co-generation, and cheap dextrose made on the premises as factors contributing to ADM's low costs. Sewon's memorandum of the meeting shows evident concern that their company was at a cost disadvantage because of its distance from the U.S. market.

At times some cartel members appeared to be well informed about each other's costs. Industrial espionage was not unknown. Kyowa paid a "consultant" with close ties to the head of ADM's lysine operations to reveal ADM's costs of production. In early 1992 Sewon lysine manager J.S. Kim reported on an extensive interview of an experienced Japanese lysine expert, one who seems to have been connected with Kyowa. One passage seems to imply that average total costs of exporting lysine from Asia to North American were in the range of $0.95 to $1.00 per pound

(Tr. Ex. 127-T). This expert believed that Ajinomoto's U.S. operations were disadvantaged by having to purchase liquid dextrose from Cargill at a price about 5 cents per pound more than ADM's own self-supplied dextrose would cost. However, this disadvantage was compensated almost equally by Ajinomoto's superior fermentation yields.[10] In other words, ADM and Ajinomoto's Heartland Lysine had equal costs of manufacturing.

Costs were a major topic at a meeting in Seoul among the three largest Asian producers in June 1992 when the U.S. price was $0.70 per pound. Biokyowa and Heartland could at least cover their variable costs, implying that average total costs were in the $0.75 to $0.85 range (Tr. Ex. 125-T). However, Miwon admitted that in exporting to North America it could not cover its variable costs because of trans-Pacific shipping costs. ADM had a more pessimistic view of Ajinomoto's U.S. costs of production. At a meeting in June 1993, Whitacre opined that Ajinomoto's manufacturing costs were as high as $0.90 per pound (Tr. Ex. 134-T).

Exhibits presented at the trial in the case *U.S. vs. M. Andreas et al.,* contain excellent information on ADM's costs of manufacturing and distribution (Tr. Ex. 60-67). During the year prior to the conspiracy, as output increased from 4 to 10 million pounds per month and as yield failures (contamination episodes) became uncommon, total costs of manufacturing slid systematically from $1.40 to $0.63 per pound. After June 1992, as plant production varied from 10 to 18 million pounds per month, variable costs of manufacturing were positively related to dextrose costs, but averaged $0.53 per pound; total manufacturing costs were predictably close to $0.63 per pound. During the conspiracy, when one adds worldwide marketing costs, average total costs varied from about $0.73 to $0.78 per pound, but did not vary systematically with monthly volume (Figure 8.3). From this information, one can conclude that when output exceeded 10 million pounds per month ADM's average total costs were constant and, therefore, equal to tong-term marginal costs.[11] In a competitive market, price will equal long-run marginal costs plus a reasonable rate of return on investment for the lysine industry.[12]

In sum, the competitive price for the lysine industry, assuming that ADM's were the lowest in the industry, would be expected to have been $0.77 to $0.83 per pound during 1992-1995. Because distribution costs to

[10] During the cartel's existence, ADM's lysine department paid from $0.15 to $0.25 per pound for dextrose. Cargill's costs of making dextrose were very similar. Thus, Cargill was making a high gross profit of 20 to 33% on its sales to Heartland Lysine.

[11] As production volume rose from 10 to about 20 million pounds per month, declining average fixed costs of manufacturing were offset by increasing average variable costs of distribution. At high levels of output, ADM needed to sell a higher portion of lysine overseas where distribution and selling costs were higher.

[12] ADM itself, its major public corn wet milling rivals, and U.S. companies in the organic chemicals manufacturing industry earned pre-tax profits close to 6% of sales.

U.S. customers were lower than the world average, the expected U.S. price would have been a few cents lower.

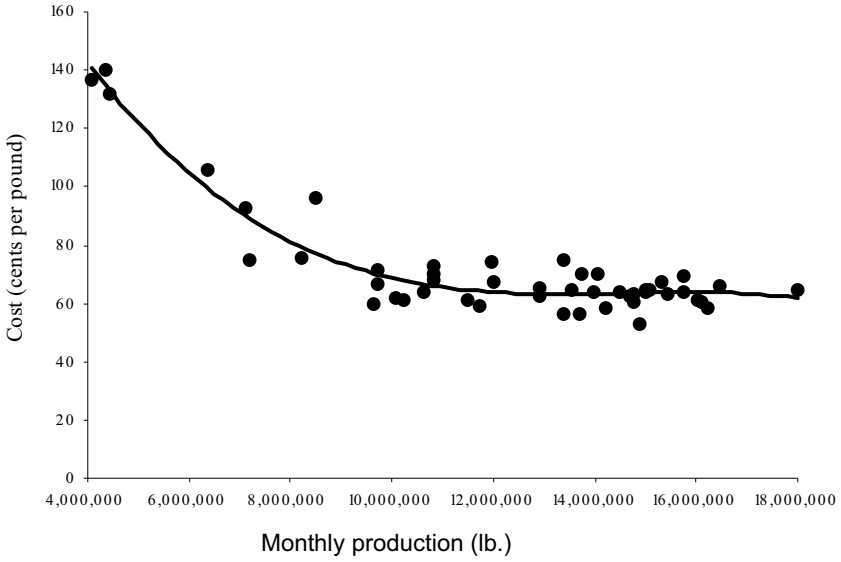

Figure 8.3 ADM's Lysine Manufacturing Costs, 1991-1995.

Capacity Utilization

Capacity and utilization levels of that capacity are key considerations in analyzing competitive conditions in an industry. When all the sellers in a market are operating at maximum feasible capacity, even if an industry is perfectly competitive, short-run prices will rise to level that will cover average total costs (including an opportunity cost of capital) of the highest-cost manufacturer. However, with no capacity constraints, price will gravitate toward to the minimum average total cost of the lowest cost producer. Capacity constraints also facilitate non-competitive pricing conduct. In a cartel with capacity constraints the likelihood of cheating on price or on market-share agreements is very low in the short run, and thus, an elaborate system of monitoring prices or sales volume becomes unnecessary. On the other hand, excess capacity (low utilization) helps scare away potential entrants and keeps prices high in the long run.

One can compare global sales with rated capacities to develop a utilization figure. In 1992, sales volume for lysine was 234,000 tonnes, while rated capacity was about 285,000 tonnes. Thus, about 80% of global lysine finishing capacity was being utilized. In 1994, the year with the

most accurate data, utilization was 74% of capacity, dropping to 65% in 1995. Thus, the cartel's elevated prices and production constraints brought about increased costs due to excess plant capacities.

At the first Paris meeting, the other lysine producers were told that ADM currently operated at a 60% utilization rate in high fructose corn syrup and at 80 to 85% in citric acid (Tr. Ex. 34). These figures may be too high if fermenters being used for making related products can be converted quickly and at low cost to manufacture lysine. The trial record contains tantalizing tidbits that suggest that such "swing capacity" existed. In 1992, Ajinomoto bought an existing MSG plant in Italy and was able to convert it quickly to lysine production, but at what cost or rate is not known precisely (Tr. Ex. 127-T). Lysine plants owned by Ajinomoto and Cheil in Asia made both MSG and lysine. With swing capacity, utilization rates of lysine plants alone would have less competitive significance.

The Lysine Association

From the first contacts made in April 1992 with his Asian rivals, ADM's Terrance Wilson pushed for the formation of a formal lysine association to facilitate the conspiracy. Wilson had in mind two models, the European Citric Acid Manufacturers Association (ECAMA) and the Corn Refiners Association (CRA) in the United States. Both of these organizations held regular meetings to discuss matters of common interest, and both collected members' sales data. ECAMA collected citric acid sales volumes monthly and shared all that information with each of its members, an activity potentially illegal under antitrust laws. The biennial meetings of ECAMA were pretexts for holding secret parallel price-fixing sessions for citric acid. In June 1992 a high-level delegation from Sewon visited ADM's headquarters and plant in Decatur. Sewon specifically stated to ADM that it was agreeable to the formation of a lysine association. Wilson proposed forming an association that would meet at least twice a year and report sales frequently. The sales reports should be independently audited by an international accounting firm (Tr. Ex. 34).

It was at the December 1992 cartel meeting that Wilson most fully explained how ADM's arrangements in its citric acid conspiracy could be a useful model for lysine as well. These arrangements included setting market shares and prices in each country or region, elaborate reporting of trade secrets (e.g., prices charged to individual customers in each geographic market), regular audits by professional accountants, and a compensation scheme for members that failed to achieve their targeted sales.

At the five-company meeting in Vancouver in June 1993, there was also extensive discussion about setting up an association. Except for

Cheil, they all agreed that the association would serve at least two useful purposes: collecting information of the size of the lysine market and as a cover-up device (Tr. Ex. 134-T). One proposal would be to create a lysine section within the European Union's International Council for Feed Additives (INCOFA) located in Brussels.

In October 1993, the five members of the cartel had an extensive discussion about the details of the Amino Acid Manufacturers International Association (AAMIA), as their new organization would be called. The key decision was to organize AAMIA as a "working party" affiliated with the European Federation of Feed Additives National Associations (FEFANA). FEFANA is an organization sponsored by the Agricultural Directorate (DG-VI) of the European Commission in Brussels. The direct members of FEFANA are national organizations of companies in the animal feeds industry, but FEFANA also permits "working parties" of multinational industry groups to join. By October, an AAMIA task force had already met twice and had produced documents that would facilitate recognition as a FEFANA working party in late October. In addition to the five lysine manufacturers, AAMIA decided to invite six methionine manufacturers to join the group at its first working party meeting in December.

On December 8, 1993 four of the five cartel members met in Tokyo mainly to fix prices (Tr. Ex. 142-T). The four companies agreed to submit an audited report of 1992 sales to the AAMIA by the end of January. Cheil expressed its displeasure by its absence. Apparently, the first formal meeting of AAMIA took place in Tokyo the next day.

The formation of AAMIA did not resolve all friction among cartel members. The two Korean conspirators, Sewon and Cheil, were the least cooperative with AAMIA in reporting sales volumes to the cartel. Internal memoranda of June and August 1992 meetings with Ajinomoto and Kyowa representatives in Seoul demonstrate Sewon's skepticism (Tr. Ex. 125-T and 126-T). A long internal Sewon memorandum written in December 1994 discusses difficulties caused by auditing of lysine sales volumes. Sewon was concerned about Ernst & Young displacing its local auditor and reporting volume levels that would be higher than Sewon wanted to report to cartel members (Tr. Ex. 136-T). A Sewon lysine manager suggested that hiding true volume would be difficult, but that volume could be "adjusted" by introducing "minor error by willful negligence." Sewon's position is strange, because estimates of its sales tonnage for 1992 presented to the cartel (Table 8.A.6) are accurate reflections of its true 1992 sales volume (Tr. Ex. 136-T). Although it withheld its monthly sales for a while in 1994, by early 1995 Sewon was again supplying data (Tr. Ex. 138-T).

Concerns about Antitrust Violations

Cartel members were aware that their discussions were antitrust violations. At a meeting in Seoul, Korea of all four Asian manufacturers in August 1992, Cheil objected to having future meetings in Korea because of "legal matters," presumably concerns about Korea's young but relatively rigorous antitrust agency (Tr. Ex. 126-T). Even in Tokyo fixing a domestic price "can cause trouble," but ". . . talking about 'fixing an international price' is alright" *(ibid.).* Further evidence of the cartel's consciousness of the antitrust illegality of their activities comes from a memorandum of its Hawaii meeting in 1993 (Tr. Ex. 137-T). The Asian firms were reluctant to audit the sales data being sent monthly to Mimoto at the end of the year, claiming that replacing their regular auditors with a large international auditing firm might be illegal. Wilson demurred, saying that ". . . price negotiation is illegal, not the volume auditing." At their Atlanta meeting in 1995 participants made nervous jokes about the FTC knocking at their hotel room door.

To avoid detection, Wilson's opinion was that few people should attend the price-fixing sessions. ADM did keep the number of employees knowledgeable about the conspiracy limited to three or four employees at the beginning.[13] Wilson also declared that ADM would not send representatives to regional meetings of local managers. Regional meetings did occur without ADM's participation. An Ajinomoto manager agreed to transmit the substance of such a European meeting on prices by telephone to Whitacre.

Perhaps the best evidence that the group was aware of that they were violating the antitrust laws showed up in their consistent efforts to hide their activities from the antitrust authorities. At the Paris meeting of October 1992, the first at which all five companies sent representatives, the local host prepared a fake agenda that included topics such as environmental constraints, animal rights, and "interest of [sic] setting an International Amino Acid Producers Association" (Tr. Ex. 9). In fact, extensive notes taken at the meeting by J.S. Kim of Sewon show that the meeting was dominated by price-fixing details and never covered the fake agenda items (Tr. Ex. 128-T).

The lysine association was intended to provide reasons for the members to travel to a central location for meetings; travel invoices and credit card charges could ostensibly be covered by travel to a legitimate industry association. The conspirators took pains to avoid meetings on U.S. territory until the 1993 gathering in Hawaii. At the FBI's prompting,

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[13] Eventually at least eleven ADM employees would come to know about the lysine conspiracy besides Andreas, Wilson, and Whitacre (Connor 2001: 232-233).

Whitacre urged the group to meet there. When Whitacre proposed the Hawaiian venue, Mimoto expressed his concern about the severity of the U.S. antitrust laws. It was the temptation to play golf at a luxurious course that overcame their fears (Eichenwald 2000).

Using the mail was avoided in favor of faxes and telephone conversations that often times included code words and code names. Conspirators were urged to destroy written records of the meetings, but this dictum was often ignored by the Asian companies' employees who typically kept diaries or wrote detailed memorandums for their supervisors.

ADM's Charm Campaign

ADM had a general reputation as a tough, indeed ruthless company. The other lysine producers had seen ADM bully its way into the industry in 1991-1992. This reputation made cooperation difficult at first.

However, in mid-1992 ADM tried to reassure its future partners in crime of its good will by displaying remarkable candor about many aspects of its technology of production, information that is normally treated as a trade secret by biotechnology enterprises. ADM twice gave complete tours of its Decatur plant, first to Sewon in June 1992 and second to Ajinomoto in April 1993. Ajinomoto's lead conspirator later described a plant tour of this type as "very unusual." During the first tour, ADM revealed its lysine production capacity, its costs of manufacturing, the employment size of the Bioproducts Division (120 persons), production capacities of six ADM products (dry corn, soybeans, sorbitol, dextrose, alcohol, and carbon dioxide), the name of the company supplying its MSG technology, the identity of its enzyme supplier, and future products in pilot production. It is doubtful that any of these facts were publicly known (Tr. Ex. 140-T). ADM also admitted that two former Ajinomoto employees had supplied lots of technical information about Heartland's lysine operations to ADM.

At another general meeting of the cartel in late 1992, ADM again revealed a substantial amount of proprietary information about its Biotechnology Division to its Asian co-conspirators (Tr. Ex. 135-T). Partly this presentation was designed to boast about its size and prowess, but partly it was a demonstration of ADM's intention to be an open, candid, and reliable business partner in the price-fixing venture. ADM told the others details about its three domestic (Decatur, St. Louis, Atlanta) and six overseas sales offices (UK, Singapore, Sidney, Tokyo, Mexico, and Miami for South America). The group was told of the Division's present and future product portfolio, in particular about its imminent entry into vitamin B2 production. Specific information was shared on recent capital equipment purchased, such as the size of its largest fermenters (31 million liters per

year). In general, ADM's reports to its co-conspirators exactly matched ADM's own internal manufacturing records (Tr. Ex. 61).

ADM was particularly concerned about keeping good relations with Ajinomoto, the volume leader of the lysine cartel, because it relied on the company to liaise with the other three members. Ajinomoto's CEO Toba was entertained in Decatur in a lavish fashion (Lieber 2000). At a dinner at the Four Seasons Hotel in Chicago in April 1994, Michael Andreas promised to take his father Dwayne to visit Ajinomoto's headquarters in Japan. Later, Andreas vowed to reduce ADM's output of monosodium glutamate (MSG) by 50%. In the previous July, Ajinomoto had proposed that a cartel be launched for MSG (Eichenwald 2000: 164).[14]

ADM's charm campaign, though probably genuine, had only limited success in quelling an unruly group whose only glue was the glitter of profits.

Continuing Cartel Contentiousness

It was not easy for the five lysine producers to arrive at a consensus on prices and volumes. Distrust and disagreements of many kinds permeated the discussions among the five from the beginning of their contacts in early 1992 until their last meetings in early 1995. The greatest number of complaints was directed by the four Asian companies against ADM, but complaints by both Japanese companies and ADM against the Korean companies were not far behind. There were relatively few criticisms made about Ajinomoto and Kyowa, who acted as buffers and liaisons between the two more assertive wings of the cartel.

The cultural gap between ADM and the other companies was significant at the beginning of this story. It narrowed over time, but never closed completely. ADM's two plant tours helped reduce Asian companies' skepticism about ADM's capacity, but as late as 1993 when the Decatur plant was fully built, some of the Asian firms remained doubtful about its size. At the cartel's first major meeting, ADM attempted to create trust by giving its best estimates of lysine capacities (Tr. Ex. 4-T). The senior Ajinomoto manager's notes of that meeting indicated that he found ADM's figures for Ajinomoto so close to his company's actual figures that he speculated that ADM had a spy at Heartland Lysine. His concerns were well founded.

At a May 1993 "summit" meeting of the three largest Asian companies, Ajinomoto and Kyowa took the candid position that "Each company is

[14] ADM was not criminally indicted in the U.S. for price fixing MSG but it was successfully sued in civil cases. ADM's criminal plea agreement in October 1996 probably immunized the company from prosecution for its MSG price fixing.

lacking reliability . . . There is no measure against a contract violation" (Tr. Ex. 130-T). That is, the Japanese thought that the cartel had a problem of disciplining deviants from price or volume agreements. In June 1993, near the end of several months of dissension within the cartel, at a meeting of the four Asian producers in Tokyo Cheil raised concerns about ADM's misuse of the proposed lysine association. Cheil's representative's minutes of the meeting say: "ADM's attitude is not clear: Are they not [going to] use this to get information and one day they betray?" (Tr. Ex. 131).

Five months later at the cartel's second Paris conclave, on the whole a friendly and businesslike meeting lubricated by a dinner at one of the city's temples of gastronomy, ADM and Kyowa clashed openly about one of the main episodes that led to a decline in the group's consensus in the spring of 1993 (Tr. Ex. 135-T). The dispute concerned ADM's aggressive drive into Latin American lysine markets, which Kyowa viewed as a threat to its perceived franchise in the area by virtue of its ownership of Latin America's only lysine plant in Mexico. "Latin American – this is the area over which the Japanese (especially Kyowa) and ADM disputed each other most strongly" noted Sewon's representative *(ibid.).* Acrimony over ADM's perceived aggressiveness largely disappeared at the cartel's meetings once the late-1993 volume-allocation agreement was successfully implemented. So long as members of the cartel made progress toward keeping to their global market shares, arguments over sales in particular regions became moot.

The great majority of accusations of bad faith were aimed by ADM and the Japanese companies toward the two Korean firms. Even though Sewon seems to have cooperated somewhat more consistently with cartel demands for discipline, Sewon's larger capacity made it a more frequent object of criticism than the guiltier but smaller party, Cheil. At times the Korean firms were excluded from cartel discussions.

Sewon was not invited to the cartel's first overtly collusive meeting in Mexico City (Tr. Ex. 4-T). Sewon hosted two meetings with Ajinomoto and Kyowa in Seoul in June and August 1992 to try to hammer out a response to ADM's initial demands. Significantly, Cheil was not invited, probably because it was viewed as the least likely to cooperate in any plan that restrained its sales. At these meetings Sewon was interested in a price agreement but highly skeptical that a volume-allocation agreement could be reached, implemented, or monitored (Tr. Ex. 125-T). If surveillance of such an agreement involved export statistics, ". . . our company will be the most disadvantaged" said a Sewon internal memorandum. At the second Seoul meeting, a volume agreement was again discussed at length, but ". . . no one agreed. Especially we/our company cannot," said a Sewon document.

Sewon was often accused by the other lysine producers of aggressive sales increases. At a top-level meeting of the big three Asian producers in Tokyo a year later (May 1993), Sewon was accused by Kyowa of being primarily responsible for the spring 1993 price declines. Kyowa's Managing Director Akita was blunt: ". . . it is Japan's view that the price drop this time was due to [Sewon]. Definitely it is because of [Sewon]" (Tr. Ex. 130-T). At the otherwise harmonious second meeting in Paris in October 1993, Sewon was accused of aggressively increasing exports to both the United States and Europe (Tr. Ex. 135-T). In its own memorandum of the meeting Sewon admits that its export volumes did increase 18% and 25%, respectively, from the previous year.

In late 1992 Sewon came under intense pressure from Ajinomoto to accept a 34,000-tonne allotment. An angry telex from Ajinomoto in mid-November shows that Sewon was trying to maneuver for a 37,000-tonne share (Tr. Ex. 28). The minutes of the December 1993 Tokyo meeting show that Sewon was eventually forced to accept the lower volume allocation (Tr. Ex. 142-T). One part of the volume plan Sewon could not stomach was the idea of faithfully reporting honest volume data to one of the big five international accounting firms (Tr. Ex. 136-T). In fact, during part of 1994, Sewon stopped sending its monthly volumes of sales to Mimoto, an action that threatened to unravel the cartel's consensus (Tr. Ex. 17-T). At the 1995 Atlanta meeting Sewon began agitating for a 46,000-tonne allocation for 1995, an extraordinary 25% increase at a time when general market growth was one-fourth that rate. It had to settle for a 39,000-tonne allocation in the end, but Sewon's minutes of the meeting indicate bitterness about the low quota.

Cheil Jedang was closest to being a maverick throughout the cartel's existence. The other four sellers consistently underestimated its production capacity and its stubborn desire to grab disproportional increases in market share. Cheil was the firm least likely to attend conspiracy meetings and the most likely to play hard-ball tactics to get sales increases. It rarely shared information with the others about its capacity and sales plans. Cheil's uncooperative stance was discussed at the 1993 meeting of the three other Asian manufacturers in Tokyo (Tr. Ex. 130-T). The Japanese were blunt: "[Cheil] is no less a trouble maker than ADM." Kyowa's representative said that ". . . the big worry is the attitude of Cheil Jedang."

Cheil first sent a representative to a conspiracy meeting in Tokyo in June 1993 (Tr. Ex. 13 l-T). It expressed its concern about sharing proprietary sales information with ADM. That same month at the five-party Vancouver meeting, Cheil boycotted part of this meeting in order to extract a higher volume share than had been proposed earlier (Tr. Ex. 134-T). Cheil attended the Paris meeting of October 1993, but boycotted the next meeting in Tokyo (December 1993) to demonstrate its unhappiness at the

low volume share being offered to it (14,000 tonnes) which was 6,000 tonnes less that it demanded (Tr. Ex. 142-T). In early 1994 Cheil apparently agreed to accept the cartel's quota offer. It had taken a long time for the maverick to be broken.

In general, it was Ajinomoto and Kyowa that acted as the glue that held the cartel together. They often had a moderating influence in the negotiations at several points. Although clearly concerned about their impending loss of industry leadership, eventually they came to a position of almost fatalistic acceptance regarding ADM's drive to become Ajinomoto's peer. More importantly, the others must have recognized that the two oldest firms in the industry were sacrificing some of the growth they could have had without an explicit agreement. In the end, it was the Japanese companies' acceptance of virtually no growth in the volume of sales that made the cartel. ADM and Cheil were, in market-share terms, the biggest winners.

The Cartel Is Unmasked

The little Corn Belt city of Decatur, Illinois had never seen anything like it. Later, residents would call June 27, 1995 "Gestapo Night" (Lieber 2000). Residents were used to seeing convoys of limousines conveying Washington big-shots or foreign dignitaries in town to meet the powerful Chairman of ADM. But the scores of dark cars filled with 70 to 100 FBI agents and Department of Justice lawyers who flooded the town that night seemed like a nightmarish invasion.

The majority of the FBI agents headed off in pairs to interview virtually every ADM officer wherever they were that night. Around 5:30 p.m., Terrance Wilson, drink in hand, was found at a local country club. Simultaneously, Vice Chairman Michael Andreas was interviewed in his home (Eichenwald 2000). During the taped interviews, all the officers were asked questions about their knowledge of price fixing by ADM in the markets for lysine, citric acid, and high fructose corn syrup.

The interviews with Wilson and Michael Andreas went a little differently. For Andreas, the FBI played incriminating excerpts of meetings on a tape recorder. The agents made a one-time offer to both men: if you agree to cooperate in our investigation, they said, the government will go easy on you (Tr. 3503-3508). Wilson and Andreas refused to cooperate, and they lied repeatedly to the FBI agents about their involvement in the conspiracies (in itself a federal crime). Even worse, the explanations of their activities they did give during their FBI interviews contradicted their lawyers' theories when they had to defend themselves in court three years later. As soon as Wilson and Andreas turned down the offers of cooperation,

around 6 p.m. the largest contingent of FBI agents moved to ADM's corporate headquarters building. Armed with subpoenas and search warrants, they began to remove boxes and boxes of documents from the files of certain offices. The offices of Michael Andreas, Terrance Wilson, Barrie Cox, and Mark Whitacre were given particularly close scrutiny.

The scene in Decatur was repeated at the U.S. headquarters or sales offices of nine other companies. Investigators found a treasure trove of documents showing volume targets and actual volumes of lysine in the files of Heartland Lysine in Chicago, Biokyowa in St. Louis, and Sewon America in New Jersey. Eventually, more than 2 million documents would be cataloged. However, the interviews on the night of the raid produced practically nothing of value.

By 6:30 or 7:00 p.m., ADM's general counsel was calling all the ADM officers in Decatur and ordering them to say nothing to the FBI. The ADM employees proved to be a loyal bunch. It would take the government more than a year to get any of them to cooperate, and then only under the protection of an immunity agreement.

ADM's immediate reaction was to contact one of their law firms, the well connected Washington, DC firm of Akin Gump, which immediately flew squadrons of lawyers to Decatur. Those lawyers began to interview top ADM executives. The Andreases wanted to know the identity of the whistle-blower. At one point Dwayne Andreas even suspected ADM President James Randall, his right-hand man for almost 30 years (Eichenwald 2000: 327).

Despite being warned by his FBI handlers, on June 28th Mark Whitacre confided to an ADM lawyer about his role as an informant to the FBI for the previous 32 months. When he heard about Whitacre's role as a mole, Dwayne Andreas said that Whitacre would "learn to regret the day he was born." The next day, Whitacre was ordered to leave ADM headquarters. He was fired on August 7, 1995.

It is fairly safe to assume that the conspiracy ceased to function on that day, June 27, 1995. It had begun in Mexico City on June 23, 1992, almost exactly three years before.

Chapter 9: Economic Effects of the Lysine Cartel

This chapter documents the economic effects of the lysine cartel on prices, production levels, international trade, and buyers' incomes. Monetary estimates of these effects typically play a key role in legal actions to punish cartels or compensate their victims. The legal ramifications of the lysine cartel are discussed in Chapters 13 to 15.

The principal objective of the lysine cartel was to raise selling prices around the world, thereby generating profits well in excess of the profits cartel members would have earned if the normal forces of demand and supply had been allowed to play out. The decision to collude or not to collude involves a weighing of expected benefits and costs. The corporate benefits are primarily the increases in company profits above normal levels combined with a subjective probability of the likelihood of success. Personal benefits may accrue to participants as well through faster job promotions, profit sharing, and the excitement of undercover activities. The costs are probabilistic notions of the social and economic pain that might be imparted by prison time or fines for antitrust violations adjusted downward by the probability of being caught, indicted, and found guilty. The probability of discovery is well under 100% (see Box).

Price Effects

Civil antitrust proceedings and the criminal trial of Andreas, Wilson, and Whitacre released abundant information on prices charged for lysine from 1991 to 1995. Without these legal documents, the behavior of prices would remain hidden or cloudy to this day.

U.S. quarterly transaction prices for dry feed-grade lysine in 1991 to 1995 are shown in Figure 9.1. This price series is the weighted average price received by the four largest suppliers of lysine. Only sales to customers located in the United States are included. These prices reflect all contract sales (and customer rebates) at prices below list as well as a small portion of spot sales at list prices.

Weighing Benefits and Costs

Take, for example what might have gone on in Terrance Wilson's head. On the benefits side, Wilson was caught on tape asserting that the lysine industry was giving up $200 million in profits by not agreeing to raise their price to $1.20 per pound (Tr. 712-714). ADM's share would be about $60 million per year, and these extra profits would propel ADM's stock prices upwards, which would monetarily benefit nearly all ADM officers. Perhaps he guessed that the cartel would four years. Wilson had helped get the citric acid cartel going the previous year, and it had been performing admirably well in his eyes. Even if the lysine conspiracy was going to be more of a challenge, perhaps Wilson thought that it had an 80% chance of success. This means that the probable benefits to his employer would be $192 million over four years.

The cost calculation is rather more difficult on which to put a dollar figure. Fines were capped at $10 million, and it had been decades since the DOJ had won a price-fixing case at trial, so it would be natural for Wilson to trivialize the costs to ADM. At worst, if Wilson was sentenced to the full extent of the law, he would face three years in prison and be fined $350,000 and pay legal defense costs. In the early 1990s most conspirators spent no time in prison and paid small fines. Wilson may have mused on his poor health (a serious heart condition) and the few years he had remaining until retirement. And the chances of being caught? Probably less than 10%. Pain and suffering? He was a Marine. Loss of his ADM pay? Less than $5 million for sure. Wilson might well have valued all these possible costs at no more than $10 million, of which 10% is $1 million. The net benefits are $191 million.

The decision is clear. Take the risk.

U.S. lysine prices averaged $1.12 per pound in 1990, the last year of the price-fixing by the three oldest manufacturers: Ajinomoto, Kyowa Hakko, and Sewon. Thereafter, prices fell three times (January 1990-July 1992, January-June 1993, and January-September 1995) and rose to plateaus twice (July-December 1992 and July 1993-December 1994). These price declines were primarily propelled by surge in output from ADM's new plant. Transaction prices rose or fell within a month or two of comparable changes in the cartel's list prices. Transaction prices were nearly always below list. When the cartel was disciplined (i.e., little cheating or discounting off list), the two prices were only a few cents apart. The cartel set list prices as high as it could below the shadow price. But when bickering erupted, disharmony led to a wide gap between list and transaction prices.

Except for a brief seasonal up-tick in prices in October 1991, prices fell inexorably 48% from late 1990 until July 1992. The decline was due to the unilateral actions of ADM. In order to build its U.S. market share quickly, ADM sold lysine at 4 cents per pound (4%) lower than its three market rivals. As a result of its aggressive price cutting, ADM's 1991 growth in sales was extraordinary – quarter-over-quarter volume grew by

an average of 194% (Connor 2001: Table 8.A.1). At the same time, sales volume by the three established manufacturers stagnated. Because ADM poured so much lysine into the U.S. market, the increase in supply outstripped the long-run increase in demand, thus forcing down prices for all sellers.

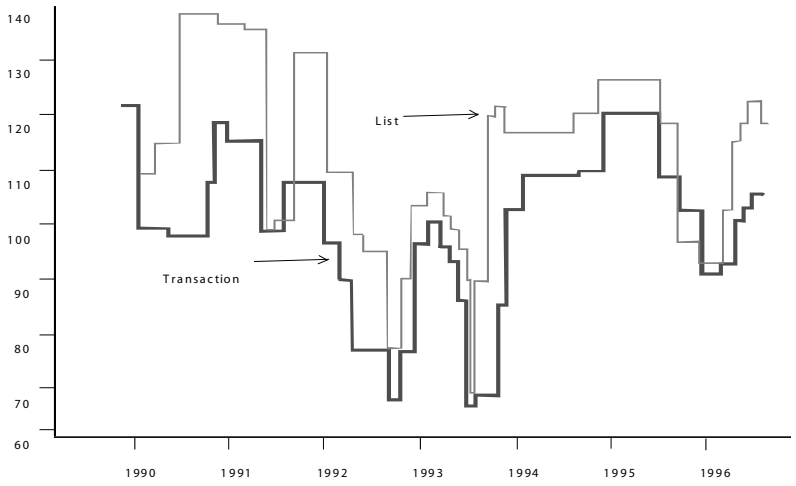

Figure 9.1 U.S. List and Transaction Prices of Feed-Grade Lysine 1990 – 1996.

Sources: Lysine transaction prices supplied by the four largest defendants in a notice to class-action members. List prices from buyers as reported to *Journal of Commerce*.

In the first half of 1992, prices continued to fall, but not because of ADM's underbidding of prices offered by its three rivals. Generally, at this time ADM's domestic selling price was about equal to that of its rivals. However, ADM continued its aggressive increases in output. In the first three quarters of 1992, ADM's quarterly growth was 19%. The three Asian producers suffered a huge decline in their collective market share (Figure 9.2). This slippage continued through the third quarter of 1992 when the three firms' share hit a rock-bottom 29% of the U.S. market. ADM's success in moving from zero to 70% of the market continued in the face of desperate price cutting by the Asian firms.[1]

[1] One reason for ADM's leaps in quantity was that it had become the sole U.S. seller of liquid lysine. Liquid lysine accounted for 10 to 30% of ADM's U.S. volume in 1991-1992.

The plight of the three Asian companies set the stage for the rapid rise and plateau of July 1992 to January 1993. ADM lost money on its lysine operations for four months in mid 1992. Because their costs were higher, most of the Asian companies had negative earnings for six or seven months in 1992.[2] All the evidence points to the Mexico City agreement as the primary reason for the late 1992 price rise of 53%. Moreover, the high November-January plateau immediately followed an amicable meeting of the "lysine association" in Paris. Ajinomoto's global sales manager testified explicitly that prices responded to the agreement made in Mexico City and to all subsequent meetings (Tr. 1468-1666). The CEO of Eurolysine said the same thing, explaining further that the one-month lag in price response was due to price protection clauses in lysine supply contracts (Tr. 2198-99). It is true that the plateau transactions prices of $0.98 fell short of the $1.05 (and later $1.20) price objective, but the 50% increase in price from July to November must have seemed highly satisfactory to cartel members.[3]

U.S. lysine prices tumbled from $0.98 per pound in January 1993 to $0.62 in June. Bickering among the cartel members seems to have been the primary cause of the early 1993 price decline. ADM's demand for a market share equal to Ajinomoto's caused a good deal of friction, as did ADM's rapid expansion into regions long dominated by Ajinomoto or Kyowa Hakko. At the regular, full-scale meetings of the cartel in early 1993, ADM's push for a market share agreement was repeatedly thwarted. The two Korean firms pressed hard for volume shares well above their historical levels. Ajinomoto's executives believed that Wilson had promised that ADM would limit its production to 9 million pounds per month during 1993. In fact, ADM's 1993 monthly production had averaged 13.2 million pounds through October and was rising.

The crisis was resolved at a summit meeting in Irvine, California in October 1993 between ADM's Executive V.P. Michael Andreas and his counterpart at Ajinomoto. This meeting, caught on video by the FBI, largely restored harmony to the lysine cartel. For the second time, prices rose quickly, aided at first by the normal seasonal increase in lysine demand. Moreover, a serious Midwest flood caused soybean prices to rise to very high levels, which lifted the ceiling price of lysine well above actual lysine prices in late 1993. ADM then restrained its production for more than a year to adhere to the Irvine volume agreement.

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2 In 1991-1992, Ajinomoto's U.S. total costs were only 2 to 5% higher than ADM's costs, but Ajinomoto's biggest plant in France was 35% more costly than the Decatur plant. Kyowa, Sewon, and Cheil had higher average U.S. costs in 1991-1992 than Ajinomoto.

3 It has been suggested that the late 1992 price rise has alternative competitive explanations (White 2000). I agree that a quarter of the increase can be attributed to seasonality of demand.

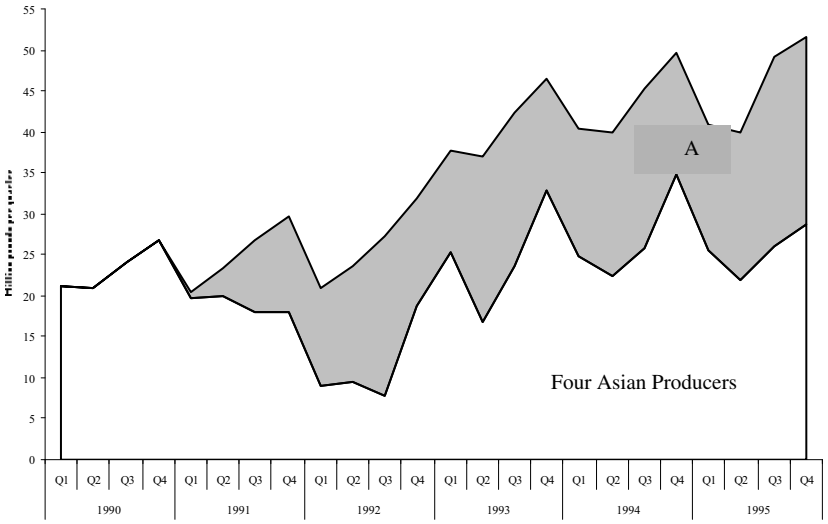

Figure 9.2 U.S. Lysine Sales Volume, Quarterly 1990-1995.

Source: Connor (2001:Table 8.A.1)
Note: The average annual compounded rate of growth in U.S. sales from 1990 Q1 to 1995 Q5 was 14.3%.

November 1993 to January 1995 was the cartel's high point. U.S. lysine prices for months hewed closely to $1.11 per pound, reaching an apogee of $1.22 per pound for several months in late 1994. The volume agreement had ushered in a period of exceptional harmony for the cartel, and the shadow price of lysine remained high.

There was a decline in prices from January to September 1995. This reduction coincided with weakening seasonal demand. The most cogent explanation lies with the ceiling price for lysine. Because of large declines in the prices of soymeal, the opportunity cost for lysine fell from almost $2.00 per pound in 1993 to about $1.00 in mid 1995 (Figure 9.1). This ceiling price dropped below the U.S. transaction price in January 1995 and stayed below for five months. After a lag of a month or two, U.S. transactions prices followed. When the ceiling price rose in mid-1995, so did transaction prices a couple of months later.

Therefore, apart from the influence of seasonal demand fluctuations and one instance of a falling ceiling price, the cartel's decisions to fix list prices controlled transactions prices during the conspiracy period. The

lysine cartel was successful in raising market prices in six out of eight attempts. In general, when the conspirators were cooperating, transaction prices were 3 to 5 cents below list.

Production Effects

The cartel had profound effects on the production levels and capacity investments of the world's leading lysine producers. In the three years prior to collusion, global consumption had grown by 28% per year. However, the high prices in 1992-1995 stalled growth to *one-fourth* the previous rate. Moreover, the advent of the cartel had the effect of freezing the relative positions of the leading firms in comparison to what had been a very fluid situation prior to the conspiracy.

The price of lysine at the peak of the cartel's effectiveness in 1994 reached about $1.20 per pound, which was about $0.50 above the but-for price of lysine. With information on the elasticity of demand (see Chapter 8), it is possible to apply a formula to calculate the value of lost production due to the monopoly pricing (Connor and Peterson 1996: 208). Taking the quantity consumed in 1991 as the base year, this dead-weight loss to U.S. consumers and producers in 1994 was between $11 and $20 million.[4] This dollar loss implies that the 1994 global sales volume was suppressed by 135 to 242 million pounds below what a more competitive market would have generated. Put another way, at its peak the lysine cartel produced about 30% less than the industry would have made without the cartel, and this in turn reduced farm output and retail purchases of pork and poultry.

Global capacity and production volumes may be found in Connor (2001: Table 8.A.3). Prior to the volume-allocation agreement, ADM's capacity grew from nothing to one-third of global capacity in 1993. ADM's capacity grew at the expense of the three established Asian manufacturers. Only little Cheil was able to increase its capacity share in the face of ADM's onslaught. Production shares followed capacity shares except in 1991 when ADM's plant was new.

From 1993 to 1995, both capacity shares and production shares of lysine manufacturers were quite stable. After the cartel broke up in late 1995, notable changes in global shares can be observed (Connor 2001: Table 8.A.3). Shares of the top three companies declined by 7% in 1996. Sewon and Cheil had chafed at their volume restrictions mightily during the conspiracy. As soon as those chains were removed, they returned to their

4 U.S. sales volume in 1991 was 123 million pounds; world volume was 381 million pounds. The own-price elasticity was assumed to be between 0.9 and 1.6. In 1995, U.S. and global volumes were 218 and 655 million pounds, respectively.

old strategy of building new lysine capacity as fast as possible on borrowed money. In the United States Sewon, Cheil, and ADM resumed their aggressive market tactics (Figure 9.3)

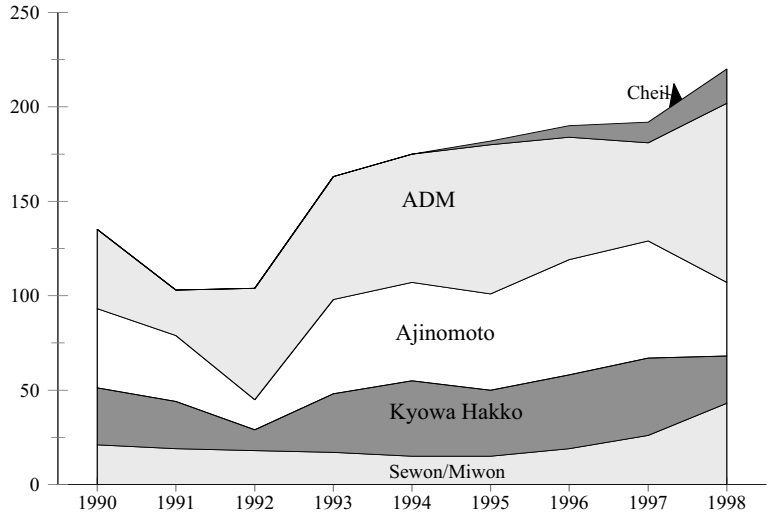

Figure 9.3 U.S. Lysine Sales Volume, by Company, 1990-1998.

Source: Connor (2001: Table 8.A.2)

Effects on International Trade

International trade patterns shifted radically before, during, and after the lysine cartel was in operation. From 1991 on, U.S. exports and ADM's exports are practically one and the same.[5] As part of its strategy to aggressively seek a global market share equal to Ajinomoto's, before the cartel was formed ADM cut prices worldwide, set up foreign sales offices, and established beachheads abroad. The years 1991-1992 approximated a competitive market. During the high point of the cartel in 1994-1995, trade would reflect monopoly behavior. What happened in the late 1990s was a

5 During almost every year of 1990-1995, Ajinomoto and Kyowa had to import lysine to the United States to supplement their U.S. production.

blend of the two situations; tacit collusion or partial cooperation seems to have developed.[6] The years 1993 and 1996 are transitional.

U.S. Export Volume

What happened to U.S. lysine exports during the three competitive periods? First, after a brief burst of growth in 1990-1992, the cartel restrained ADM's exports. From 1992 to 1997, the volume of exports rose an average of about 23% per year (Figure 9.4). During the peak cartel years of 1994-95, export growth fell below the trend. When the cartel ended, export volume doubled, far above the average growth rate.

Second, cartel behavior dampened U.S. exports to the "home countries" of Ajinomoto and Kyowa (i.e., countries in which they owned plants making lysine). During the period of aggressive price cutting, the share of U.S. exports rose to Mexico, France, Italy, Thailand, and Japan and rose faster than average growth in each home market (Figure 9.5). ADM was behaving quite aggressively toward its future co-conspirators. During the cartel's high period, 1994-1995, the share of ADM's exports to Ajinomoto's and Kyowa's home countries was cut in half.[7] After the cartel broke up ADM resumed exporting to the countries in which Ajinomoto and Kyowa dominated production.

Third, ADM shifted its exports toward two areas during the cartel's most effective period. Its share of exports to the Netherlands rose from 25% in 1992 to 35% in 1994-1995. When the cartel ceased operating, the share of U.S./ADM exports to the Netherlands dropped. A similar pattern on a smaller scale can be observed in major South American markets and in selected markets in East Asia (Malaysia, Singapore, Indonesia, Philippines, and Taiwan). Thus, ADM's export behavior conforms to a pattern of restraint to Ajinomoto's and Kyowa's key markets complemented by a pattern of aggressive sales in the Netherlands, South America, and certain Asian markets.

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6 During 1996-1997, unlike any previous period, price changes lagged a month or two behind changes in the lysine shadow price. This suggests that the shadow price had become a barometer for price followership.

7 ADM did not cut exports to Chiel's and Sewon's home markets (Indonesia and Korea) during the cartel period.

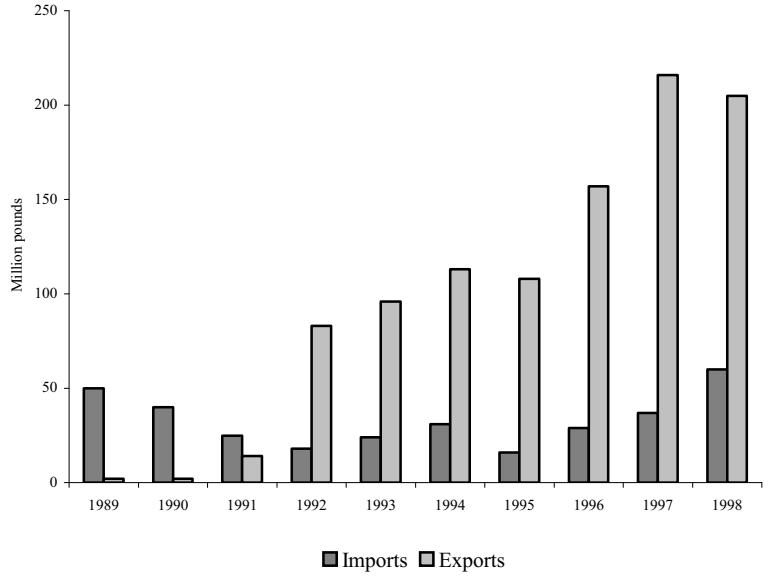

Figure 9.4 Volume of U.S. Lysine Exports and Imports, 1990-1995.

Source: STAT-USA on-line data service; HTS Code No. 292241000.
Imports include food and feed grade.

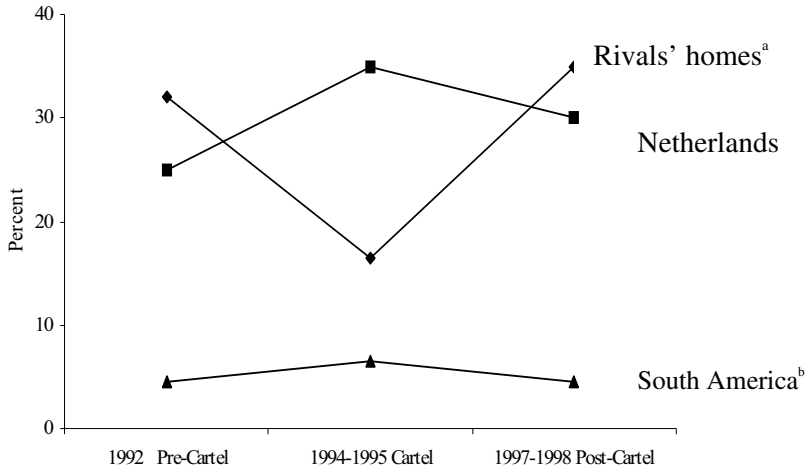

Figure 9.5 Volume of U.S. (ADM) Exports of Lysine to Selected Destinations, 1992-1998.

[a] "Home" countries of Ajinomoto and Kyowa are Mexico, Belgium, France, Germany, Spain, Italy, Thailand, Hong Kong, and Japan.
[b] Columbia, Venezuela, Brazil, Argentina.

U.S. Export Prices

Trade data offer one more possible insight into the lysine cartel's behavior -- geographic price discrimination. Except for minor dillerences due to domestic transportation costs, with nondiscriminatory pricing export prices be the same across countries of destination *prior* to shipping. However, in the mid 1990s ADM was in a position to increase its profits by discriminating among recipient countries on the basis of their price or income elasticities.

During 1992-93, ADM was aggressively targeting many overseas markets that had been served for many years by plants in Japan, Korea, and France. ADM immediately began exporting to all parts of the world, but *Europe* seems to have been an especially important target, accounting for almost 45% of total lysine exports in 1992 (Connor 2001: Tables 9.A.3 and 9.A.5). That ADM was courting customers in Europe is revealed by the relatively low prices offered in the Netherlands, UK, Germany, and even France in both 1992 and 1993. ADM's *Canadian* pricing strategy was different: even though Canadian demand approached 20% of U.S. exports, lysine prices were kept almost precisely at the global average selling price. In the early years, the *Asian* market accounted for about one-quarter of total U.S. lysine exports. Despite its growth potential, ADM kept prices relatively high to most Asian destinations for the first two or three years. There were three very instructive exceptions: Thailand, Korea, and Indonesia, where lysine was priced about 13% lower than the average (despite higher U.S. transport costs of lysine to West Coast ports). Exports were priced so low to these countries that it is easy to entertain the idea that ADM was predating on Sewon and Cheil. Only Japan itself was spared ADM's aggressive pricing among the four Asian lysine-producing countries, perhaps a signal to Ajinomoto and Kyowa of ADM's friendly intentions. Finally, the *South American* lysine market accounted for about 10% of total U.S. export sales. Here, ADM kept prices quite high in nearly all markets in the first three years. Again, there is one telling exception: Mexico, where Kyowa's plant was located, was treated to *below* average prices in 1993 and especially 1994.

During the cartel period, pricing changed. Within *Europe* during 1995-96, U.S./ADM exports to the Netherlands and Spain about doubled; prices to the Netherlands, UK, and Spain were set on average (simple average of five country-year observations) 6.5% *below* the U.S. average export price. On the other hand, for the remaining European countries prices averaged 13.3% *above* the U.S. average. Rather than refusing to deal with customers in countries close to Ajinomoto's plants in France and Italy,

ADM simply used higher prices to discourage imports into what appears to be Ajinomoto's cartel-designated "exclusive sales territory." It is perhaps no accident that the three countries apparently allocated to ADM were those geographically closest to eastern U.S. export ports.

Canadian export prices in 1995-96 prices were raised 16% above the U.S. average. Prior to ADM's entry, Canada was provided lysine either from Japan-Korea through British Columbia or from France through Atlantic ports. Later, the cartel assigned Canada mostly to ADM.

In general, ADM set relatively high prices on exports to *Asia* in 1995-96. With a few exceptions, U.S. prices to Asian destinations averaged 9.8% above the world average. Australia and New Zealand became ADM-dominated markets as ADM dropped its relative prices compared to the 1992-93 levels.

Latin America was forced to pay the largest price premium for ADM's lysine. Excluding the Kyowa "home country" of Mexico, lysine prices in 13 other countries of the region averaged 21.2% above global prices in 1995, with very little variation across countries. The best guess is that (except for Brazil and Mexico), ADM was intentionally pricing itself out of the Latin American market in 1995.

Effects on Profits

Internal documents prepared for the president of ADM's Biotechnology Division reveal with great precision how various phases of the cartel's activities benefited ADM's bottom line. Operating profits were calculated monthly for lysine and each of the other "departments." Lysine sales and product-specific production and marketing costs were calculated. When the lysine manufacturing operations were mature, total manufacturing costs averaged about 62 cents per pound: 10 cents per pound for fixed costs, 20 cents for dextrose, and 32 cents for other variable costs. Distribution, storage, and selling costs averaged 11 cents per pound.

ADM's quarterly lysine profit rates are shown in Figure 9.6. In late 1991 the company was still experiencing low yields, so even average selling prices of $0.98 to $1.06 per pound resulted in huge losses. In the first eight months of 1992, ADM's costs were under control but selling prices

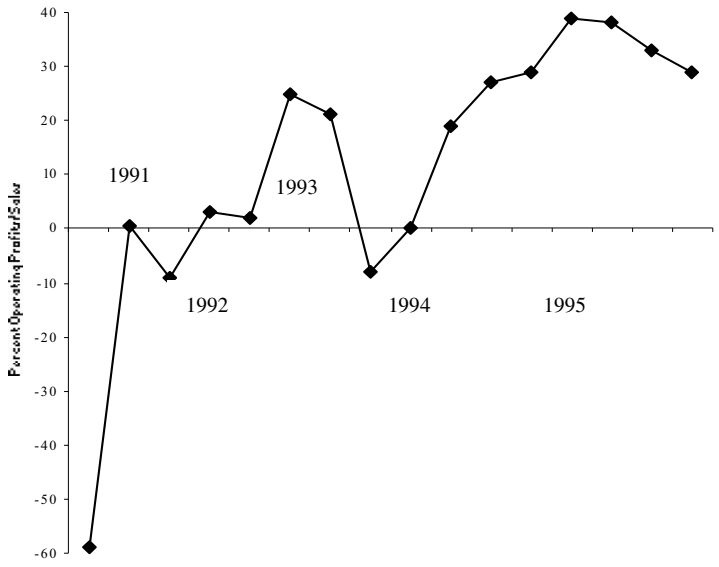

Figure 9.6 Pre-Tax Profit Margin, ADM=s Lysine Department, Quarterly,1991Q3-1995Q2.

Source: ADM Bioproducts Division, *Operations Statistical Reports*.

fell by 30% or more from late 1991 levels, so the lysine department continued to experience very low or negative profits.

The big turn-around in profitability came in September 1992. The cartel's agreement began to affect U.S. market prices in August and export prices in September. By the end of the year, domestic prices had risen 62% from their July nadir and export prices by about half that amount. As a result, the profit rate in the fourth quarter of 1992 soared to 25% of sales. After the brief second price war in mid-1993, profits once again took off. In the six quarters shown in 1994-95, ADM's lysine profits averaged 33% of sales, or more than six times ADM's historical pre-tax profits. It is likely that Ajinomoto and Kyowa Hakko were earning similar profit rates on their U.S.-made lysine.

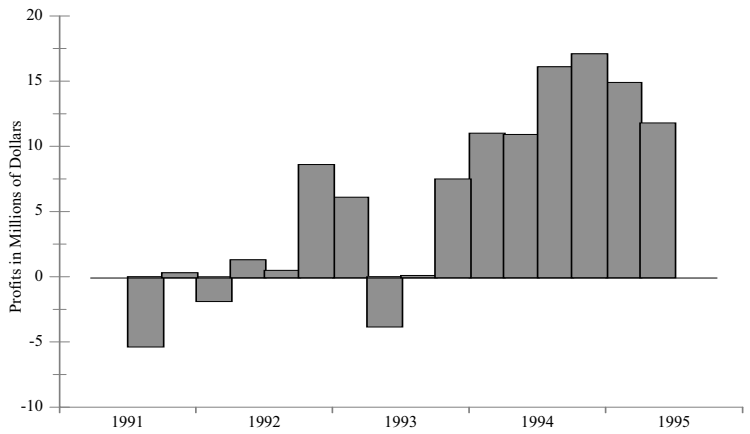

Figure 9.7 Operating Profits of ADM=s Lysine Department, Quarterly, July 1991 - June 1995.

Source: ADM Bioproducts Division, Operations Statistical Reports.

Figure 9.7 demonstrates the impacts of the price conspiracy on ADM's dollar lysine profits. At the peak of the conspiracy in late 1994 operating profits reached as high as $6.3 million per month. During the cartel's most effective nine quarters, ADM's lysine profits totaled about $104 million.[8] The cost in lost profits of punishing the other cartel members in the 2nd quarter of 1993 so that they would join the deal on market shares was about $5 million. Despite these caveats, the vast majority of ADM's $104 million in profits represents a return from illegal price fixing.

The Customer Overcharge

Direct buyers of lysine are injured two ways by an effective seller's cartel. They pay more for each unit purchased and, because the price is higher than it would have been absent the cartel; there is a reduction in quantity

[8] It is likely that not all of the $104 million represents pure monopoly profits. Some of these profits may have compensated ADM for the costs of learning how to produce and sell lysine and how to improve its manufacturing processes. Moreover, some of the operating profits may reflect a normal return to investors

purchased. The first loss is called the overcharge. Under U.S. law customers that were overcharged may seek triple the damages they sustained. The second source of injury is called the dead-weight loss. Although the latter is recognized as a compensable harm in some federal court districts, this section focuses solely on the lysine overcharge.[9]

The 1995-1996 civil suit offers a minimal indicator of the size of the lysine overcharge imposed by the cartel on buyers located in the United States. First, in April 1996 the law firm representing the federal class of lysine buyers negotiated a settlement of $45 million to be paid by the four largest members of the cartel. Because this amount theoretically represents triple the overcharge, ADM *et al.* implicitly were admitting to an overcharge of $15 million. Depending on how long the conspiracy affected market prices, this overcharge estimate implies an average price increase of only 2.6 to 3.1% of U.S. sales. Alternatively, it implies a but-for price of $1.10 per pound. This is the lowest of the overcharge estimates.

Economic facts revealed about the lysine cartel can be used to make a other estimates of the overcharge (Connor 2004b). The calculation of the overcharge rectangle is in principle a simple arithmetic exercise. One requires actual transactions prices charged by the conspirators, the quantities sold during the affected period, the dates of the conspiracy-effects period, and the price that sellers would have charged but for the conspiracy. The overcharge is the revenues of the members of the cartel during the conspiracy-effects period less revenues that would have accrued at the but-for price.

During the discovery phase of the civil case, four of the lysine defendants revealed their average monthly lysine transactions prices for the years 1991-1995. Annual sales to customers located in the United States were also given, so reasonable estimates of monthly quantities sold by the four companies could also be calculated (see Connor 2000: Table A2). In addition to market prices and quantities, there was essential agreement among experts on the market structure of the U.S. lysine market in the early 1990s. However, disagreements among the experts developed about the dates of the conspiracy-effects period, the type of industry conduct absent collusion, and the but-for price.

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9 Indirect buyers of lysine, such as hog farmers or consumers of pork may seek treble damages in some state courts. Their injuries depend on the size of the direct buyers' overcharges

Time Period

Reasonable persons might well differ about the conspiracy-effects period (White 1995). The high and suspiciously stable monthly prices observed during the period November 1993 through March 1995 makes this period the least controversial one (16 months). It is clear that prices began to rise a month or two after the Mexico City meeting in June 1992, but defendants argued that during July 1992-October 1993 the cartel had no effect on prices. July 1995 seems to be the earliest the effects period could have terminated. With lags in raising production and exports to the U.S. market, the rest of 1995 might be included. Thus, the conspiracy-effects period could have lasted as little as 16 months or as long as 44 months.

The But-For Price

There are four analytical approaches to estimating the appropriate nonconspiracy price (Page 1996, Connor 2006c). First and most common in court proceedings is the before-and-after approach. In this instance the analyst uses information on industry conduct to identify a period or periods free of collusive conduct. The reigning prices during those cartel-free periods become the benchmark or but-for prices. Second, consonant with the Lerner Index of market power, defendants can supply proprietary information on capacity utilization, fixed costs, and variable costs in order to construct a proxy for a but-for price. Cost and margin analyses can supplement the before-and-after price analysis for proof of overcharge in courts. Third, a benchmark price could be developed from the behavior of prices of similar products in analogous markets. This "yardstick" method is often applied to geographically localized conspiracies.[10] Fourth, a time-series econometric model can be formulated and fitted either to all the data available or just to nonconspiracy periods. The former model will include a qualitative variable for the alleged conspiracy period that should capture the collusive effect on price; the latter model can forecast the but-for price for each week or month during the cartel period.

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10 A yardstick market should have cost structures and demand characteristics highly comparable to the cartelized market, yet lie outside the orbit of the cartel's influence. Because the lysine cartel was global in scope, the geographic yardstick method could not be applied.

The Before-and-After Method

Employing the before-and-after method, two periods of three or four months each were identified as apparently highly competitive ones, namely, May-July 1992 and April-July 1993.[11] During both periods, U.S. transactions prices of lysine averaged $0.70 per pound.

The two periods seem to exhibit the kind of cutthroat price rivalry described by the economist's model of pure competition. The two periods correspond to the months just prior to two key meetings of the lysine conspirators: Mexico City in late June 1992 and Irvine, California in October 1993. Prior to Mexico City there was no oligopolistic consensus, and ADM was aggressively expanding output. Prior to the California meeting the fragile consensus had broken down over a dispute about ADM's promise to restrain production.

However, if these months represented predatory pricing conduct, $0.70 may be too low to be considered a long run competitive price. ADM, was suffering operating losses in lysine during July-August 1992, losses that turned to profits in September when the market price rose above $0.70 per pound. If the but-for prices are $0.70 or $0.80 per pound, the overcharges are $141 and $78 million, respectively.

The Cost-Based Method

In early 1999 during the sentencing phase of the criminal trial of three ADM executives, the size of the U.S. overcharge became an issue because the prosecution asked for fines above the statutory amount. The government had received detailed information on the costs of production and distribution of all the lysine plants in the world owned by the five members of the cartel. An analysis by the government's expert economist determined that ADM's Decatur plant had the lowest costs of production of any that supplied the U.S. market and that average total costs were constant during the conspiracy period.[12] With constant returns to scale, the average total

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[11] I was employed by a law firm representing buyers of lysine who were contemplating opting out of the federal class of private plaintiffs. I performed this analysis during April-July 1996, a time during which the lysine defendants had offered to settle the private suit for $45 million but before they had pleaded guilty to criminal price fixing.

[12] See Chapter 7 for more details. The present author was the government's expert. ADM's lysine costs are trial exhibits in the public record.

costs are equal to the competitive price. Allowing for a generous expected rate of return for investors in the industry, the government's uncontested estimate of U.S. overcharges was $78 million. By an eerie coincidence, $78 million is the midpoint between the defendants' estimate of $15 million and the federal class' estimate adjusted for seasonality of the $141 million (Connor 2001: Table 9.A.1). Moreover, the $78 million is nearly identical to a more complex, multiple-equation econometric model developed and tested by Morse and Hyde (2000).[13]

Summary

Three methods of estimating overcharges due to price fixing were applied to the lysine cartel. The three techniques (before-and-after, cost-based, and econometric) yield a set of estimates from $15 to $141 million. However, the two most recent and scientifically satisfying analyses came up with an $80 million overcharge estimate for the U.S. market during July 1992-June 1995. The U.S. sales of dry lysine during the conspiracy period were $460 million, therefore direct buyers of lysine overpaid by 17% on average. Although no formal analysis of non-U.S. overcharges are available, the higher prices in Western Europe suggest an overcharge of around $100 million to European customers; the lower prices in Asia suggest overcharges in the rest of the world were lower than those in the United States. A reasonable projection of the global overcharge by the lysine cartel would be in the $200 to $250 million range.

Conclusions

The lysine cartel was successful in raising prices worldwide for most of its three years of operation. Although the timing of its price increases was aided seasonality in the demand for lysine, a significant share of the 50- to 70-percent increases in prices can be traced to the cartel's collusive agreements. As a result, the cartel's direct customers were overcharged between $200 and $250 million for the lysine they added to their products. There is some evidence that buyers in low-income parts of the world were hit harder by overcharges. It is likely that most of this monopoly overcharge

[13] Morse and Hyde (2000) estimate the U.S. market demand for lysine and ADM's cost of production using monthly data from January 1990 to June 1995. Then they estimate ADM's conjectural variation, that is, the responsiveness of the sales volume of ADM's rivals to changes in ADM's sales volume. The econometric results are good-fitting and reasonable. Industry behavior becomes progressively less competitive from October 1992 to the 1994-95 period. Their model predicts a competitive but-for price for each month during the conspiracy. The total overcharge to U.S. buyers was $80 to $83 million.

was passed on eventually to consumers in the form of higher pork and chicken prices.

A second negative effect on buyers of lysine was a contraction in output of lysine and in small subsequent lysine-containing products: animal feeds, marketed swine and poultry, and processed pork and poultry products. In the cartel's peak year 1994, lysine volume sold was at least 30% below the volume a competitive industry would have achieved.

There were other effects on the industry. What had been a tumultuous industry structure in 1991-1992 suddenly became frozen for two or three years. The aggressive newer lysine producers were tamed, and the two industry pioneers saw their slide in market share halted. Investment in new capacity by the cartel members slowed.

Chapter 10: The Global Vitamins Industries

Introduction

Basel, Switzerland is an historic city of about a half million people located at the intersection of the French, German, and Swiss borders. Home to Switzerland's first university established in 1460, the city played a pivotal part in the Protestant Reformation. Although the city houses many architecturally important medieval buildings, manuscript and art collections, and a pretty late-Gothic Rathaus fronting the central market place, Basel receives more business visitors than tourists. Aided by its fortuitous location on the Rhine River, Basel was the Swiss city most affected by the 19th century forces of industrialization. By the turn of the century, it had become the center of Switzerland's chemical and pharmaceutical industry, second only to Germany's in Europe. Basel pharmacist Felix Hoffmann-La Roche was the founder of a pharmaceutical manufacturing partnership that would become a global leader in medicinal products. Its corporate successor, Roche Holdings, remains headquartered in the city of its birth and is still controlled by the founding families.

Switzerland has a long history of hosting meetings and secretariats for international cartels. In recent decades that tradition intensified, because Switzerland remained outside the jurisdiction of the European Union (EU), making surprise inspections by European Commission competition-law authorities impossible. Basel in particular became an important locus for most of the vitamins cartels. By virtue of Hoffmann-La Roche's headquarters and its proximity to the headquarters of the other leading vitamins conspirators, Basel may well be able to lay claim to the title of World Capital of Global Cartels.

To paraphrase an Iranian propaganda slogan, the vitamins cartel was the "Mother of All Global Cartels." It was the biggest, most elaborate, longest lasting, and most harmful of the international cartels discovered by the U.S. Department of Justice (DOJ) the 1990s. Moreover, the success in vitamins spawned the formation of other international

cartels. The initial steps in establishing global conspiracies in vitamins were taken in 1985, but these early efforts required renegotiation and the addition of more products and more conspirators in 1988 and 1989. Most of the vitamins cartels did not end until early 1999.

By 1990 the early signs of financial success in vitamins price fixing were so palpable that the participants were moved to explore the feasibility of forming more feed or food ingredient cartels. Memoranda have come to light that show the citric acid cartel was formed in 1991 by Hoffman-La Roche explicitly because of its profitable prior experience in vitamins.[1] Then the cartel contagion spread within Archer Daniels Midland (ADM) from its citric acid division to its lysine operations in 1992.[2]

From 1988 to 1992 21 chemical manufacturers headquartered in seven nations joined the bulk vitamins cartels, and the number of markets infected by price fixing would grow to 16 distinct products.[3] Sales by these cartels exceeded $30 billion, an amount that is quite likely the largest of any discovered international conspiracy since 1990 (Connor 2003). The pharmaceutical manufacturers involved became virtually addicted to the infusion of monopoly profits, giddy financial results that prompted the conspirators to continue their clandestine activities for up to 15 years. These illegal activities persisted in the face of several public prosecutions of parallel conspiracies, multiple antitrust investigations of the vitamins industries, mounting economic sanctions by antitrust authorities, and strenuous efforts to stop the collusion by some of the conspirators' own company lawyers. The conspirators simply burrowed deeper and developed more elaborate methods of subterfuge.

The vitamins conspirators erected a mechanism of customer exploitation that incorporated almost every technique of cartel organization known to man. These exploitive techniques resulted in historic monopoly overcharges on customers; buyers of animal feeds; of fortified foods; of meat, poultry, fish, eggs, and milk; of vitamin supplements; and of cosmetics in every corner of the world paid inflated prices for these goods. These

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1 ADM was involved in at least two U.S. price-fixing conspiracies prior to 1991, carbon dioxide and high fructose corn syrup. In 1991-92 ADM became the prime mover in two more cartels, the global citric acid and lysine cartels (Connor 2001).

2 Ironically, after a cartel is discovered by antitrust authorities, much like the methods used by public health officials to trace the spread of venereal diseases, a reverse contagion process works to assist in cartel prosecutions. Under the corporate leniency programs of the United States, the EU, and other jurisdictions, amnesty for antitrust violations can be obtained if a company under investigation agrees to cooperate with officials by revealing a cartel in a second product market.

3 Every commercial vitamin except K and D2 were cartelized. One of the 16 products is "other carotenoids," which consists of four compounds each with unique uses.

overcharges later fattened the income statements of the participating vitamin manufacturers.

Most of the conspiracies were exposed to the world one day in May 1999 at a widely publicized Department of Justice press conference in Washington DC. Eventually, the antitrust authorities of at least nine countries and the European Union would open formal investigations of the vitamins cartels, and several of them would impose record fines on the companies involved.[4] For the first time in the history of the 1890 Sherman Act, the United States imprisoned several high-ranking foreign executives for price fixing. In addition to actions of government prosecutors, more than 100 law suits were filed by buyers of bulk vitamins in the United States, Canada, Australia, and the United Kingdom seeking compensatory and punitive damages. In 2004 the U.S. Supreme court became involved in the vitamins cartels by issuing a ruling that significantly altered the way in which defendants in international cartels can be sanctioned. By the end of 2005, the members of these cartels had in absolute dollar terms become the most harshly punished antitrust violators in the history of the world.

Despite the heavy sanctions imposed by prosecutions around the world, the most somber lesson to be drawn from these dreary episodes is that the crime of price fixing pays.

Industry Origins[5]

The discovery and commercialization of most vitamins typically evolved through five stages (Kiple and Ornelas 2000). First, physicians would describe and name a disease of unknown etiology. Second, a dietary cure would be identified empirically, but the active ingredient responsible for the cure is not understood. In some cases folk remedies provided clues. Third, scientific researchers isolate a compound that is known to be curative. Sometime an unused letter of the alphabet was provisionally assigned to the vitamin at this time. Fourth, usually within a few years the chemical structure of the vitamin would be identified. The vitamin's chemical name

[4] The United States, Canada, EU, and Australia each imposed record monetary fines. Two early investigations of the French competition-law council failed to discover incriminating evidence. As of early 2005, Brazil's antitrust authorities were still investigating, Mexico's decision was unknown, Japan's and Switzerland's had decided to issue only cease-and-desist orders, and New Zealand's had exceeded the statute of limitations.

[5] Most of the facts cited about the history and manufacture of vitamins can be found in Achilladelis (1999), Hui (1992), Kiple and Ornelas (2000), Trager (1995), Bernheim (2002b), Connor (2001:277-304), Connor (2006b), and Connor (2000: Appendix Tables D and E).

would sometimes require its letter to be re-designated or a number added. Fifth, chemists would find a method of synthesizing the vitamin. At this point, patents could be issued and commercial production would begin on a small scale. Engineering improvements would subsequently permit cost reductions, and the falling price would stimulate mass-market demand. Sometimes demand would spurt well before dietary deficiencies were identified for the vitamin or all a vitamin's curative powers understood.

Companies with experience in making organic chemicals and marketing human health products were the best positioned to be pioneers in vitamins. In the late 19th and early 20th centuries, sellers of vitamins started by extracting them from plant or animal materials relatively rich in the vitamins of interest. However, the greatest period of growth for the vitamins industry occurred in the 1930s and 1940s when the techniques of synthetic chemistry began to be applied to large-scale industrial production. Long in use for dyestuffs and certain pharmaceuticals, synthetic chemistry permitted manufacturers to substitute less expensive raw materials, to achieve economies of scale in production, and to make final products of greater purity than could be achieved with extraction methods.

Uses of Vitamins

The value of certain foods in maintaining health was enshrined in culinary customs practices that predate written history (Tannahill 1988). Moreover, pre-modern medical texts make it clear that physicians with no notions of vitamins prescribed effective dietary cures for diseases now known to be caused by vitamin deficiencies. For example, night blindness was diagnosed by Egyptian physicians, and in texts dating from 1520 BC beef liver was prescribed as a cure (Kiple and Ornelas 2000). Classical Greek medical manuscripts repeat the diagnosis and cure. Hundreds of years before nutritional experiments confirmed the wisdom of the practice, fish-liver oils had been administered as a folk remedy in Northern Europe for certain deficiency diseases. By the 1840s, cod-liver oil had become a common dietary supplement in North America and Western Europe, demand being met by supplies out of fisheries in Newfoundland and Norway.[6] Published European controlled medical experiments from 1861 onwards verified the efficacy of cod-liver oil in overcoming a deficiency in ocular retinol, long before scientists were to realize that fish and animal livers are rich in vitamin A. Finally, in 1929-1934 scientists proved that beta carotene is the

[6] Oral applications of bitter cod liver oil were still maternal best practice in the United States until the 1960s, as the present author can testify.

precursor of retinol in the eyes of animals and that vitamin A is essential to vision.

Inspired by informal observations of ships' officers, scientists in the late 18th century demonstrated that the addition of citrus fruits to the diet would prevent the onset of scurvy. As a result, in 1795 the British Navy decreed a daily ration of lemon or lime juice for all seamen on long voyages. That citrus juices were high in vitamin C would verified by scientists in the 1920s.

In the late 19th century, the cause of a rising incidence of beriberi in the Indonesian population was discovered by Dutch scientists. The introduction of polished white rice had removed some then unknown substance in the germ and coating of brown rice that prevented beriberi in rice-based starchy diets. Another important step in scientific understanding was research published in 1906 by British biochemist Frederick Hopkins. He showed that many foods had substances that could not be classified as carbohydrates, proteins, fats, or minerals. Then, in 1912, chemist Casimir Funk identified the anti-beriberi substance to be an amine (a compound containing nitrogen). Thus, he proposed that it be named "vitamine" a neologism that combined the Latin word *vita* ("life") with "amine."[7]

In 1912, Hopkins and Funk proposed the vitamin-deficiency theory of nutrition. This theory postulates that minimal amounts of vitamins must be ingested in order to avoid the appearance of certain diseases or functional impairments. Among the diseases they believed were caused by vitamin deficiency were scurvy, beriberi, pellagra, and rickets. Over the next three decades or so, this theory would be verified for more than 20 vitamins, popularly known by their letters or letter-number combinations (e.g., B12).[8] Research showed that minute quantities of 13 or 14 vitamins are necessary for the regulation of metabolic functions in humans, animals, and even some bacteria and yeast.[9] Vitamins can also cure anemia and dermatitis, assist blood coagulation and reproduction, and are related to cancer and heart disease.

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[7] Later, when scientists determined that many other vitamins do not contain nitrogen, the final "e" was dropped.

[8] The urgency of research into the causes of malnutrition was spurred by the discovery that fully two-fifths of all young men called for military conscription in the UK in 1917-1918 were medically unfit because of diseases traced to vitamin deficiencies.

[9] Technically, most vitamins act as enzymes, coenzymes, or precursors of coenzymes; many vitamins undergo chemical changes after being ingested in order to arrive at their functional (coenzyme) stage and may further chemically change before reaching an active (enzyme) stage. The enzymes then become catalysts in regulating various metabolic processes. Unlike minerals and the macronutrients (proteins, carbohydrates, and fats), vitamins are not converted into energy or building materials for tissues.

The need for specific vitamins varies across species. A compound that is an essential vitamin for one species is not necessarily required by another species. Levels of vitamins required also vary by gender and growth phase. For example, in humans one type of vitamin D is synthesized in the skin tissue when it is exposed to sunlight. The enzyme produced by vitamin D regulates the conversion of calcium into bone. However, children deprived of adequate sunlight may require dietary supplements of vitamin D during phases of rapid skeletal growth to avoid arrested or deformed bone development. Residents of the Nordic countries are advised to consume relatively large amounts of vitamin D. Pregnant and lactating mothers often require different and larger amounts of vitamin supplements than other women.

Today, almost half of the sales of bulk vitamins are "animal grade."[10] Indeed, some vitamins are purchased primarily or exclusively for inclusion in animal feeds. The principal components of animal feeds are pasture grasses, hay or silage crops, or the so-called rough grains (maize, millet, sorghum, and the like). Surplus food grains or byproducts of food processing are also incorporated into animal feeds. Under more intensive modern farming practices, animals are fed supplements high in proteins, minerals, amino acids, and vitamins. These relatively costly ingredients are called concentrates; approximately 0.5% by weight of a typical feed concentrate consists of bulk vitamin "premixes."[11] Mature cattle, sheep, and other ruminants are able to synthesize vitamins in the first of their stomachs (the rumen) from grains or roughage. However, like humans, animals with single stomachs will benefit from supplementary vitamins to enhance the rate or type of growth or to increase production of eggs. Swine, poultry, fish, and immature ruminants are fed the most of vitamins produced today. A small but fast-growing source of demand is the biotechnology industry, which needs vitamins to optimize the metabolism of microorganisms during fermentation. The great majority of the sales of vitamins A, E, B2, B3, B4, B5, B12, D, K, biotin, canthaxanthin, and folic acid are

[10] Bulk vitamins sold for animal feed or pet food may contain somewhat higher proportions of impurities than those destined for human consumption. As a result, feed-grade bulk vitamins typically sell at a discount from human-grade versions. For most vitamins the discounts are in the 5% to 15% range, but for vitamins A and E the price differences are closer to 50%. New entrants into a vitamin industry will usually begin making feed-grade products before offering pharmaceutical-quality products.

[11] Vitamin premixes are primarily sold to feed manufacturers. Only about 4% of the value of premixes consists of filler, the rest being bulk vitamins. Premix formulas vary systematically by animal species and the age, stage of life, and gender of the animal. One seller in the vitamins cartel sold thousands of premixes.

purchased for animal and fish feed (Table 10.1).[12] Some carotinoids function as colorants for the flesh of poultry or fish.

Besides as supplements in animal feeds, bulk vitamins are purchased for human use in pharmaceutical and food products. In the mid 1930s when synthetic vitamins were first marketed to the public as pharmaceuticals, they were regarded as the "wonder drugs" of the age because of exaggerated claims that they would cure several human diseases. Initially, their high prices and prescription-only status confined them to the wealthy, but by the end of the decade huge cost reductions made vitamin supplements affordable to most consumers in high income countries. Research continues today on the role of vitamins as antioxidants that may help avoid heart conditions, colds, or cancers.

Nowadays, about 30% of world production ends up in pills and capsules for purchase over the counter as nutrition supplements. Except for vitamin B4, large amounts of all the vitamins and carotinoids are purchased by pharmaceutical companies to be mixed and packaged for sale directly to consumers (Table 10.1). Indeed, the primary use of vitamins B1, B6, and B12 is for human nutrition supplements. In more recent years, it is common to find vitamin E and other vitamins added to cosmetics and skin creams.

Also in the 1930s, scientists began to advocate the fortification of foods as a public health measure. Fortification of butter, margarine, and other dairy products with Vitamin D was initiated in 1933 and became common in the late 1930s. By the early 1940s fortification became mandatory or customary in flour and bakery products of high income countries. Mandatory fortification was accelerated to some extent by food rationing necessitated by World War II. Today the food processing industries of most countries purchase large quantities of vitamins A (and its precursor beta carotene), B1, B2, B3, B6, folic acid, and C to fortify a wide range of foods and beverages. Food fortification accounts for about one quarter of total global demand for bulk vitamins.

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[12] In the mid 1970s the feed/food/pharma breakdown in Europe was approximately 60/15/25 (EC 1976:2). Thus, the relatively size of the channels have changed only slightly in the past 20 years.

Table 10.1 Relative Size of the Feed, Food, and Pharmaceutical Channels for Vitamins

	World 1987-1998			U.S. 1990-1998		
Product	Feed	Food	Pharma	Feed	Food	Pharma
			Percent [a]			
E	73	3	23	34	13	52
C	8	50	42	1	66	33
A	87	6	7	85	7	8
B4 Choline chloride	100	0	0	100	0	0
B5 Cal Pan[b]	69	3	22	40	9	51
B2 Riboflavin	75	8	17	18	31	51
B3 Niacin	73	11	14	43	25	32
B6	42	8	49	1	14	85
H Biotin	85	4	10	75	7	18
B12	58	2	40	30	3	67
B1	35	16	49	1	24	75
D3	93	3	4	43	0	57
Folic acid (B9)	79	17	15	16	44	40
Beta carotene	8	64	28	10	47	44
Other carotenoids[c]	92	7	1	23	77	1
Total	43	26	30	40	24	36

Source: März (1996) and Bernheim (2002a: 32-60).
-- = Not available
[a] Percent of value of sales. Feed includes pet food and vitamins used in blends and premixes. Some rows may not add to 100% because of cosmetic and technical uses or because of rounding.
[b] Calcium pantothenate.
c) Includes primarily canthaxanthin but also astaxanthin, apocarotenal, and apoester.

U.S. demand for various forms of bulk vitamins is in general similar to global demand. Pharmaceutical uses are somewhat higher in the United States than the rest of the world, and this is true for every individual vitamin as well except vitamin C. On the other hand, vitamin C and the other carotinoids are used more heavily in the U.S. market for food and

beverage fortification. U.S. feed applications of vitamins also vary considerably from global uses.

Vitamin Manufacturing Methods

Drug production is a branch of the chemical manufacturing industry group. Pharmaceutical raw materials may be plants, animal byproducts, or other biologic products; inorganic elements and compounds; or organic compounds. Allowable raw materials and purity standards are usually specified by a national formulary or pharmacopoeia.[13] The oldest drugs, now called crude drugs, were obtained from biologics that were cured, ground, and dried or preserved in solutions by apothecaries. Modern industrial methods of production can also involve extraction from natural sources, but preparation from biotechnologies or chemical synthesis is now more typical. Both of these modern methods awaited advances in organic chemistry that began in the late 19th century. The first drug made by synthetic chemical means was Antipyrine in 1884 (Achilladelis 1999).

In the case of extraction methods, a material containing the drug is placed in water or a solvent, and then the active ingredient is separated by distillation, skimming, pressing, filtering, or centrifuging. For example, cod livers can be suspended in warm water until their oil rises to the surface. The oil that is skimmed off is rich in vitamins A and E.

Synthesis is ultimately a less expensive process than extraction and generally produces a purer product. Synthetic organic compounds are produced from chemical reactions that rearrange the molecular structures of two or more chemical elements or compounds, at least one of which must contain carbon. The reactions are caused by heat, pressure, acids, or other catalysts. Many different types of reactions are used to synthesize vitamins. Sometimes the same vitamins will be synthesized by different pathways depending on a manufacturer's raw materials, equipment, or access to proprietary technologies. The expertise required to master synthetic processes comprised of multiple stages of reactions may take decades for a manufacturer to acquire (März 1996). Plants using synthetic methods are complex and large in scale; lowest costs are achieved only when running at nearly full capacity (UKCC 2001). That is, there are formidable technological barriers to entry in many bulk vitamins industries.

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[13] In the United States, the acronym "USP" is used to signify products that meet the standards required by the *U.S. Pharmacopoeia*.

Biotechnologies are quite different. They harness the metabolism of microbes in biological systems using generally inexpensive carbohydrates (dextrose, sucrose, starches, etc.) as the source of carbon. Except for the final separation and purification, the fermentation process is a single-stage operation during which cascades of chemical reactions occur within the microorganism. In principle, the simplicity of these biotechnologies allows them to be commercialized at more modest scales of production than those required for synthetic methods of production. A two-stage fermentation technology was developed in China around 1990 that resulted in significantly lower costs of production for vitamin C than the synthetic process used by European and Japanese manufacturers (UKCC 2001: Table 2.1). By the mid 1990s, almost 30 Chinese companies were using this process.

Advantages in production efficiencies will accrue to biotechnology manufacturers that select the most productive microorganisms and improve their productivity through genetic manipulation. Genetically mutated microorganisms can be patented. Almost 100 biotechnologies for the production of vitamins were patented from 1985 to 1995 (März 1996:31). By the mid 1990s, a significant portion of the markets for vitamins E, B2, B5, H (biotin), and D3 were being made solely via biosynthesis.[14] The Archer Daniels Midland Company has made a strong commitment to producing vitamins from fermentation of corn sweeteners. It already makes and markets vitamins E and B2 and produces biotin for captive use by means of various fermentation technologies.

Sometimes synthetic and biotech manufacturing methods are combined. For vitamin C the traditional Reichstein method combines fermentation with chemical processes. This was the technology employed by the three leading manufacturers, Roche, BASF, and Takeda Chemical Industries, in the 1990s. This method required a fermented intermediate material called ketogulonic acid (KGA). Three European chemical companies (BASF, E. Merck, and Cerestar) owned a joint venture that was one of the few sources of KGA.

Biotechnological processes are not always the cheapest. Vitamin B2 can be made by either a single-step fermentation process or by a process that combines fermentation with synthesis. The first method results in a product that is 80% pure, the standard grade for animal feeds. The second combined method is more expensive but produces a final product that is 96% pure. To prepare vitamin B2 that is acceptable for food and pharma

[14] When sold for human use, vitamins made by biosynthesis may be labeled “natural” and command higher retail prices than their otherwise identical synthetic versions.

uses (98% purity), the cost of purification makes the fermentation approach more costly than the synthetic method.

Besides the introduction of fermentation methods in a few of the vitamins industries, other process innovations were being made (Bernheim 2002a: 34-60). In the late 1980s and early 1990s, a new "variable catalyst" production method was adopted in the choline chloride industry. In the mid 1990s, Roche and BASF developed novel technologies for making beta carotene and canthaxanthin. It is noteworthy that in none of these three markets did process innovations interfere with effective collusion. In 1999, the year the cartels ended, Daiichi and Lonza began manufacturing vitamins B5 and B3 with superior processes. However, for the great majority of vitamins (A, E, B1, B3, B5, B6, B9, B12, and D3), there were virtually no major changes in production technology from 1980 to 1999.

Early Development of the Industries

Most of the early development of the vitamins industry occurred first in Germany, Switzerland, and the United States (Achilladelis 1999). In each case, these countries offered strong patent protection for new products and processes. Moreover, manufacturers were assisted by strong ties to leading researchers in organic chemistry in universities.

Like all scientific innovations, commercial development of new pharmaceuticals evolves through at least four stages: the isolation of the chemical and identification of its molecular structure, production of the compound via chemical synthesis, pilot production, and large-scale manufacture usually accompanied by cost reductions and mass-market acceptance. Preceding and accompanying these innovations were clinical studies that identified vitamin-health relationships.

Despite the worldwide depression of the early 1930s, this was the decade of the most dramatic growth for the chemical industry in general and the pharmaceutical branch in particular (Henahan 1976). The rapid pace of scientific discoveries in vitamins and pharmaceuticals that began just before World War I fed a speedy adoption into commercial production by chemical companies in Europe and the United States. Vitamins became an important segment of the pharmaceutical industry's boom period. Roche, Merck, Pfizer, and many other drug makers opened or expanded their research laboratories and developed close relationships with university chemistry departments.

The basic research in isolating and identifying the chemical structures of the 13 essential vitamins[15] began with vitamins D and E in 1922, B1 in 1926, C in 1928, and all others between 1931 and 1948 (Connor 2006b: Appendix Table 15). Roughly half of these discoveries took place in U.S. laboratories and the rest in Switzerland, Germany and the UK. Methods for synthesizing vitamins came quickly in the 1930s and early 1940s. Commercial production often began at least on a pilot scale within a year of patenting or publication of a feasible method of synthesis. By the end of the 1930s, synthetic chemistry had made possible large-scale, low cost production of vitamins E, C, B1, B2, B3, and B4.

Some other vitamins and provitamins took longer to reach commercial production. Vitamin E was discovered around 1922. However, it was not until 1936 that the chemical structure of the first of its four forms, alpha-tocopherol, was identified. Two years later, scientists working with Hoffmann-La Roche first synthesized vitamin E. Demand grew slowly at first because the physiological functions of vitamin E were not understood until the 1970s. For a few vitamins the delay was more than ten years.

Roche Takes Leadership

Hoffmann-La Roche was the first company to learn how to synthesize most of the vitamins and provitamins. Its first commercial success was synthetic vitamin C (ascorbic acid); it sold 50 kilos in 1934. Roche's entry into mass production of vitamins C, B1, B5, and B6 was the result of purchasing the rights to technologies developed in the United States, but afterwards Roche was the global leader in scientific discoveries of vitamin chemistry and production technologies (EC 1976: 4). By 1938 Roche had mastered the synthesis and bulk manufacture of ten vitamins, and vitamins had become Roche's major source of sales.

Roche maintained a monopoly position in vitamins A, E, biotin, B5, and beta carotene for an average of 20 years. Its monopoly in the large market for vitamin E was not broken for 28 years, when the Japanese chemical company Eisai entered in 1967. After 1950 Roche extended its product line and began selling vitamins for animal feeds by the late 1960s. In the 1970s, Roche cemented its early lead in vitamins for animal feeds by offering optimization programs and extensive after-sales service to feed manufacturers (EC 1976: 4). Although significant entry by other companies into vitamin manufacturing had begun, in the 1970s Roche

[15] There is scientific controversy as to whether choline chloride is essential. Niacin was discovered in Germany in 1867, but its nutritional value was not recognized until 1936.

remained the world's dominant supplier of synthetic vitamins, with a global market share of 50 to 60%. Roche was the dominant supplier of vitamins A, B1, B5, B6, folic acid, C, D3, E, biotin, and carotinoids (Connor 2006b).

Some Roche's first rivals came from Europe. The big German chemical firm Badische Anilin-und Soda-Fabrik (now called BASF) was successful in imitating Roche in several vitamin-product lines. BASF first built production facilities for animal-grade synthetic vitamin A in 1970, animal-grade vitamin A in 1972, and beta carotene in 1972. By the early 1970s, Roche and BASF controlled more than 75% of global vitamin production, with especially strong positions in vitamins A and E. The large French chemical maker Rhône-Poulenc began producing vitamins A, E, D3, and B12 sometime before the 1980s, but tended to specialize in feed-grade products. Another big German chemical company, Hoechst, entered B12 manufacturing, Solvay dominated vitamin D3 production, Lonza was the premier source of B3, and the small chemical maker E. Merck was producing vitamins C, B2, B6, and B12. In the early 1980s these seven companies controlled 80% or more of global production in nine vitamins: A, E, B2, B3, biotin, B12, D3, and the carotinoids.

Vitamins in the United States

In the 1920s U.S. scientific prowess in organic chemistry was slightly behind that of German and Swiss research institutions (Achilladelis 1999). However, it caught up rapidly in the 1930s, partly because of the amalgamation of virtually all German chemical companies into the I.G. Farben monopoly in 1925. The absence of rivals on the domestic market dulled Germany's technological edge. Swiss and American companies also benefited from the expulsion of Jewish scientists from Germany.

Merck and Co.[16] became the most R&D-intensive U.S. pharmaceutical company in the 1930s. In 1933 its first research director decided to focus on vitamins. By the end of the 1930s, vitamins B1. B2, B3, B5, B6 and C constituted a large share of Merck's total sales. However, Merck decided not to exploit its technological lead in these six vitamins in Europe and most other non-U.S. markets. Pfizer began to manufacture vitamin C in 1937 and A in 1940 using licensed technology, but by 1940 it had developed its own proprietary methods for manufacturing vitamins B2 and C. American Home Products acquired two vitamins makers in 1941 and 1943.

[16] U.S.-based Merck was part of the German chemical firm E. Merck before World War I. It's former parent would become a member of three vitamins cartels.

Despite the early involvement of American companies in the vitamins industries, by the 1980s none were any longer major suppliers.[17]

Vitamin C was first isolated and its chemical structure identified in 1932. One year later, Merck and Co. was manufacturing synthetic vitamin C. When vitamin C was first sold commercially in 1933, its wholesale price was $7,515 per kilogram. Competition and process improvements brought its price down to $97 per kilogram five years later. By the late 1970s, further technological progress had dropped the wholesale price of bulk vitamin C to $10 per kilogram.

Vitamin B1 followed a similar course. A scientist at Bell Laboratories patented a method for making vitamin B1 from bran in 1934. Merck and Co. scientists developed an improved synthetic method two years later; when vitamin B1 was sold that year by Merck, its price was $300,000 per kilogram. Five years later, the flour industry was able to begin fortification of flour because the price of B1 had fallen to $1,750 per kilogram. During World II, the U.S. War Food Administration mandated enrichment of breads and pastries with vitamin B. By the late 1970s, vitamin B1 could be procured in bulk for merely $30 per kilogram.

Manufacturing Spreads to Asia

Organized research on vitamins began in Japan in the late 1930s. Takeda Chemical Industries was the first mover, following a strategy of specializing in the water-soluble vitamins for human consumption. A predecessor of Takeda sold locally made vitamin C in 1939 in Japan. Production of several vitamins in Japan began on a significant scale in the 1950s and 1960s, in some cases because the original patents had expired. By 1955 Takeda began to export vitamin C to the United States. Takeda developed significant global market shares in the early 1980s in vitamins C, B1, B6, and folic acid. Moreover, it entered the vitamin B2 industry in 1990.

In the 1990s, Takeda had become the world's second largest manufacturer of vitamins B1, C, and folic acid; it was third in the vitamins B2 and B6 industries. The second largest Japanese manufacturer of vitamins was Eisai Co. It began sales of pharmaceutical grade vitamin E in 1951; by 1989 it would account for 15% of the huge world market for this vitamin. The third largest was Daiichi, which became the second largest supplier of vitamins B5 and B6 in the world. Other important vitamin

[17] Choline chloride and niacin are exceptions. Roche may have acquired some of the U.S. vitamin facilities in the 1950s and 1960s.

makers were Mitsui (B4), Alps Pharma (B5), Tanabe (B2), Sumitomo (biotin and folic acid), Nippon Chemical (B12), and Kongo (folic acid).

Japanese exports to North America and Europe increased steadily up through the late 1980s. At the same time, U.S. pharmaceutical companies largely left the field; their facilities either were closed or sold off to the leading European vitamin makers. Beginning in the late 1980s, Chinese chemical firms began to imitate the earlier success of their Japanese rivals. By the 1990s, a large number of small manufacturers in China had made the country the fourth significant location for world vitamin manufacturing, threatening to surpass Japanese production in several lines. China's growth in vitamin C output was particularly striking, aided in part by low cost production based on biotechnologies (UKCC 2001, de Roos 2004).

Market Structure

Because of its early technological lead and continuing improvements in the synthetic chemistry of vitamins manufacturing, Hoffmann-La Roche quickly became the dominant producer in the 1930s. While its shares of most vitamins markets slid somewhat, Roche retained its premier position throughout the 1990s, with an average 50% global share of its product lines. Roche was also the most diversified of the producers, making 13 of the 16 cartelized products and selling all of them.[18] Only BASF came close to Roche in its degree of diversification. When cartels were formed in 1989-1991, Roche's average global share of the markets for 14 major vitamins was 46%. BASF, Rhône-Poulenc, and Takeda Chemical Industries were second, third, and fourth, with market shares of 18%, 8%, and 7%, respectively. Thus, the four largest companies supplied almost 80% of the global market for vitamins sold in bulk or in blends. Companies below the top four tended to be specialized in the manufacturing of one or two products.

Market Seller Concentration

It is inappropriate to view all vitamins as a single market at the manufacturers' level. Whether speaking of human or animal populations, the metabolic functions for each vitamin are unique. One vitamin cannot be

[18] Technically there are four carotinoids, but beta carotene and other carotinoids will be counted as two products. Vitamin premixes is not shown in Table 2.

substituted for another with the expectation of avoiding some specific health or growth problem in a given species. Moreover, the manufacturing techniques used to make one vitamin will not work to make another. The combination of factories, machines, raw materials, technical knowledge, and other supply factors are unique to each vitamin. Thus, differences in demand and supply characteristics assure that each of the 16 vitamins falls into its own separate market.

Moreover, there is a sharp distinction between bulk vitamins destined for consumption by humans and those made for animal-feed market. Human-grade vitamins must meet higher standards of purity, must be packaged in containers affording greater protection from contamination, and typically are sold in lower strengths so as to avoid toxic effects. In some cases, food-grade, pharmaceutical-grade, and cosmetic vitamins may form separate markets.[19] For example, vitamin powders would be preferred for tablets or dry food applications, whereas liquids would be needed for capsules, beverages, or skin creams. Of course, in a pinch human-grade vitamins might be substituted for feed-grade, but the typically higher prices of the former (on an active-ingredient basis) would generally rule this out as a regular practice. Finally, within the human grades of vitamins, a distinction may be made between natural and synthetic versions, a distinction that is important for marketing purposes. Cartels were formed only for synthetic vitamins.

The significance of these market features is that the number of suppliers will be fewer for one vitamin type than all types of vitamins in the aggregate. For example, seller concentration is higher for human-grade vitamin E than for all grades and types of vitamin E.

Table 10.2 shows the best available data on the global production shares of the 21 companies in the vitamins cartels. It is clear that the typical product market was dominated by at most three or four firms.[20] The four industry leaders attracted a total of 21 companies to the fictional collusive organization they would call "Vitamins, Inc." Indeed, it appears that Vitamins, Inc. was comprised of *every* manufacturer of vitamins in the

19 In some countries, pharmaceutical grades of bulk vitamins are purer than grades suitable for fortification of foods, but this is not typically the case.

20 In general production shares and sales shares are quite close (Bernheim 2002a: 30-31). The main difference is that the sales shares of the big three manufacturers --- Roche, BASF, and Rhône-Poulenc – are one or two percentage points lower than their production shares. Consequently, at the time the cartels were being launched in 1989-1990, the top three companies had lower rates of capacity utilization than the remaining producers. As the ringleaders the ability of the big three to quickly ramp up production with their existing plants was a distinct bargaining advantage in forming cartel agreements.

Table 10.2 Global Production Shares, 20 Companies and 15 Straight Vitamins, Early 1990s

Company	A	B1	B2	B3	B4	B5	B6	B9[a]	B12	C	D3	E	H[b]	Caro-tinoids	World Markets[c]
								Percent							
Roche	48	44	54	S	S	36	49	39	S	46	43	46	45	83	46
BASF	30	2	30	S	15	21	3	S	S	7	13	28	S	16	17
Rhone-Poulenc	21		S	S		S			62	S		13	S		8
Takeda		31	3				12	23		26					7
Eisai												12			2
Daiichi						29	12								1
E. Merck	S	S	S				5			10			10		2
Hoechst									7	S					1
Solvay	S		S							S	44	S	S		0.6
Lonza				58									5		2.3
Akzo					15										0.8
Degussa				22[e]											0.6
Reilly				22[e]											0.3
Nepera				6											0.3
Chinook					19										1.0
Mitsui					10										0.5
DuCoa					18										1.0
UCB					13										0.7
Kongo								15							0.1
Sumitomo								20					17		0.6
Tanabe		S											20		0.6
Cartel total	99	77	87	86	90	86	81	97	69	89	100	99	97	100	93

S = Sold but did not manufacture
Sources = Connor 2006b: Appendix Table 6.
a) Better known as folic acid
b) Better known as biotin
c) The total bulk vitamin sales of the company divided by global sales around 1990-1991. Excludes sales of premixes. The weighted average share with global market sales as weights of Roche, BASF, Rhone-Poulenc, Takeda, Daiichi and Lonza were 50%, 20%, 19%, 24%, 21%, and 33%, respectively.
e) Degussa and Reilly were joint venture partners.

world with more than a 10% share in each of the 16 cartelized markets.[21] Moreover, overall market control by Vitamins, Inc. in Western Europe and the United States was practically the same as at the global level. On average, the cartels would start out colluding with control over 90% to 91% of supply in these two jurisdictions.

Figure 10.1 summarizes the degree of global industry control by the cartels around 1990. Because the vitamins cartels contained all of the top

21 The Japanese firm Alps Pharmaceutical had a 10% global share of the vitamin B5 market, and Nippon Chemical had a similar share of vitamin B12 (Appendix table 6). These are quite exceptional cases, because the next highest share of a fringe firm was 5% (Korean manufacturer E. Sung in biotin).

three or four producers, cartel market control is almost the same as market concentration in most markets. Mean four-firm concentration in 1990 was an extremely high 97%. Market concentration is similar at the regional levels in Western Europe and North America.

The market shares of individual manufacturers varied across the two regions in predictable ways. Most of the European firms (BASF, Lonza, Akzo, etc.) had greater penetration of the European market than the U.S. market. Except for biotin, the Japanese manufacturers had more success penetrating the U.S. market than the European one. Japanese and Chinese firms had higher shares in Asian markets than in Europe.

However, there are four markets in which the cartels began with lower levels of regional control than world control. In the cases of vitamins B1, B6, and B12, the cartels had much higher market control in Western Europe than in the United States; for vitamin C the reverse is true. Low regional cartel control may have contributed to the fragility of three of these cartels.

In most of the cartels control slipped during the conspiracy periods. For the nine cartels for which the information exists, five experienced significant entry by sellers outside the collusive group. Vitamins, Inc. lost about 20 percentage points of global market share from the founding of the biotin (B9) and vitamin C cartels until their demise.[22] In vitamins B1, B2, and B6 markets, the cartels lost 8 to 10 percentage points during the conspiracies. All of these are water-soluble vitamins. In four of the five cases, it was Chinese vitamins manufacturers who were responsible for the erosion of cartel control. On the other hand, despite high prices Vitamins, Inc. held on to its market shares in vitamins A, D3, H, and carotinoids.

Buyer Concentration

Buyer concentration in the bulk vitamin and vitamin premix markets is generally quite low. In the 1990s, there were more than 4000 direct buyers of bulk vitamins in the United States. Animal feed manufacturers are numerous because many serve local markets; there were more than 2000 feed

[22] De Roos (2004) has a sophisticated model that explains the dynamics of the vitamin C cartel.

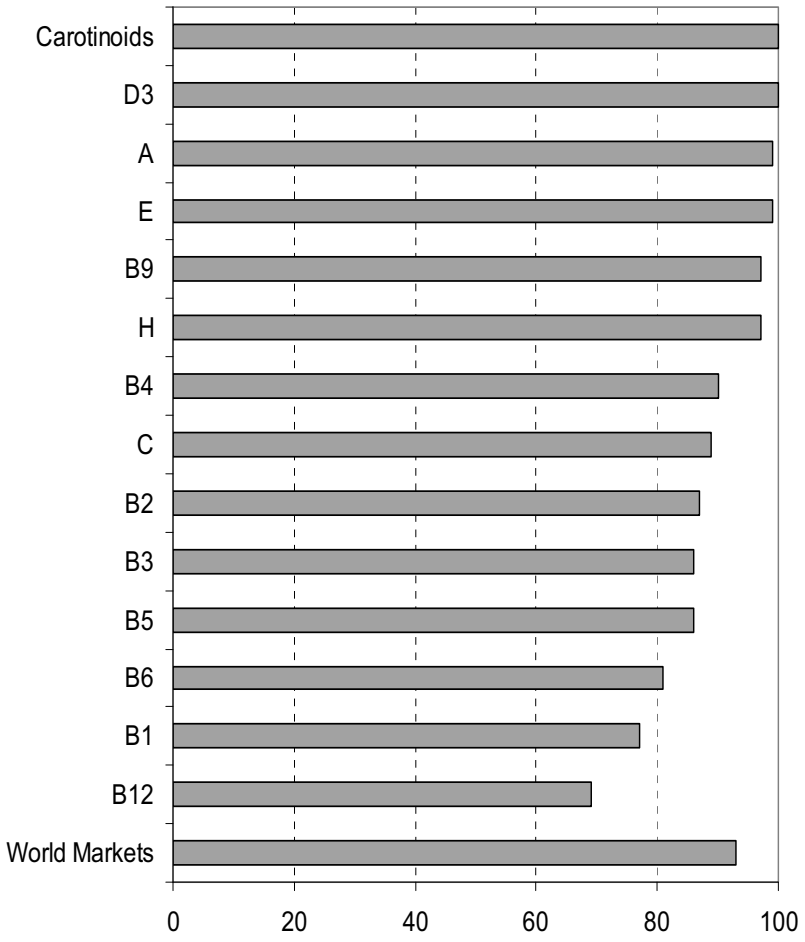

Figure 10.1 Global Cartels' Market Control, Early 1990s

manufacturers in the United States alone in the 1990s (Schiek and Connor 1997). Many large agricultural producers of pork, chicken and eggs purchase bulk vitamins directly from the manufacturers. More than a thousand food-processing companies purchase vitamins to fortify their products. Scores of pharmaceutical companies buy bulk vitamins to make multivitamin pills or capsules. Finally, there are many chemical brokers and wholesalers that purchase large quantities of vitamins and resell them in smaller amounts to small farmers, feed mills, or food processors.

A report by the European Commission has some information on buyer concentration in Western Europe (EC 1976:4-5). This report noted that the dominant firm Hoffmann-LaRoche maintained accounts for about 5000 buyers for its products. Twenty-six of its most important customers accounted for merely 16% of its sales of bulk vitamins.

Homogeneity

At first blush, the markets for bulk vitamins appear to be rather heterogeneous. Within nearly all the 16 vitamin "families" (A, E, C, B1, etc.), there are those suitable for human consumption and those made for incorporation in animal feeds, and the latter cannot legally be substituted for sale to pharmaceutical or food-processing companies. Moreover, some vitamins are available in alternative physical forms, such as, oils, dry powders or, aqueous solutions. Vitamin premixes are sold in thousands of different formulas. Roche alone offered about 4,200 blends of premixes in the 1990s (Bernheim 2002a: 187). Finally, all the vitamin families are marketed in a range of strengths that are based on the percentage of active vitamin compound. For example, choline chloride (vitamin B4) is typically sold in four forms: aqueous 70%-pure, aqueous 75%, dry 60%, and dry 50%. Most bulk vitamins are sold in six to 12 versions that account for the vast majority of sales in the vitamin family.

Although there are multiple quality grades and strength levels available for most bulk vitamins, it is clear that for a given grade of bulk vitamin there is little or no differentiation across producers. A vitamin has a unique molecular structure with unique biological properties. Vitamins are widely viewed as "commodities," that is, products so homogeneous that delivered price net of discounts is the only factor driving buyers' decisions. For each vitamin there is likely to be one variety, typically the modal one, which drives the prices of all other varieties of the same vitamin. Human-grade tends to sell in fixed price relationship to the same vitamin's feed grade; the same is true of different strengths when converted to a 100%-pure basis. Prices of 100%-pure human and 100%-pure feed versions of the same vitamin are very highly correlated over time.[23] This customary pricing practice is convenient for collusion, because sellers need only

agree on one price for each vitamin, from which the prices of all other types will be priced using historical premiums or discounts.

The only departure from perfect product homogeneity may be in after-sales services provided by the leading manufacturers. In the earlier decades of the vitamins industries, manufacturers sold most of their output directly to food, feed, and pharmaceutical manufacturers. The manufacturers' representatives were in a position to pass on fresh research findings about dosages and effectiveness to their customers. Slowly, as the research moved into the public domain and government agencies set recommended levels, the need for this type of after-sales service dried up. However, in the 1980s Roche and BASF leveraged their large product portfolios by developing networks of premix plants to serve agricultural producers and feed manufacturers. Sales of these premixes may have involved after-sales technical advice. A survey of this issue by the UK Competition Commission found that a few premix customers found customer support important in choosing a supplier (UKCC 2001: 13); however, the Commission later concluded that competition between suppliers of bulk vitamins "… is primarily on price" (*ibid. p. 16)*. The European Commission is of the same opinion (EC 2003).

Entry Conditions

Getting access to the sophisticated synthetic chemistry needed to produce most vitamins is difficult. That and mastering the implementation of large scale manufacturing of vitamins appear to be the major barriers to entry. Entry is slow and impeded by sunk costs and excess capacity. A report of the European Commission summarized technical barriers from an internal 1972 memorandum by Roche:

> "Mass production of synthetic vitamins…requires heavy investment, since the synthesizing process is in large measure unique to each group of vitamins and highly specialized equipment is necessary. Plants used for manufacturing vitamins of one group cannot therefore be used for producing vitamins for another group, nor is the conversion of [a] plant for such production a simple matter…[P]roductive capacity is normally geared to

23 Bernheim (2002a: 84-121) has carefully constructed such time series for 1980-2001. Feed and human price patterns are nearly identical for all vitamins except perhaps vitamins B3 and beta carotene.

> the estimated growth in demand over 10 years…At present there is surplus capacity throughout the world for the production of vitamins" (EC 1976: 2).

Technological impediments vary somewhat across vitamins. Actual entry patterns reveal differences in the height of entry barriers in the manufacture of vitamins (Table 10.3). Producing the "oil-soluble" vitamins A, B3, D, and E seems to present the greatest difficulties for entry because they are still largely in the hands of the original producers, Roche, BASF, and Rhône-Poulenc; the same appears to be true for beta carotene and canthaxanthin.

A somewhat lower degree of industry barriers to entry is revealed by production by Japanese chemical companies. Although evidence is spotty, Takeda, Eisai, and Daiichi seem to have begun producing vitamins B1, B2, B5, folic acid, and biotin a decade or two later than the big three European pioneers. The more moderate barriers for these B type vitamins can be inferred by the less advanced state of Japanese pharmaceutical and organic-chemicals R&D up to the 1950s; however, by the 1970s the general scientific prowess of Japanese research had caught up to U.S./Western European levels in most fields.

Finally, there are a few cases of vitamins where more recent entry has occurred on a large scale in newly industrializing countries with relatively backward scientific infrastructures. The case of China in the 1980s and 1990s is particularly instructive, because the Chinese government has made investment in chemical industries with high export potential a high priority. Rapid rates of growth in Chinese exports of certain vitamins may be taken as an indicator that *technological* barriers to industry entry are fairly modest, especially access to knowledge about the synthetic chemistry required to implement feasible manufacturing methods. Thus, in those cases where Chinese vitamin exports were becoming competitive in the same markets to which the major European producers also exported, one can safely assume that patents or technological secrecy no longer protect the primacy of the established pioneer firms. There were six vitamin markets with large or growing Chinese exports to the United States in the 1990s: vitamins C, B1, B2, B6, B12, and folic acid. China's vitamin C imports were especially large, accounting for 54% of the value of total U.S. imports in 1996; B12 was next with 27%. The other four B vitamins were in the 8 to 13% import-penetration range, but growing. It is noteworthy that these are almost the same vitamins with significant Japanese production (B12 is the exception). However, there is little evidence of large-scale Chinese entry into synthetic production of vitamins A, E, B3, D, K, or – all

Table 10.3 Evidence of Technological Barriers to Market Entry into Vitamins, 1990s.

High Barriers: Big Three Pioneers in 1980s Still Dominated Global Production [a]	**Moderate Barriers**: Pioneers No Longer Dominate but Little Fringe Firm Entry	**Low Barriers**: Chinese Exports Were High at End of Cartel [b] (Share of World Supply)
A	B2	C (34)
E	B12	B1 (40)
B3	Biotin	B6 (43)
B4		Folic Acid (34)
B5		
D3		
Beta carotene		
Other carotenoids		

a) Dominance is indicated by global production shares of 80% or more at the end of the collusive period.

b) In every case, there was earlier entry by Japanese chemical companies as well; cartels in the 1990s disbanded quickly.

markets supplied nearly exclusively by the pioneering, mostly European manufacturers. Therefore, technological barriers to entry appear to remain high for this last set of vitamins.

Table 10.4 provides additional specificity on the technical sources of possible barriers to entry into the manufacture of bulk vitamins. First, most of the vitamins made by chemical synthesis require chemical intermediates that are not available for purchase on open markets. These inputs must either be made as captive supplies by the vitamin maker, or they must be obtained from the one or two feasible local sources under long term supply contracts. In the first case, a potential entrant will incur additional sunk investment costs beyond those needed for vitamin production itself. An extreme example of this barrier is the fact that trimethylamine (TMA) is a key ingredient in making choline chloride. The major vitamin makers do not produce choline chloride because they do not have easy access to TMA. In the second case, suppliers are likely to have a profitable relationship with one of the established vitamin manufacturers that the supplier is loath to endanger by supplying a new rival.

Table 10.4 Key Chemical Ingredients Required for Vitamin Synthesis

Vitamin	Intermediates Not Readily Available in Markets/ Other Barriers	Raw Materials
E, synthetic	isophytol, trimethylhydro-quinone, synergies with making vitamin A	acetone, acetylene, isobutylene, napha, formal-dahyde
A	Pseudoionone, synergies with making vitamin E	acetone, acetylene, isobutylene, butenediol, for-maldahyde
C	sorbitol	glucose
B4	Trimethylamine (TMA)	hydrochloric acid, ethylene oxide
Beta carotene	synergies with vitamins A and E	acetone, ocetyene, triphenylphosphine
B5	pantolactone, beta-alanine	isobutryaldehyde, bydrogen yanide, hydrochloric acid, acrylonitrile, ammonia, caustic soda, cal-cium hydroxide
B3	methylglutaronitrile, beta picoline, 3-cryanopyridine, methylethylpyridine	ethylene, nitric acid, farmaldyhyde, ammonia
B2, fermented		sugars
B2, synthetic	ribose	
Biotin (H)	thiolactone	furnaric acid or diketene, cysteine, thiophene, phosgene gas
B1	synergies with A, E, B3, or beta carotene; grewe dia-mine	ethylene, prymidine, malononitrile, acronynitrile, carbon monoxide, cetamidine, butyroloctone, methyl acetate, hydrochloric acid, ammonia, car-bon disulphate
B12, fermented		sugars, nitrogen compounds
B6		oxazole, dienophile
Canthaxanthin	beta carotene	15-carbon compounds
Astaxathin	canthaxanthin	15-carbon compounds
D3		cholesterol
Folic Acid (B9)		acetone or acrolein, chlorine gas, guanadine, cyanoethyl acetate, sodium ethoxide, nitric acid, hydrogen gas, glutamic acid, benzoic acid

Source: Bernheim (2002a: 34-58) and trade magazines.

Second, several vitamins are made under synergistic conditions of production. Entrants that do not intend to make two or more of the synergistic products will suffer cost disadvantages relative to multiproduct established firms. Very few vitamins have neither of the two technical impediments to entry.

The major significance of this discussion of technological barriers is the fact that the Chinese exporters were spoilers for the cartels. The Chinese vitamin companies were too small, too numerous, and too inclined to be aggressive about exporting – all characteristics that made them unsuitable candidates to recruit to the vitamins cartels. Whenever Chinese chemical companies could adopt production methods that made their vitamin production price-competitive (assisted by Chinese government export subsidies), they aggressively captured U.S. market shares that in some cases were so large that the cartels affected were unable to sustain their conspiracies. This certainly happened in the case of vitamin C around 1995. Chinese incursion into the U.S. market was also one factor for the early demise of the cartels established in vitamins B1, B2, B6, B12, and folic acid.

Summary of Structural Conditions

Most of the bulk vitamins industries were highly concentrated on a global level and had severe barriers to entry due to technological secrecy, market foreclosure of key inputs, or economies of scale or scope in production.[24] Not counting an unknown number of small but aggressive Chinese vitamins manufacturers, the typical vitamin industry comprised from two to five companies that controlled more than 95% of worldwide output. Combined with the undeniable homogeneity of the products, these are the archetypes ripe for formation of durable collusive arrangements.

[24] The premix business had different types of barriers: availability of a complete array of bulk vitamins, mastery of the science animal nutrition and least-cost rations, an ability to offer custom blends tailored to specific customers, and a sales force trained to offer after-sales technical advice.

Companies

Major Players

Prior to World War II Hoffmann-La Roche dominated global production of most vitamins. Rhône-Poulenc, Takeda Chemicals, Hoechst, and a number of smaller European and Japanese chemical companies entered in the post-World War II period. By the late 1980s, the "Big Three" manufacturers of vitamins (Roche, BASF, and Rhône-Poulenc) would control 60% of world production. They would become the core of the global vitamins cartels of the 1990s. This section provides brief sketches of their histories, strategies, and financial conditions.

Hoffmann-La Roche

The company began as a partnership founded in Basel, Switzerland in the late 19th century to manufacture medicines. Roche also began to invest abroad quite early in its history. Its first U.S. branch was opened in 1905.[25] By the advent of World War I, Roche had developed a successful portfolio of products that were sold on four continents. Although it began to sell shares to the public in 1919, the majority of the company's stock has been retained by the heirs of the five founding families.

Roche invested heavily in research and development from the beginning. In the 1960s Roche began marketing two important tranquilizers, Librium and Valium, which became a major source of profits. Around 1973 a British employee of Roche revealed an extraordinary level of geographic price discrimination across Europe for its tranquillizers.[26] An investigation by the UK Monopolies Commission determined that Roche's UK subsidiary was required to pay 50 times the price of the tranquillizer in Italy. The Monopolies Commission ruled against Roche and required the company to reduce its UK wholesale price by 60% and to compensate UK buyers.

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[25] Its foreign investments came in handy during World War II. Like some other Swiss multinationals, such as Nestlé, Roche transferred most of its assets to a North American holding company in case Switzerland was overrun. Roche's CEO moved to its world headquarters in Nutley, New Jersey during the War.

[26] The whistle-blower's name was Stanley Adams. He was jailed by Swiss authorities for revealing Roche's trade secrets. Adams (1984) wrote a book about this episode. However, Adams came to a bad end. In 1994, he was convicted of conspiring to murder his wife for the insurance money (Barboza 1999).

Roche had also run into antitrust trouble with the European Commission in the mid 1970s concerning its bulk vitamins business. In a decision made in June 1976, the EC charged Roche with a violation of the European Community's rules on abuse of a dominant position; Roche was fined the then substantial amount of €300,000. The EC found that Roche had imposed unreasonable restrictions on contracts with a large number of food, feed, and pharmaceutical manufacturers. In particular, Roche had given substantial (up to 20%, but most much lower) rebates to customers that agreed to buy all of their bulk vitamins from Roche. These contract terms were effective in preventing new entrants like BASF and E. Merck from expanding through price cutting.

Roche's patents on the two tranquilizers expired in 1985, and its failure to find any exceptional new drugs in the 1980s began to place pressure on the company's profits. Adding to the company's woes were losses in market shares in two other major product lines: vitamins and citric acid. Chinese manufacturers were making significant inroads into these industries in the late 1980s, a trend that accelerated in the 1990s.

Roche was a financially strong company in the late 1990s. In 1997, Roche had global sales of $12.9 billion, of which almost two-thirds was pharmaceuticals. Roche is the fourth largest drug company in the world. The remaining third of its sales is spread across flavors and fragrances, vitamins, carotinoids, citric acid, enzymes, and genetic-engineered products. Roche manufactured vitamins in 11 factories: Europe (6), the United States (3), and Asia (2). Vitamins and carotinoids in the last full year of the cartels were 10.6% of Roche's sales.[27] In fiscal 1997, Roche was very profitable. Its net income was 22.8 % of sales. Bloated by two as yet uncovered price fixing conspiracies, Roche's Vitamins and Fine Chemicals Division had an operating profit of 18.5 % of sales.

BASF AG

BASF was founded in 1865. Its first successful products were dyes produced synthetically from coal tar. BASF grew quickly in the early 20th century. The company concentrated its production at its huge complex in Ludwigshafen near Hanover. By 1926, the plant covered 2,787 acres and employed 26,000 people. This plant was and remains the largest chemical manufacturing site in the world.

In 1904, BASF joined with the huge chemical company Bayer and many smaller German chemical companies to form a full-blown cartel in

[27] At more competitive prices in 1999-2000, it had vitamins sales of $1.5 billion, which comprised almost 9% of company sales (Bernheim 2002a: 62).

numerous lines of chemicals. Besides setting prices, the BASF-Bayer cartel enforced production quotas for each of its members, forced vertical integration among its members, engaged in predation and full-line forcing against rivals outside Germany, and pooled its profits. In the same year, Germany's largest chemical company, Hoechst, and most of the rest of Germany's chemical companies formed a second similar cartel. In 1924-1925, the two German chemical cartels extended their dominance of the world's chemical industries by merging into one giant cartel called I.G. Farben. This new cartel refined the monopolistic practices of its predecessor cartels. I.G. Farben was larger than the three largest chemical companies outside Germany combined. Beginning in the early 1930s, I.G. Farben began secretly helping Germany re-arm. As a result of active collaboration with the German war effort, I.G. Farben's directors were indicted, tried, and found guilty of war crimes at the Nuremberg trials in 1946.[28] In 1947, I.G. Farben was dismantled by the Allied occupation authorities. However, BASF, Bayer and Hoechst were essentially recreated in their pre-war images.

BASF made a rapid recovery after 1947. By the 1960s, BASF had become a world leader in dyes, petrochemicals, plastics, synthetic fibers, coatings, and agricultural chemicals (including vitamins). BASF's rapid growth continued up to 1989. In that year, BASF earned a profit rate on sales of 9.5%. However, 1989 proved to be a peak year, with sales and profits falling each year for four years thereafter. Employment contracted by 24% by 1994. Besides layoffs BASF divested itself of many operations (primarily in Europe), directed most of its new investments to East Asia, and made biotechnologies a high priority. From 1994, things began to improve at BASF. Sales, profits, and profit rates rose once again. By 1997, sales had reached $31 billion, and profits were back up to about 8% of sales. Indeed, by 1997 BASF edged slightly ahead of its two historically bigger rivals, Bayer and Hoechst.

BASF operated six plants that made 11 vitamins, two in Europe, two in Latin America, and two in Asia. In 1999-2000 BASF sold $541 million in vitamin products, which was about 2% of company sales (Bernheim 2002a: 63).

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28 When Germany overran countries during the War, the country's chemical assets were given to Farben. I.G. Farben built at least two chemical plants that were staffed with slave labor from concentration camps.

Rhône-Poulenc SA

This company traces its roots to two French companies. Ets. Poulenc-Frères began in Paris in 1858 as a maker of household cleansers, but turned to pharmaceuticals in the late 19th century. Rhône was started in Lyon in 1895 as a manufacturer of dyes and fragrances. The two firms merged in 1928. During the Second World War, Rhône-Poulenc became a leader in nylon and penicillin. Rapid post-war growth made the company France's largest industrial enterprise by the late 1960s.

However, a number of poor business decisions in the 1970s combined with the poor performance of the French economy brought Rhône-Poulenc to the brink of bankruptcy in 1980-82. The French government nationalized the company in 1983 and sold off its assets in petrochemicals and agricultural chemicals. By 1993, when Rhône-Poulenc was privatized once again, it was drawing on foreign markets for 75% of its sales. By the 1990s, Rhône-Poulenc had become a big, diversified chemical manufacturer that made moderate profits in most years (pre-tax profits of 5 to 7% of sales). However, overall sales in the decade stagnated at around $15 billion per year. In 1998, Rhône-Poulenc and Hoechst announced plans to merge into a new entity called Aventis. This new company with its general headquarters in Strasbourg, France became a reality in December 1999. Aventis' life-sciences division is the largest in the world.

Rhône-Poulenc sold $516 million of feed-grade bulk vitamins in 1999, about 3% of Aventis' total revenue. Both of the company's vitamin plants are located in France.

Takeda Chemical Industries

Takeda was the Japanese pioneer in making and selling vitamins. By the 1980s it had become Japan's largest research-based pharmaceutical firm. In 1990, from factories in Japan and North Carolina, Takeda maintained leading production positions in four bulk vitamins. In 1999-2000, the company sold $686 million in vitamins worldwide, which represented more than 8% of its total revenues (Bernheim 2002a:65). Takeda would become the key link between the European members of the vitamins cartels and the six other Japanese manufacturers that joined the conspiracies.

Minor Players

The top four companies each generated well over half a billion dollars in vitamin sales in the year after the cartels of the 1990s ended. Below them

were arrayed 17 smaller companies with fewer vitamin product lines; five are based in Western Europe, five in North America, and five in Japan.

Headquartered in Europe were E. Merck KGaA, UCB SA, Akzo Nobel NV, Degussa AG, Hoechst AG, and Solvay SA. **E. Merck**[29] is a private German chemical maker with a single plant that made vitamins E, biotin, C, and B6 during the 1990s. Merck had made several forays into various vitamin businesses in the 1980s. It made vitamins C, B6, and biotin throughout most of the 1980s and produced vitamin B2 until 1984. However, although Merck stopped manufacturing vitamin B6 from 1992 to 1997, it continued to sell purchased material until it resumed production in 1998. **UCB** is a large Belgian chemical manufacturer with choline chloride plants in Belgium, Germany, and Spain. Dutch chemical company **Akzo Nobel** also made choline chloride in plants in the Netherlands, Italy, and China. (Europe's third choline chloride maker is BASF). **Degussa** is Germany's third largest chemical concern; it makes vitamin B3 in its Belgian plant. **Lonza**, headquartered in Basel, Switzerland, is partly owned by the large Swiss aluminum maker, Alusuisse. Lonza is the world's largest producer of vitamin B3, which is made in its plants in Switzerland, China, California, and Pennsylvania. Lonza also manufactured biotin from 1990 to 1996. Finally, **Solvay** is a Belgian firm with the leading position in vitamin D3, which it makes through an affiliate in India.

In the North America there are five companies that only manufacture vitamins B3 and choline chloride (B4). **Nepera**, Inc., a subsidiary of Cambrex Corp. of New Jersey, produced vitamin B3 in its sole plant in New York State. **Reilly Industries**, Inc. manufactured vitamin B3 in its Indiana plant through Vitachem, a joint venture with Degussa; Vitachem also seems to have operated a Belgian plant until it was dissolved in December 1998.[30] **DuCoa** was a joint venture of the ConAgra and DuPont companies devoted to making vitamin B4 in Missouri, South Carolina, and Mexico; In August 1997, DuCoa was acquired by its management under the name DCV. **Bio-Products**, Inc. is the second vitamin B4 maker with production facilities in Louisiana, Kentucky, and Brazil. Bio-Products is a subsidiary of the Tokyo-based trading company Mitsui & Co. **Chinook Group** of Toronto, Canada manufactured vitamin B4 in Ontario, Minnesota, and Singapore.

Besides Takeda and Mitsui/Bio-Products, five other Japan-based manufacturers joined the global vitamins cartels of the 1990s. **Daiichi**

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[29] E. Merck is the former parent of the now much larger U.S. pharmaceutical manufacturer Merck & Co.

[30] The small Belgian plant is still operated by Reilly. Whether it is the same Belgian B3 plant owned by Degussa is not clear.

Pharmaceutical Company made vitamins B5 and B6 in its two Japanese plants. In 1999-2000, Daiichi sold $88 million worth of bulk vitamins, about 3% of its total revenues. **Eisai** Company made only vitamin E in its Japanese and Texas plants. **Sumitomo Chemical** manufactured biotin and folic acid in its Osaka plant; its participation in these cartels ended in the spring of 1994. **Kongo Chemical** also withdrew from fixing the price of folic acid in mid 1994. Finally, **Tanabe Seiyaku Company** was another Osaka manufacturer of vitamins; it ceased production of vitamin B2 in 1991, but in most years it was the second-largest producer of biotin. Because Sumitomo, Kongo, and Tanabe ceased colluding more than four years before the first indictments were handed down, none was fined by antitrust authorities.[31]

Fringe Firms

At the beginning of the 1990-1991 cartels, the fringe supplied 7% of world vitamins manufacturing production (Bernheim 2002a: Chapters 7 and 8). Fringe firms are those that produced cartelized products but did not join actively the cartel agreements. In some cases, fringe producers acted passively in support of the cartel by raising their prices along with the cartel and restraining their output.[32] In other cases, fringe producers behaved opportunistically by under pricing the cartel and expanding their output when prices were high. Aggressive increases in market shares by fringe producers appear to be the main explanation for the early termination of four or five of the vitamins cartels.[33]

The most important part of the fringe that explains the dynamics of vitamin cartelization is about 50 Chinese chemical companies. Whenever these firms were able to master the techniques of production and produce a vitamin at a competitive price, they expanded output rapidly and exported vitamins in large quantities. The more effective the vitamins cartels were

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31 Although saved by the statute of limitations from government fines, they were defendants in civil actions in the United States where plaintiffs asserted fraudulent concealment. The European Commission identifies the three as active members of the two cartels (EC 2003).

32 This form of followership is termed umbrella pricing; although such parallel conduct harms buyers it is generally not held to be illegal behavior. It is possible for a given firm to be both a conspirator and a fringe firm; E. Merck explicitly colluded in the vitamin C cartel, but because of its insignificant market share remained in the fringe of the vitamin E cartel.

33 One borderline case is vitamin E. Production in China began in 1991 but stayed below 3% of world production until 1997 and 1998 when its share rose to 7% and 11%, respectively. Only modest price effects can be noted in those years.

in raising world prices, the faster Chinese manufacturers captured market shares. In the first years of exporting the quality of Chinese vitamins made them unsuitable for human consumption in the high income importing countries, so helped by government export subsidies they focused at first on entering feed-grade channels at discounted prices. In the late 1990s, some European and Japanese vitamin manufacturers formed joint ventures with leading Chinese exporters, whereby Chinese producers got access to equipment and expertise to purify their bulk vitamins. By the late 1990s the purity of Chinese made vitamins had improved but government subsidies had been reduced or withdrawn. When prices collapsed in most vitamin markets in 1999-2002, the global share of Chinese product also fell.

Clarke and Evenett (2003: 700) chart the growth of exports of vitamins from China. Measured in 2002 dollars, the value of these exports was between $25 and $50 million in 1985-1989. These exports were not enough to undermine the cartels operating in the late 1980s. However, as soon as market prices began to rise in 1990-1991, Chinese exports doubled. From 1991 to 1995, Chinese exports rose at an average annual rate of 37%. By 1995 or 1996 Chinese exports almost single handedly destroyed four of the global cartels. In the late 1990s this torrid growth paused but total exports remained near the 1995 peak of $350 million.

Market Size and Growth

The sizes of the major vitamins markets varied considerably. Overall, however, the sales of the 16 vitamins and carotenoids that were affected by cartels were far greater than any other price-fixing conspiracies uncovered by antitrust authorities in the mid 1990s. Estimates of annual vitamin sales are shown for the world and four regions in Table 10.5.

Global sales of bulk vitamins sold "straight" (i.e., unblended) were $2.8 billion per year. Another product that was subject to price fixing in the 1990s was feed premixes.[34] Premix sales are very large, but are known with some precision only in North America. Counting premix sales, Vitamins, Inc. garnered annual worldwide sales of $3.8 billion.

For the entire affected periods of the 1990s, total sales in nominal dollars amounted to $26.9 billion (Table 10.6). Some of the vitamins markets may have been cartelized in the late 1980s, and their affected sales were $7.0 billion. During the cartel periods, sales in the U.S. market accounted for about 28% of the global total and Canada for an additional

[34] Sellers were convicted criminally and in civil actions of fixing the prices of feed premixes in Canada and the United States. Affected sales of these products are approximate.

1.9%. In the U.S. market, three types of direct buyers may be distinguished. The largest share of U.S. sales was four thousand buyers that

Table 10.5 Annual Sales of Bulk Vitamins, 1990s Collusive Periods

Product	United States [a]	Canada [b]	Western Europe [c]	Rest of the World [d]	World [f]
			Million nominal U.S. dollars		
A	89.6	6.9	159.9	73.6	329.9
B1	14.3	1.8	29.1	22.6	68.0
B2	29.1	2.5	49.3	20.7	100.2
B3 Niacin	35.6	1.9	33.3 [e]	33.9	104.7
B4 Choline	43.5	13.7	58.3	20.9	136.4
B5	22.4	1.7	37.6	8.4	70.1
B6	13.5	3.8	20.9	27.1	65.3
B9 Folic acid	3.3	0.6	5.7	1.3	10.9
B12	14.0	0.5	18.8 [e]	25.3	58.4
C	205.4	14.4	251.1	293.3	764.2
D3	7.8 [e]	0.5 [e]	10.7	7.1	26.1
E	180.0	13.0	229.2	87.1	509.3
H Biotin	30.3	2.0	26.9	41.8	101.1
Beta carotene	49.0	3.5	89.2	23.3	165.0
Carotinoids, other	14.5 [e]	0.8	84.5	140.6	240.1
Premixes	291.4	19.3	375.0 [e]	355.2 [e]	1040.9
Total	1,044.0	85.5	1,482.8	1186.5	3798.8

Source: Connor (2006b: Appendix Table 1)
a) Affected sales divided by plea periods; sales in the extended conspiracy period are 33.5% higher.
b) Affected sales divided by Canadian "conspiracy period".
c) Affected sales divided by EU conspiracy period. If not available, used U.S. dates.
d) Estimated as a residual.
e) Estimated as a proportion of more certain data available in other regions.
f) Data from Bernheim (2002a: 33) divided by mean of U.S. and EU conspiracy periods.

Table 10.6 Affected Sales of the Vitamins Cartels, 1980s and 1990s

Buyers	Late 1980s	1990's Plea Periods	Both Periods	
			Amount	Percent of World
	Nominal million U.S. dollars			*Percent*
U.S. Federal class	727.8	2985	3713	10.3
U.S. Direct action	634	2600	3234	9.0
Others	612	2509	3121	8.7
Total U.S.	1974	7555	10068	28.0
Canada	133	546	679	1.9
W. Europe	2513	8555	11068	30.8
Rest of the World	2429	11253	13682	38.1
Total World	7049	26909	35959	100

Source: Bernheim (2002a).

were members of the federal were members of the federal class action against the vitamins defendants. Most of the 143 largest purchasers opted out of the federal class action and filed separate suits. Western Europe accounted for 36% of global sales. Buyers in Asia, Africa, and Latin America purchased 35% of the cartelized vitamin products. One reason for the large global shares of Europe and North America is the fact that about half of the value of vitamins sold are for animal-feed use, and consumption of grain-based feeds for meat, poultry, and aquaculture production is especially

intense on those continents. Animal husbandry in other parts of the world tends to depend more heavily on pasture grasses. It is likely that vitamins sold for food and pharmaceutical uses follow human populations more closely. That is, relative to feed-grade, human-grade vitamins have higher geographic shares in Asia, Africa, and Latin America.

Vitamins A, C, and E are by far the largest of the bulk vitamins markets, accounting for 42% of total vitamin sales worldwide. Seven more vitamins and carotenoids had average annual sales of at least $100 million per year in the 1990s. The smallest global vitamin markets are for folic acid and vitamin D3.

As recently as 1960-1975, the markets for bulk vitamins had seen their volumes expand by 10% per year (EC 1976), but by the 1990s they had become mature. The average rate of volume growth worldwide for all vitamins in the mid-1990s was down to 2% to 3% per year. Only vitamins C, E, and the carotinoids could be described as growing rapidly (generally 8 to 12% in the early 1990s, but down to 3 to 6% in the late 1990s). Most vitamin markets displayed negative or nearly zero volume growth in the 1990s.

Trade and Location of Production

In the early 1990s the 21 members of the vitamins cartels of the 1990s owned 54 generally large vitamin production facilities that accounted for more than 90% of world production (Table 10.7). Twenty of these 54 plants were located in Western Europe, 19 in North America, 11 in Asia, and four in Latin America. In addition there were more than 60 generally smaller plants operated by fringe firms in China, India, Eastern Europe, and a couple of other places. Around 1990 these smaller plants supplied about 7% of world demand, but by the late 1990s they accounted for about 15%.

In the 1930s and 1940s U.S. pharmaceutical firms were major suppliers of bulk vitamins. However, by the early 1990s there was very little local manufacturing of vitamins by U.S. companies (USITC 1995). Two U.S. and one Canadian company made only vitamins B3 and B4. The major part of U.S. production came from 14 plants owned by six non-U.S. chemical companies. Roche was by far the largest producer of vitamins in the United States. It made vitamins A, C, E, H, and beta carotene in plants in New Jersey and Texas. Besides Roche, Takeda is the only large producer of vitamin C in the United States. Vitamin E is made by BASF in Michigan. Small amounts of natural vitamin E are being made by ADM in Illinois (since 1995), Henkel in Illinois, Eisai in Texas (since 1997), and by a Cargill joint venture in Iowa (since 1997).

Western Europe, Japan, and China produced considerably more than was needed for local consumption. Roughly speaking, those three regions manufactured 70 to 80% of the world's vitamins, yet they accounted for only about 50% of world consumption. Exports from those areas flowed to North America, Africa, Latin America, and other nations of Asia. For example, North America accounted for about 30% of the world's demand and imported about half of what it consumed. The rest of the world imported more than 75% if its needs.

Table 10.7 Plant Locations, Bulk Vitamins, 1990s

Company	Europe	Asia	North America	Latin America	Total No.
Roche	CH CH CH DE FR UK	JP CN	US US US		11
BASF	DE DK	CN	US	MX BR	6
Takeda		JP	US		2
Rhone	FR FR				2
Takeda		JP	US		2
Daichi		JP			1
Eisai		JP	US		2
E. Merck	DE				1
Akzo Nobel	NL IT		CA		3
Lonza	CH		US US CA		4
Hoechst	FR				1
Solvay		IN			1
DuCoa			US US	MX	3
Bio-Products			US US	BR	3
Chinook		SG	US CA CA		4
UCB	BL DE ES		US		4
Degussa	BL				1
Reilly	BL		US		2
Sumitomo		JP			1
Tanabe		JP			1
Kongo		JP			1
Cartel Total	20	11	18	4	54 [a]

Source: Bernheim (2002a: 62-80) and Connor (2001: 296-299).
a) Non-cartel manufacturers of bulk vitamins accounted for about 4% of world production from plants in the USA (2), Eastern Europe (4), Japan (3), Korea (1), and many small plants in India and China.

Chapter 11: The Vitamins Conspiracies

Collusion Begins

The vitamins industries were ripe for collusion. Nearly 100 international cartels were formed in the chemical industries in the early 20th century (Leiden University 2005). One of them formed in 1928 pooled patents and divided world exports in vitamin D (Hexner 1946:347-349). Makers of organic chemical intermediates have one of the highest rates of cartel formation of any industry, and vitamins are organic chemicals (Connor and Helmers 2006). Among international cartels discovered since 1990, 30% were in chemical markets. International cartel conduct is also more common among European and Japanese manufacturers than among North American firms. Because vitamins production was even more highly concentrated and more difficult to enter in the 1970s and 1980s than in the 1990s, it seems likely that overt collusion was practiced at least among firms within the Western European and Japanese markets prior to 1990.

Origins in the 1980s?

The plaintiffs in the civil suits in the United States appear to have had some direct evidence of illegal collusion on a global basis in most of the bulk vitamins markets in the late 1980s. What the nature of that evidence is not generally known.[1] The likelihood of collusion is reinforced by highly suspicious U.S. transactions price movements in most bulk vitamins markets beginning in 1985 or 1986 and ending in late 1988 or early 1989. These price patterns trace the "hump-shaped" pattern that is characteristic of effective collusive behavior. Moreover, the price humps are preceded by about four years of falling prices, a trend commonly observed prior to the

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[1] Bernheim (2002a) cites several documents obtained during discovery, some of them deposition transcripts, which appear to be direct evidence of agreements in the late 1980s.

formation of cartels. It appears that collusion may have broken down briefly prior to the more durable cartels that were (re)negotiated in 1990 or 1991.

These suspicious price patterns are observed in all the markets for oligopolistically structured vitamins markets except folic acid, and B12 (Table 11.1). In these markets prices declined on average 30% in the early 1980s, then rose 40% until 1989 or 1990, and fell once more about 12% in the year agreements for the 1990s were being hammered out. However, for three duopolies, only steady or increasing prices are observed throughout the decade of the 1980s. The three duopolistic industries consist of carotenoids manufactured globally solely by Roche and BASF from 1980 to the late 1990s. Roche, the original producer of synthetic carotenoids, slowly ceded a portion of its near-monopoly positions to BASF over the two decades. Because prices moved only upward from 1980 to 2000, it appears that Roche and BASF were extraordinarily cooperative in pricing conduct in these industries; that is, whether overtly colluding or tacitly colluding, pricing was practically at monopoly levels (Kovacic *et al.* 2006).

Table 11.1 Collusive Price Patterns in 1980-1991.

Vitamin Product [a]	Prices before Collusion		Prices during Collusion		Prices after Collusion	
	Time	Price Change *Percent*	Time	Price Change *Percent*	Time	Price Change *Percent*
Oligopolies:						
E	1981-6/85	-33	6/85-12/88	+39	1989	-25
A	6/81-12/85	-26	12/85-12/88	+61	1989	-14
C	1/82-6/86	-27	6/86-12/90	+36	1991	0
B5	6/81-12/85	-42	1/86-6/88	+67	6/88-12/90	-13
Niacin feed	6/81-12/86	-33	1/87-12/89	+56	12/89-6/90	-21
Niacin USP	6/81-9/86	-23	9/86-9/89	+33	9/89-9/90	-12

Niacina-mide feed		0		0		0
Niacina-mide USP	6/81-9/86	-23	9/86-9/89	+33	9/89-9/90	-4
B2	1/81-12/85	-27	1/86-6/88	+35	6/88-12/90	-13
Biotin feed	1/82-12/85	-27	1/86-6/88	+40	1/90-12/91	-30
Biotin USP	6/82-12/87	-48	1/88-12/90	+53	1/91-12/91	0
B1	1/82-12/85	-35	1/86-6/88	+49	6/88-1/90	-10
B6	1/81-12/85	-41	1/86-6/88	+52	6/88-12/90	-21
D3 feed	1/83-12/85	-37	1/86-12/88	+19	1/89-12/90	-11
D3 USP	No data	--	1/85-12/89	+25	1990	0
Mean	6/81-6/85	-30	1/86-12/88	+40	1990-91	-12
Duopolies:						
Beta caro-tene	1/80-1/88	0	1/88-12/90	+25	1/91-12/91	0
Cantha-xanthin USP	1/80-1/88	0	1/88-12/90	+17	1/91-12/91	0
Apocaro-tenol	1/80-12/87	0	1/88-12/90	+52	1991	0
Mean	1/80-1/88	0	1/88-12-90	+31	1991	0

a) No price data are available for choline chloride and folic acid. In addition, no collusion alleged for B3, B12, and premixes.

New Negotiations in 1989-1990

Dissention within cartels caused by cheating is the most frequent cause of their demise, but other external factors may have contributed. Decelerating growth rates and standardization of quality had caused the vitamin business to evolve from its former specialty-chemical status to one more like a mature, commodity-type industry in which buyers focused solely on price during purchase negotiations. Ironically a movement towards greater homogeneity of quality would have made price fixing easier.

Another hypothesis about the timing of the vitamins cartels may be derived from the general financial conditions facing the prime movers of the conspiracies. Each of the major chemical companies (Roche, BASF, Rhône-Poulenc, and Hoechst) faced a financial crisis in the late 1980s that became public knowledge when their financial results were later reported for fiscal years 1990 to 1994 (see Chapter 10). Internal projections of poor sales or profitability would have been known to top managers of the companies in 1988-1989. In some cases, profitable pharmaceutical products were losing patent protection. In other cases, one of the periodic bouts of overinvestment in fixed capital was hitting the chemical industry. For some the problems were overstaffing, inflexible labor markets, overcapacity, and unprofitable diversifications, particularly in the companies' core Western European operations. Compounding the companies' woes was the onset of a global recession in 1990, a downturn that lingered for several years longer in Western Europe than in other regions of the world. In Japan too, the miraculous growth that had characterized the post-war period had burst. Japan experienced a nearly zero-growth phase that was to persist throughout the 1990s. Desperate times produce desperate men, and the top managers of the world's great vitamins concerns would not be immune to desperate measures to restore profitability. Price fixing, though illegal for pharmacists to dispense, was a tonic that promised to restore the financial health of these companies' anemic income statements.

Major price increases announced by leading companies are usually faithfully reported by the chemical trade press. The late 1980s was generally a period of modest inflation, and there were relatively few price increases announced for vitamins during that time. However, rounds of list price increases announced in late 1989 (effective January 1990) and early 1990 caused vitamin buyers to sit up and take notice. Market demand for many vitamins was described as flat and in early 1990 and the first signs of a recession were appearing, so the timing of the price increases was unusual. Rhône-Poulenc made the first "official" public announcement in November 1989, but other European producers were doing the same informally to their customers. The most publicized list-price changes came from Roche

and BASF in early March 1990. Roche *raised* its list prices on both human-grade and feed-grade vitamins A and E, while BASF simultaneously *lowered* its list prices. The important result was that both leading producers' list prices now exactly matched. The March 1990 round was the first change in list prices since 1988. The two companies publicly admitted that during 1989 market transaction prices had hovered 20 percent below their list prices, but they promised that the gap would close during 1990. Indeed, the major purposes in the March 1990 changes were to close the gap and to increase margins. A more forthright, if brazen, statement can hardly be imagined.

Cartel Organization and Methods

The vitamins cartels resemble the innards of a Swiss watch. There were wheels within wheels (Figure 11.1).

Twenty-one manufacturers joined one or more of the conspiratorial groups that met to agree on prices and tonnage quotas, to monitor implementation, and to enforce those agreements. Of the 21 participants, 14 belonged to only one cartel, and seven belonged to multiple cartels. Hoffmann-La Roche was in 14 cartels.

Price fixing was arranged for at least 16 products: 13 bulk vitamins, two carotenoids, and feed premixes. In all but two of these cartels Roche, BASF, or Rhône-Poulenc took the lead in initiating the conspiracy. These may be called the "Roche cartels." The first two cartels to be formed were at meetings held in 1989 for vitamins A and E. A year later the Big Three European firms and Hoechst formed four more cartels among themselves in the markets for vitamin B12, two carotenoids, and premixes. In early 1990, Roche contacted Eisai of Japan, which was the only significant producer of vitamin E besides Roche and BASF (Figure 11.2). The last Roche cartel was formed in either 1990 or 1993 when Solvay agreed to join with Roche and BASF to cartelize the vitamin D3 market. Except for D3, these six cartels were all up and running by early 1990 and formed the "core set" of cartels. The six core cartels are symbolized by the dark circle in the center of Figure 11.1.

Shortly thereafter in 1990-1991, Roche and BASF reached out to other European and Japanese rivals to consolidate their control of the five core cartels and establish seven more cartels (the four small circles intermeshed with the large grey circle). First, in 1990 Roche contacted Daiichi to form the vitamin B5 cartel, which was underway by early 1991. Second,

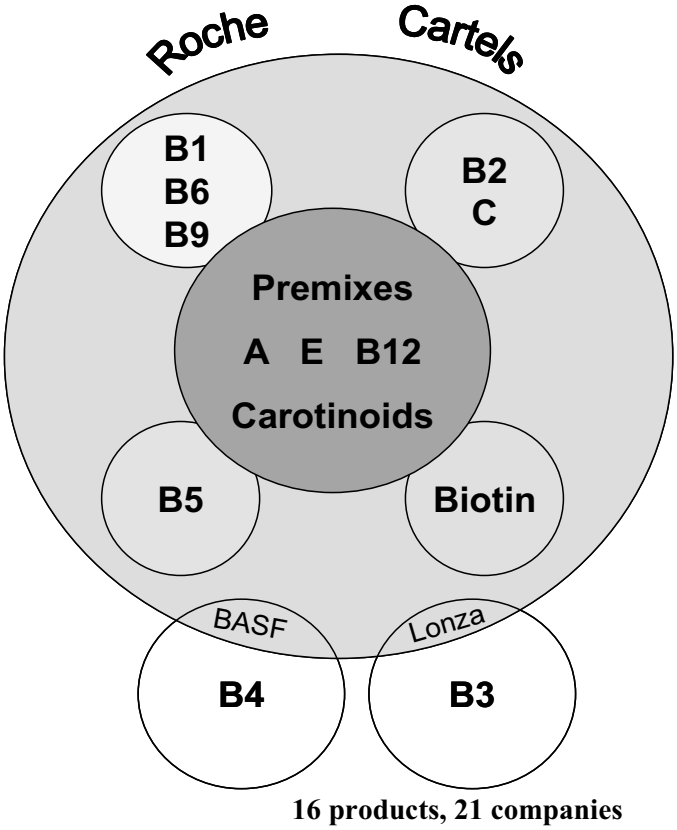

Figure 11.1. Wheels Within Wheels.

Roche approached E. Merck and Takeda to complete the membership of the vitamin C cartel and to recruit Takeda for the vitamin B1 and B2 cartels. Third, Takeda agreed to become the go-between in establishing the folic acid (B9) and biotin (H) cartels. In each case Takeda and two of the smaller Japanese manufacturers were needed to surpass the threshold of global control to make price fixing feasible. Therefore by early 1991, all 14 of the Roche cartels were successfully raising the prices of bulk vitamins.

Two more cartels got started later. They did not have Roche as a member, but they did have connections with other companies that had joined with one of the Roche cartels. That is why they are visualized as two small white circles just touching the large grey circle in Figure 1. First, the vitamin B3 cartel was launched in early 1992 by the dominant global producer, Lonza, which had begun colluding in the biotin market

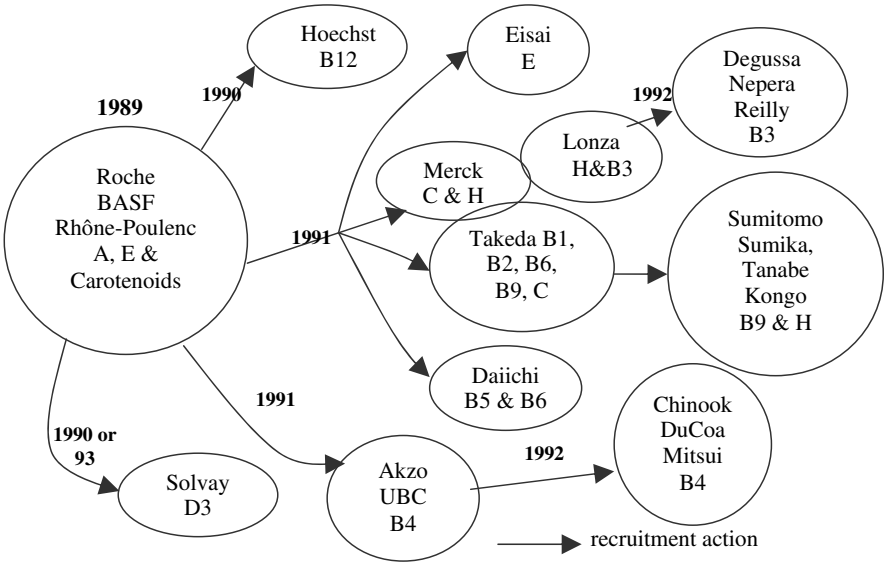

Figure 11.2. Vitamins in the 1990s: A Web of Conspiracies.

with Roche and others a year earlier. Lonza seems to have been the ringleader of this cartel that brought in one German producer and two smaller U.S. manufacturers. Second, the choline chloride (vitamin B4) cartel was the most remote from the Roche cartels. It comprised two branches, one centered in North America that had begun in 1988 with a Canadian, a Japanese, and a U.S. company. The other branch was initiated by BASF in 1991; together with two other European choline chloride makers, BASF negotiated an agreement with the three North American manufacturers that divided the two geographic markets through a cessation of trans-Atlantic trade in early 1992. Thus, though briefly joined by negotiations, the result was the establishment of two autonomous cartels, each branch with a geographic hegemony.

Now the conduct of the16 cartels is discussed in greater detail.

The Roche Cartels

Vitamins A & E

Hoffmann-La Roche was the largest seller and took the lead in organizing and managing 14 of the conspiracies. BASF was Roche's willing partner in ten of the collusive schemes. The first and most important group was formed by Roche, BASF, and Rhône-Poulenc for vitamins A and E; soon thereafter the Japanese pharmaceutical company Eisai was drawn in to strengthen the vitamin E cartel. These committees began to refer to themselves as "Vitamins Inc.," a fictional joint venture that would conquer nearly all the vitamins markets of the world.

Against a backdrop of falling prices in the late 1980s, the presidents of the vitamins divisions of Roche and BASF met in a hotel in or near Basel, Switzerland on June 7, 1989 to start the new conspiracy in motion (EC 2003). Two months later the Roche and BASF presidents invited the head of Rhône-Poulenc Animal Nutrition to join them at a planning meeting in Zurich, Switzerland. The three men conferred again in Zurich for two days in September, 1989. By the end of the four days of meetings, the objectives and general organization of the vitamins cartels had been agreed upon.

The three companies agreed to raise the prices of vitamins A and E in stages beginning in early 1990. They also shared data on the size of these markets to arrive at a consensus on 1988 sales volume for each firm and the whole market. They then agreed to freeze their firms' market shares at the 1988 levels for the foreseeable future; growth of the market would be shared proportionally to their quotas. Other rules were adopted regarding sales practices and a compensation scheme to handle year-end deviations from assigned quotas. Late in 1989 a fourth meeting was held in Basel during which country-by-country market shares were set, 1990 sales were forecasted, and sales shares were converted to tonnage quotas for every region of the world. These late summer or fall gatherings came to be known as the "budget meetings."

The planning and management structure created to operate Vitamins, Inc. was in comparison to many contemporaneous international cartels extremely elaborate. Four integrated layers of cartel management were created. The top-level budget meetings were attended by the most senior officers of the companies' vitamins divisions, sometimes accompanied by the chiefs of global vitamins marketing. Budget meetings for the A & E cartels would be held in or near Basel at least once each year

in September or October from 1989 to 1999. After initially setting up the cartels, they became the occasion for approving specific plans for the following year that had been drawn up by their lieutenants. The attendees at the top-level meetings made occasional small adjustments to company quotas and adjudicated disputes that lower level managers could not resolve. In some years a second summit was held in Basel, Paris, or Frankfurt.

At the second level were meetings of the chiefs of global vitamins marketing. They met among themselves two or three times each year to develop specific plans for the following year and to monitor implementation of the annual budgets. One of these meetings occurred at hotels in or near Basel each August. At these meetings, detailed company sales information would be exchanged, and price increases were settled. The price increases were always multiples of 5% and were to take effect in April of the following year. They also agreed which of their members would take the lead in announcing the price increase (usually Roche was designated but occasionally BASF was tapped for the role). Then after the anointed "price leader" announced the new list prices, the others would pretend to follow an increase that had been preordained eight months earlier.

At a third layer of cartel management, the heads of worldwide product marketing met four times per annum. It was their function to monitor the progress of the annual quotas and make a progress report to the next layer above. Sales volumes were reported on a monthly basis.

Finally, regional product marketing managers assembled four times per year to monitor regional quotas, to assess trends in demand and supply, and to make small changes in prices in local currencies. For example, the committee handling sales in the European region met in Basel like clockwork in January, April, July, and October each year; "Europe" included sales in Western Europe, Eastern Europe, Africa, and the Middle East. The other regions were North America, Asia, and South America. Spreadsheets were prepared by the regional marketing managers that identified the participants by code numbers. A special task at the January meeting was to arrange compensatory sales from over-quota members to those that were under-quota. The sales were made at cost so that when the under-quota members resold the product at the cartel price, the excess profits made by the over-quota firms in the previous year were in effect transferred to the under-quota buyer. In 1996 and 1997 both Roche and BASF had to make compensation purchases (*ibid.* p. 225).

With minor variations, the management structure designed for vitamins A and E would be adopted for all the other Roche cartels.

Market Structure and Entry Deterrence

The vitamin A cartel controlled an average of 96% of global sales during the conspiracy years. The remaining 4% of production was in the hands of Russian, Indian, and Chinese manufacturers (*ibid.* p. 225). As the cartel raised prices from 1990 to 1996, the Russian fringe producer entered in 1991 and captured as much as 10% of world production by 1993-1994; even as prices remained high in 1995-1998, Russian supplies ranged from 5 to 8% of production. It seems likely that some of the Russian output was exported to Western Europe. While prices in euros rose each year from 1990 to 1998, the rate of increase was lower than in the U.S. market. Dribbles of Asian product appeared from 1989 to 1998, but total Asian production never exceeded 2% of global supply in the 1990s. Although very little actual entry took place during the conspiracy period, Roche told the European Commission that the cartels contemplated and explored measures to eliminate or deter these marginal producers from entering Europe.

The stability of vitamin A world market shares among the three cartel members is remarkable, which is evidence that the original 1990 quota allocations probably did not need to be renegotiated. For example, Roche did absorb about half of the cartel's loss of market share in the late 1990s, but *within* the cartels Roche's share never wavered from 48%. Similarly, BASF adhered to its assigned 28% cartels quota, and Eisai held to 21% throughout 1990-1998. Market shares were allowed to be different at the regional levels; Roche and Rhône-Poulenc, for example, had higher shares in North America than in the world generally.

The vitamin E industry was slightly less concentrated than vitamin A. The three original conspirators accounted for 87% of the vitamin E world market in 1990, the first year of the cartel's operation. However, without Eisai's cooperation, the cartel found that price increases were somewhat sluggish in the first year. After Eisai joined in early 1991 and raised the cartel's market control to 96%, world prices rose by more than 20% per year through 1993, peaking in 1997-1998.

Higher prices boosted modest fringe production; manufacturers in China, Russia, and Slovakia managed to capture 4% or 5% of world production during the late 1990s. In the mid and late 1980s, none of these fringe firms had had commercial sales. However, there is some indication that Chinese producers may have begun challenging the cartel in its last two years. Chinese output doubled from 1996 to 1997 and reached 11% of global output in 1998; indeed, Chinese production surpassed that of Eisai, the smallest cartel member, in that year. The lion's share of Chinese production, most of it feed grade, was exported. By 1998 Chinese imports captured about 7% of the European market, but euro prices remained

steady 1997-1998. Vitamin E prices did not decline until 1999, the year the cartel was discovered by the U.S. DOJ. Chinese imports may have had a stronger effect in the U.S. market. There the prices of feed grade vitamin E fell about 10% from 1997 to 1998, and human grades of vitamin E by about 5%.

As in the vitamin A case, there is no evidence of dissention among the four members of the vitamin E cartel. The ringleader Roche maintained a steady 46 to 48% share of the cartel's production from 1990 to 1998. The other three members' intracartel shares were similarly invariant over the nine years of collusion.

Pricing Policies

The general principle enunciated repeatedly by the managers of the vitamins cartels was "Price before volume." What this aphorism seems to mean is that the conspirators would give precedence to increasing price at a higher rate than the rate of losses of tonnage due to the price increases.[2] That is, the aim was to increase market price so long as total revenues or profits increased.

The organizers of the cartel prepared planning documents with two prices, one a "target price"[3] and a second "lowest price." Initially, prices for vitamins A and E were set in U. S. dollars (USD) and in Deutsche marks (DEM).[4] A price list distributed to Roche's product managers in March lists target and lowest prices in both dollars and marks. The document reveals that Roche's corporate objective was to raise prices of the two products by 5 to 10% when measured in Swiss francs (CHF). At the same time, an objective was to keep the USD and DEM prices close enough that vitamin brokers could not profit from geographic arbitrage.[5]

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2 "Price over tonnage" must mean more than the fact that they are inversely related. In economic terms Roche was encouraging the cartels to raise price toward the inelastic portion of the demand curve. When demand is inelastic a small percentage increase in results in a smaller percentage decrease in quantity sold. Monopolists and effective cartels will maximize profits when their equilibrium reaches the inelastic zone of demand.

3 Roche and BASF documents obtained by the European Commission use the German word *Ziel* , which can also be translated as aim, goal, intention, or objective.

4 The full published version of the EC vitamins cartel decision (EC 2003) reports the prices of many products in Swiss francs, but translates most of the 1989-1992 monetary figures from DEMs into euros. Officially the euro did not exist until 1999. However, one can use the ecu (the European Currency Unit or ECU), the forerunner of the euro, to convert DEMs into euros. The euro replaced the ecu at par in January 1999. For the years prior to 1999, the ecu will be referred to as the euro.

5 If currency swings between the USD and DEM caused to price of a vitamin to rise by more than 5 or 10% in Germany, then U.S. wholesalers could purchase the vitamin

Sales managers were instructed not to sell at any price that would cause Roche's market share to rise above 48%.

The cartel managers were not averse to reaping windfall profits when the opportunity presented itself. In early 1991, Rhône-Poulenc's vitamin E plant experienced a fire that interrupted production. The temporary reduction in supply was a perfect public excuse to raise prices even more than originally planned. Instead of a 5 to 10% increase in Swiss prices, the cartel opportunistically seized on a 15% increase. Because the Swiss franc appreciated relative to the DEM, in the rest of Europe vitamin A and E prices rose by 24% in 1991.

Cartel managers were ever watchful to the dangers presented by arbitrageurs. In early 1994, Roche sent a memorandum dated 4 February 1994 to its regional sales managers that said that because of currency exchange swings the price gap between Europe and the United States for vitamins A and E had grown to about 10% (EC 2003: p. 223).[6] The memo warns that brokers were using this gap to engage in arbitrage. To counter this behavior, the memo states that the

> "… key focus regarding 1994 is therefore on Europe…Our objective is to bring A prices up by DEM 2 and E prices by 1. Volumes need to be strictly controlled" (*ibid.*).[7]

The pricing goals of the vitamin A and E cartels were ambitious and successful. From 1990 to 1994, the European price of vitamin A rose by 29%; vitamin E increased by 56%. Similar price increases occurred in the rest of the world. The signal success of these cartels was so great that in 1994 Vitamins, Inc. decided to hold prices steady from 1995 on.

Cartel Expansion

The period from January 1990 to January 1991 was especially busy for the three founding members of Vitamins, Inc. In early 1990, the increases in vitamin E prices had been limited to a somewhat disappointing 5 to 10% worldwide (EC 2003: p. 213-215). The cartel managers ascribed this weak price response to an increase in sales by the Japanese pharmaceutical

in the United States at a low price (when denominated in DEMs), pay for transportation to Germany, and reap a risk-free profit when sold at the higher price in Germany (see Bush *et al.* 2004). If the dollar rose against the mark, reverse arbitrage could occur.

6 The average exchange rate in February 1994 was 1.7675 DEM/USD, up from 1.6777 in September 1993, an increase in the exchange value of the U.S. dollar of 5.4%.

7 In 1994, vitamin A was selling in Europe for DEM97 per kilo and vitamin E for DEM57. Thus the price increases were modest, only 1.8 to 2.1% (EC 2003: Tables II and III).

manufacturer Eisai. When the vitamin E cartel began, Eisai had a global share of slightly less than 10%. Thus, in September 1990, the vitamin-division presidents of Roche, BASF, and Rhône-Poulenc journeyed to Japan to woo Eisai into the fold. On October 30, 1990 top executives of Eisai traveled to Basel to finalize a membership agreement. Meeting only bilaterally[8] with the three ringleaders, Eisai agreed to accept a 1600-tonne world quota for 1991 in return for a promise that its share would rise to 11% and remain at 11% for the duration of the cartel. After January 1991, Eisai maintained bilateral contacts only with Roche representatives, so Roche became the primary coordinator of the vitamin E cartel.

Fear of Prosecution

Managers of the vitamin A and E cartels took steps throughout the conspiracy to hide their activities. Meetings were held at hotels and other places away from their offices and curious business colleagues. Eisai engaged in only bilateral contacts with its cartel partners, perhaps to maintain the deniability of cartel meetings. Conspirators in Europe were careful not to leave incriminating documents at their business locations where a dawn raid might lead to their discovery.[9]

In January 1993, the *Conseil de Concurrence* (the French competition-law authority) received complaints from buyers that vitamin manufacturers were raising prices to unjustified levels in concert. The council responded by raiding the headquarters of Rhône-Poulenc Animal Nutrition in Paris. Roche informed Takeda Chemical about the raid, and Takeda kept this record of the message:

> "Nothing was found in the investigation…nothing was found…[Roche] does not consider these inspections problematic: however they are being careful as to how they handle documentation" (*ibid.* p. 223).

Indeed, nothing came of the raid.

Things took a more serious turn in the United States in 1997. The U.S. DOJ had been busy prosecuting the lysine and citric acid cases throughout 1996 and early 1997. In early 1997 the FBI received information about a possible price fixing conspiracy in the vitamins industry. In

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8 Eisai and some other Japanese conspirators seem to have got the idea that bilateral meetings could not violate the antitrust laws.

9 Prior to 2004, EC regulations permitted only places of business to be searched. Executives' cars and homes were off limits.

March of that year, FBI agents interviewed Dr. Kuno Sommer about the matter. Sommer was the global head of vitamins marketing for Hoffmann-La Roche and also served on Roche's small management committee that formed the pinnacle of the company's management structure. If anyone should have known about vitamins price fixing within Roche, it was Sommer. Sommer's interview would have serious legal consequences for him and Roche if he did not answer truthfully. First, it is a federal crime to lie to federal investigators; second, he was interviewed under the January 1997 citric acid plea agreement in which Roche had promised full cooperation from its employees in any antitrust investigations.

Sommer denied that Roche was involved in any such illegal activity. Later it came to light that Sommer had prearranged with others at Roche to cover up the vitamin cartels' existence. Because Roche was the only vitamin co-conspirator with a cooperation pledge, Sommer's denials impeded FBI's investigation considerably. However, in late 1997, the DOJ investigation picked up speed again. The DOJ empanelled a grand jury in Dallas, Texas to investigate allegations in December 1997. This grand jury would toil away in secret for 16 months before the first fruits of the investigation would become public. By mid-summer 1998 strong and persistent rumors had begun that indictments were likely; Roche and BASF were mentioned as targets of the vitamin probe.

In response the cartels reduced the frequency of their meetings. The last tripartite meeting of the vitamins A and E cartel took place in Basel in November 1997. Thereafter, the conspirators would meet only bilaterally. Moreover, top-level meetings became "more discrete" (*ibid.* p. 231). Meetings began to take place in executives' homes so that there would be no lodging records to be later discovered. On December 22, 1997 Rhône-Poulenc announced to the other members of the cartels that it had decided to quit the conspiracy. This announcement was a sham as the company continued to meet with Roche and BASF for another year.

Collusion in the vitamin A and E markets did not end until February 1999, a total run of 117 months. Because of the large size of the vitamin A and E markets and the longevity of the cartels, the economic harm caused by these two conspiracies would amount to 36% of the economic injuries caused by all 16 cartels.

Vitamin B12 and the Carotinoids

The vitamin A and E cartels made such promising starts in 1990, that Roche, BASF, and Rhône-Poulenc spread their net wider still. The third market monopolized was the global market for vitamin B12. This cartel was one of the few markets that were not subject to collusion in the 1980s.

One reason that Rhone-Poulenc and Hoechst were unable to collude overtly earlier was their low degree of global control of production (67 to 71%). They faced two presumably competent rivals in Western Europe, Glaxo in the UK and E. Merck in Germany, that accounted for as much as 22% of industry output; moreover, unidentified Asian producers made as much as 12% of global supply in the late 1990s.

Whatever the reasons, Merck shut down production in early 1989 and Glaxo[10] did the same in late 1991, leaving Hoechst and Rhone-Poulenc as the nearly sole producers of vitamin B12 in Europe. These exits gave Hoechst and Rhone-Poulenc the degree of control they needed to collude. Surprisingly, even as prices surged in the early and mid 1990s, Asian production shrank to 10% or less of world production. Chinese entry began on a small scale in 1995 but grew to only 9% of world production in 1998. The late entry suggests that the Chinese and other Asian firms were at a cost disadvantage in making vitamin B12 until near the end of the cartel.

The vitamin B12 cartels began in January 1990, suggesting that planning had occurred in late 1989 simultaneously with the vitamin A and E cartels. In terms of timing, the B12 cartel was virtually coterminous with the A and E cartels, except that it ended about a year earlier. The two firms accounted for only 69% of global supply in 1990, Rhône-Poulenc (62%) and its much smaller German partner, Hoechst (7%). Unlike most cartels, the degree of supply control rose as prices climbed in the mid 1990s, a pattern that further supports a cost advantage by the duopoly. At the cartel's peak the two firms controlled 81 to 86% of world production -- about 95% of the European market but closer to 85% of the North American market. The vitamin B12 cartel was in effect a merger ten years in advance of the late 1999 formal merger of the two companies into the firm called Aventis, renamed Sanofi-Aventis in 2006.[11]

Far larger in scope were the two cartels for carotinoids, the older product beta carotene and three other carotenoids. Like vitamin B12, they were duopolies that endured from early 1991 to December 1997. Roche

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10 Glaxo held an 8% share in 1991 and Rhone's increased by 5 percentage points the next year; it is possible that Rhone acquired Glaxo's plant.

11 Aventis was formed in December 1999, and its headquarters moved to the French province of Alsace about midway between the two companies' former headquarters. As of 2005 neither Aventis nor its predecessor companies have been charged by the United States or the EU in the B12 market. They *were* found guilty by Canada. There is a strong possibility that in 1998 the liabilities created by participation in the vitamins cartel were seen as the only impediment to the impending Aventis merger. Although the U.S. and EU amnesty programs are given most of the credit, the Roche cartels may have been exposed by Rhône-Poulenc as part of a secret deal to obtain merger approval in Europe and the United States.

and BASF are the only known producers of synthetic carotinoids in the world. No entry occurred into these industries, even though they are among the fastest growing vitamin products. As the most recently synthesized vitamin products, technological barriers to entry are substantial.

The first contacts about forming a cartel for carotinoids began in 1991. Formal negotiations began in Basel in September 1992 and concerned beta carotene, the orange colorant and the most mature market of the four carotinoids. BASF was a relatively new producer of beta carotene and had been gaining market share prior to 1991. The 1991 quota agreement began with allotting a global share of 79% to Roche. The plan was to allow BASF's 21% share to increase by about 1 percentage point per year until it would reach 30% in the year 2001. Unlike most of the other vitamins cartels, no regional quotas were assigned. After the initial 1992 meeting, quarterly meetings were held simultaneously with those of the vitamin A and E meetings

Canthaxanthin, the red carotenoid, was the subject of delicate negotiations between Roche and BASF beginning in May 1993. BASF had reached a 33% share in Europe. However, BASF also had plans to enter the astaxanthin market in 1996 when a new plant it was constructing was expected to begin production. As an incentive to Roche not to oppose BASF's entry into astaxanthin, BASF agreed to cut its 1994 production share to 29% with the understanding that its share would grow to 35 to 40% by 2002. In return, Roche agreed to let BASF enter the astaxanthin market unimpeded in 1996 and allow its share to grow to 20% by 2002.

The manufacturing processes for the newer carotinoids must be among the most technically challenging of all the vitamins. BASF, a chemical powerhouse with great depth in R&D capacity, faltered badly in its plan to make astaxanthin. Production did not begin until 1999. Thus, the attempt to collude on the pink carotinoids was never implemented. Roche maintained its monopoly on both pink and gold carotinoids until at least 1999.

The two carotenoids cartels came as close to a blockaded monopoly as any of the cartels. Conduct was calm, orderly, and highly controlled. U.S. carotenoid prices were by far the highest of any vitamin product except biotin – human grades of beta carotene reached nearly $1000 per pound and feed grades of canthaxanthin $1500 per pound. Moreover, prices rose inexorably both before, during, and *after* formal collusion in the 1990s. Roche diplomatically ceded a percentage point or two of market share to BASF each year in order to contain what might have been a more aggressive rate of entry by the smaller partner in the cartels.

Feed Premixes

There is little reliable information about the structure of the industry that sells mixtures of bulk vitamins to large feed and pharmaceutical manufacturers. In general, there seems to be a large number of small premix companies that typically operate a single plant to serve sub national markets. Two larger independent blenders in the United States are ADM and Nutra-Blend. However, two companies stand out in this generally atomistic industry. Hoffmann-La Roche and BASF had leveraged their broad vitamin product lines and knowledge of animal nutrition into chains of premix plants that could serve the whole of North America or the European Union. By 1990 they had expanded their premix operations to occupy leading positions in those markets. Roughly speaking the two firms seems to control about half of the North American and European markets for feed premixes, with Roche about twice the size of BASF. One of their aims in forming the bulk vitamins cartels was to further the development of dominant positions in the downstream premix business.

Vitamins B1, B2, B5, B6, B9, C, and Biotin

Seven of the water-soluble vitamins were cartelized in late 1990 or early 1991; five are in the in the B complex; vitamin C and biotin (vitamin H) are also water-soluble. The proximate cause of the formation of these six cartels was falling profits. According to the European Commission, one participant asserted that the prices of all the B complex vitamins had been falling during the 1980s (EC 2003). Transactions price data in the United States do not support this sweeping claim. Vitamins B1, B2, B5, and B6 had falling nominal prices in the early 1980s, but by 1988 or 1989 prices had recovered to their previous peaks. Only in the cases of biotin and folic acid did prices fail to recover to their previous heights by 1988 or 1989. However, it is true that modest declines in prices did occur in the year or two prior to the re-establishment of the six cartels.

One factor responsible for the decline in prices in the early 1980s was the growth in Japanese exports of B complex vitamins to Western Europe and North America. Roche experienced a large loss of market share from the mid 1970s to 1990. Roche lost 32% of its European share of vitamin B1, 44% of B2, 31% of B5, 43% of B6, 7% of B9, and 61% of biotin. Takeda, Daiichi, Kongo, Sumika, Sumitomo, and Tanabe gained market share during this period. Another factor contributing to the slide in prices in 1989 and 1990 was the weakness of the U.S. dollar relative to the yen, the Swiss franc, and most other European currencies. In most parts of the world outside Europe vitamins were sold in dollars, which adversely

affected profits of companies whose products were sold in currencies other than the U.S. dollar.

To be successful in establishing cartels for the B vitamins, the three founding firms had to reach out beyond the circle of five firms already successfully colluding on four products (Figure 11.1). Each of the new cartels would require only three or four members to control the markets. Generally speaking, the makers of vitamins B1, B2, B6, folic acid, and C met together, but the complexity of the task required two days of work each time.

Vitamin B1

The vitamin B1 (thiamin) cartel began at a January 30, 1991 meeting in Tokyo between Roche and Takeda; several other Japanese vitamins manufacturers were present.[12] Internal Takeda documents showed that Roche and Takeda shared their 1990 production and sales of vitamin B1 for the world and four regions, and agreed to use the 1990 historical shares as the basis for setting 1991, 1992, and 1993 quotas. Roche and Takeda honored their agreement faithfully until the cartel collapsed in mid 1994. From 1991 to 1993 Roche maintained 56 to 57% of cartel production

Prices in the EU had dropped about 5% from 1988 to 1989, despite the withdrawal from production of the third largest manufacturer in 1989. An unusual feature of the vitamin B1 industry was the fact that BASF had decided to cease manufacturing vitamin B1 in 1989, but remained a seller of bulk vitamin B1 through a long term (1989-1994) supply contract with Roche. In 1990 Roche manufactured 50.8% of the world's supply, and Takeda made 36.2%. However, almost one-fourth of Roche's output was committed to BASF under the supply contract, presumably at favorable terms. At the Tokyo meeting, BASF was awarded a market share that kept its sales in a constant ratio with Roche's share. Although BASF never met with Takeda about its role in the cartel, it was kept informed about the prices and share quotas that were set by the other two.

Another feature of the vitamin B1 market was the significant and rapidly growing share of Chinese producers. In 1989, Chinese sales had reached about 9% of global supply (another 3% was made elsewhere). By 1991, China's share would grow to 20%. At their Tokyo meeting Roche and Takeda estimated that the Chinese share would grow to about 25% by

[12] After the initial meeting, Roche and Takeda met quarterly at meetings that combined top-level executives and operational managers. The meetings often lasted two days because the two companies had five products in common: vitamins B1, B2, B6, C, and folic acid. Sometimes BASF would be present for the sessions dealing with vitamins B2 and C, and E. Merck would join the vitamin C sessions.

1993. In fact their expectations would prove to be optimistic, because in 1993 Chinese output would actually reach 38% of world production.

The rapidly growing Chinese exports were flowing mainly to Asia and North America; Chinese imports into Western Europe remained in the 9% to 12% range in the early 1990s, a level that is worrisome but not necessarily destructive of cartel effectiveness. During the 1991-1994 cartel period in North America cartel controlled dropped to less than 60%, which is a level at which it is difficult to maintain collusion.

Another feature of Chinese exports is that initially the Chinese product was a closer substitute for feed grade vitamins than for human consumption. This is demonstrated in the U.S. vitamin B1 market by the differential response of prices to the surge in Chinese imports from mid 1998 to the end of 1989. U.S. prices of *feed-grade* vitamin B1 tumbled by about 15%, whereas the price of *food-grade* product declined by less than 5%. During the 1990s Chinese manufacturers would invest in high-tech equipment that would permit the sale of vitamins with higher levels of purity compatible with pharmacopeia standards.

To respond to the Chinese challenge, Takeda considered offering a "sub-spec" feed-grade product of its own and compete on price. In June 1993, by which time the challenge had turned into a crisis, Takeda instead decided to introduce a discriminatory pricing policy. To woo lost customers back Takeda would match the Chinese on price on feed-grade product while at the same time charging loyal customers a higher price. Roche seems to have adopted the same desperate and ultimately ineffective strategy.

Chinese exports were shipped by several nominally independent firms, but many of them were government owned and belonged to a trade association that provided a degree of centralization of decision making. At no time does the record show that any of the vitamins cartels attempted to recruit or co-opt members of the Chinese chemical industry. Instead they were viewed as mavericks hell-bent on maximizing their share of the world market through fierce price-cutting.

The rise of Chinese exports played a key role in several of the vitamins cartels. Chinese exports were increasing before most of the B complex cartels were formed in 1990-1991, but their greatest rate of growth began from 1991 to 1995. In those four years, the real value of Chinese vitamin exports rose by 250% and the quantity tripled. Doubtless, the increase in the prices of the vitamin C and the B complex vitamins was a major factor that encouraged that explosive growth.

After the cartel was formed, vitamin B1 prices in Europe did rise 5 to 6% in the first two years. However, by late 1992 Chinese imports into the EU had reached 18% of supply, and those imports had begun to restrain EU price increases. In the U.S. market for vitamin B1 prices rose

15% from January 1991 to late 1992. Vitamin B1 prices peaked in early 1993, but fell rapidly thereafter. EU feed-grade prices fell by 26% from mid 1993 to the second half of 1994. U.S. prices tumbled 20 to 30% during the same period. At a meeting in June 10, 1994 Roche and Takeda abandoned price fixing. By 1996-1999, the prices of both grades of vitamin B1 had declined by more than 50% from the 1993 peak.

At three and one-half years, the vitamin B1 cartel was the second-most fragile of all the vitamins schemes (Figure 11.2). Although it died the kind of natural death that true believers in perfect competition expect to be the norm, it did in fact turn out to be a profitable venture while it lasted. Whether the cartel could have made more money through a strategy of slowly *lowering* prices and thereby extending the collusive period is doubtful.

Vitamin B2

The history of this cartel parallels that of the vitamin B1 cartel in several respects. Roche, BASF, and Takeda were the three dominant sellers in 1990, with 87% of the world market under their control. Takeda, which had entered the industry only in 1990, was the smallest member of the cartel established in 1991. The fringe producers in the vitamin B2 industry were: Eastern European producers, which accounted for about 10% of the European market for vitamin B2; the Japanese manufacturer Tanabe in Asia; and the U.S. company Coors in North American market. Unlike vitamin B1, Chinese entry was no long-term threat to the cartel.

From 1988 to 1990 the EU price of vitamin B2 fell by 12%. In the United States, the price of feed-grade vitamin B2 fell about 15% at the same time, but human grade was unchanged. In response to falling prices, Roche and BASF executives met in Bottmingen, Switzerland in July 14-15, 1991 to discuss a vitamin B2 cartel.[13] The two companies accounted for 84% of global supply. At the Swiss meeting they agreed to raise prices and to fix volume quotas for the top three sellers for the years 1992 to 1996 at levels equal to actual 1990 levels. Roche and BASF also agreed to set up the four-tier system of cartel management with quarterly meetings that was being used in the vitamins A and E cartels.

Soon thereafter senior Roche and BASF representatives separately traveled to Japan to convey the cartel's market-share proposal to Takeda Unlike vitamin B1, Takeda was in a relatively weak third place in

[13] It appears likely that earlier discussions about a vitamin B1 cartel may have taken place in Tokyo in January 1991 when Roche senior executives visited Takeda. It is possible that Takeda wanted to delay talks about a cartel because it was expanding its vitamin B1 plant in Japan at the time.

the industry, with only 3% of global output. So by late 1991 or early 1992 it accepted the Roche-BASF offer of a 12% global share.[14] Roche and BASF both gave up considerable market shares in 1992 to allow Takeda's share to rise. Roche and Takeda met in Basel on April 13, 1992 to finalize some details on the cartel's policy of continuous increases in prices. Subsequently, Takeda met quarterly with Roche and BASF, but always bilaterally. The three conspirators exchanged sales data on a regular basis for five global regions: Europe, North America, Latin America, Japan, and the rest of Asia.

Takeda officials kept detailed minutes of their many meetings with Roche and BASF officers, even though some of them were headed by a warning: "Destroy after reading." These notes contain items that indicate constant bickering about shading of prices by Takeda, sales to specific customers, and concerns about market shares of various grades of Vitamin B2. Takeda found its initial agreement to accept a constant 12% global share hard to live with. Takeda complained that the rising prices of vitamin B2 kept its volume of sales virtually constant from 1990 to 1992. In late 1992, Takeda demanded an increase in its 1993 volume of sales to 500 tonnes, about 30% more than it had previously agreed. Roche representatives angrily rejected the demand, but Takeda's stubborn insistence on a larger volume of sales eventually had its intended effect. In the interests of cartel harmony, Roche and BASF agreed to yield some of their shares to Takeda. Takeda's global share would grow from 13% in 1992 to about 17% in 1994, almost all at the expense of Roche.

The vitamin B2 conspiracy is an interesting illustration of one in which repeated annual renegotiations were needed to maintain pricing discipline. In 1991 when the cartel was initiated by Roche and BASF alone, they agreed to a 64:36 split. To entice Takeda to cooperate Roche gave up 9.7 percentage points of intra-cartel share and BASF a proportional 5.0 points as a reward to Takeda for joining. Then to satisfy Tanabe's further demands, the two leaders ceded another 4 percentage points of the cartel's total production to Tanabe from 1992 to 1994. Finally, the two leaders needed to accommodate a fourth member. Rhone-Poulenc began selling vitamin B2 in 1994; by the next year it had been generously granted a 10% share of cartel production, which was carved out of the two leaders'

[14] Tanabe had a 7% global share in 1990 but dropped out of the market at the end of 1990 or beginning of 1991. It seems that Tanabe must have sold or leased its Japanese production capacity to Takeda by early 1992. This is consistent with many other acts of deference shown by the smaller Japanese vitamin makers to Takeda in the 1990s. Tanabe was dependent on supplies of vitamin B1 from Takeda.

quotas. After less than five years of collusion, Roche had gone from a 64% intra-cartel quota to a mere 45%

Despite the evidence of continuing disagreements over market shares, the minutes of the cartels meetings also show a continuing commitment to the overarching principle of "Price before quantity." That is, prices were continuously, even experimentally raised despite the fact that quantity growth was being adversely affected. Like the earlier cartels, the vitamin B1 conspirators agreed to two sets of prices: list (or target) and lowest. The minimum prices were about 5% below the target prices. Moreover, feed-grade prices were kept in a nearly constant ratio to the human grade – feed grade was priced about 80 to 83% lower than human. Following these customary discounts made the process of arriving at a consensus on prices quite manageable. In effect, the cartel needed only to agree on a target price for human-grade vitamin B1; deriving all the other prices was a mere arithmetic exercise.

While the vitamin B1 cartel negotiated a solution to an internal threat to its stability, it was less successful in dealing with an external threat. The external threat did not come from China this time, but rather from the United States. In 1991 and 1992 the three members of the cartel believed that only two significant rivals remained outside the cartel: Coors in the United States and the GUS group in Russia. The outsiders were believed to hold about 4.6 to 4.8% of the global market in 1990 and 1991 – a share small enough to be safely ignored for collusion purposes. However, in 1993 the cartel discovered that the U.S. brewing company Coors had built a vitamin B2 biotech plant with 230 tonnes capacity, about twice as large as they had estimated in 1991. To protect prices outside the United States, Roche contracted to purchase half of Coor's capacity, an amount sufficient to prevent Coors from exporting vitamin B2. Roche then sold a portion of its purchased product to BASF in an amount that preserved their relative quotas. This was a cunning, if expensive solution to foiling large-scale entry into the cartel's market.

The vitamin B2 cartel unraveled in 1995 because of two events. First, Takeda was caught cheating on its volume agreement. At a meeting with Roche and BASF on March 16, 1995 the Roche representative confronted Takeda with evidence of its perfidy. Roche had discovered from Japanese government trade statistics that Takeda's sales in Japan and its exports amounted to an annual sales volume of 580 tonnes, which was 40

to 50% above its agreed quota. At that meeting, the Takeda representative made an obscure reply to Roche's accusation that was tantamount to admission. Later, Takeda told Roche that it was operating at close to its production capacity, but that it would not reduce its sales volume. This episode shows the importance of information-sharing. Overt collusion works best when transparency is complete among cartel participants, and third parties do not have access to facts that cause surprise.

Second, in 1995 the Coors vitamin B2 plant was sold the large agribusiness firm Archer Daniels Midland (ADM). Furthermore, ADM signed a marketing agreement with Rhône-Poulenc to sell part of its U.S. production in Europe. As usual, ADM decided to expand its vitamin B2 production rapidly. By offering vitamin B2 at a lower price, ADM quickly garnered a 9% share of the European market by the end of 1995, up from 2% at the beginning of the year. Moreover, ADM's global share rose from about 13% in 1995 to 23% in 1998. Roche's global market share plunged from 56% in 1990 to 41% in 1996.

Prices of vitamin B2 declined in the U.S. market, slowly in 1996 and then rapidly for four years thereafter. Feed-grade prices fell from $62 per kilogram in 1995 to $26 at the end of 2000 – an astonishing 58% plunge; human-grade fell by 41%. Prices of both types in Europe reached their peak in 1995 at €60.6 ($76) per kilogram and fell to €37.6 in 2000, less than in the United States but still an impressive 38%.

In the fall of 1995, Roche unilaterally informed the others that it would terminate the failing vitamin B1 cartel.

Folic Acid (Vitamin B9)

Collusion in the market for folic acid, the smallest of the bulk vitamins markets, began as early as the January 30, 1991 meeting in Tokyo between senior officers of Roche and Takeda. Both sides had come prepared to exchange confidential sales data and were primed to deal.

The folic acid industry consisted of four major players: Roche, Takeda, Kongo, and Sumika/Sumitomo. In 1990 these four manufacturers controlled 96% of world production. Roche asked Takeda, the largest of the three chemical firms, to coordinate cartel decisions with the two smaller Japanese manufacturers. The structure and organization of the cartel was copied closely from the vitamin A and E cartels: multi-tiered quarterly meetings, market shares frozen at 1990 levels, a compensation mechanism to reward under-quota members, and target prices with minimum prices at most 5% lower set each autumn for the following year. Prices and market shares were set for four regions: the USA, Europe, Japan, and the rest of the world. The Japanese members of the cartel met

quarterly simultaneously with the Yosankai Trade Association, a creation of Japan's Ministry of International Trade and Industry.

Information provided by Takeda indicates that Roche had dual objectives in forming the cartel. Roche desired to profit from the sale of straight folic acid but also wanted to raise the prices of bulk folic acid in order to improve its market position in the downstream market for feed premixes. Because Roche could supply its own growing premix business with bulk vitamins at the cost of production, it could keep its premix products low in price and squeeze rival premixers out of the market. The Japanese members of the cartel did not benefit from the premix objective, so Roche's dual objectives caused some tensions early during the cartel's life.

Events in the cartelized folic acid market unfolded in a manner reminiscent of vitamin B1. Folic acid prices took off from the first year of the agreement until mid 1994. U.S. prices rose by 40% in that three-and-one-half-year period. The cartel's downfall began in late 1993. Until that year Chinese production had never accounted for more than 3% of global supply. However, like a few of the other water-soluble vitamin cartels, Chinese manufacturers had in the early 1990s solved technical production problems and were rapidly scaling up output and exports. From 1992 to 1993 Chinese production exploded, increasing by 700%. By 1994, Chinese producers accounted for more than one-third of global production.

At its meeting on September 24, 1993 the three Japanese firms identified growing Chinese exports as the main cause of falling folic acid prices. In Europe, Chinese imports had reached a level that amounted to 28% of the cartel's planned 1993 volume. Prices began to decline in mid 1994, so the folic acid agreement was formally abandoned at a meeting in Tokyo on June 10, 1994. Five years later U.S. prices had dived by nearly 60%.

Vitamin B6

This cartel also began with the January 30, 1991 visit of Roche executives to Tokyo. In 1990 Roche, Takeda and Daiichi controlled 72% of global sales, the second smallest initial degree of control of any of the vitamins cartels. The pricing pressures facing the three firms in this market were especially severe. From mid 1988 to 1990 the EU price of vitamin B6 declined by 15 to 20%; in the United States, the decline was more than 20%. The major reason prices had declined so precipitously is that a previous cartel that had operated in the 1980s had ended in 1989.

As was the case with so many of the vitamins cartels, the agreements were patterned closely after what had been working so well in vitamins A and E. The three members of the vitamin B6 cartel met pair-wise:

biennially in Basel (Takeda and Roche) and biennially in Tokyo (Takeda with Daiichi). They agreed to raise minimum prices at least four times: in January 1991 (increase unknown), October 1991 (by 3.5%), and April 1992 (by 2.3%), and July 1992 (by 5.6%). In April 1993 the remnants of the cartel lowered its minimum price by 5.6%.

During the cartel's first 15 months prices rose dramatically faster than the agreed prices. In Europe the price rose from DEM 51 in the first quarter of 1991 to DEM 85 by March of 1992, an increased of 67%. In the United States, the comparable increase was 60%. However, most of the price rise is attributable to two fortuitous events. First, two significant suppliers (BASF and E. Merck) withdrew from the industry in early 1991.[15] Second, Daiichi closed an old plant in August 1991, and its new plant did not start up until March 1992. After Daiichi's new capacity came on stream, EU transaction prices continued to rise by only about 2% to the peak in early 1993. Prices held steady until July 1993, after which they fell precipitously.

Internal dissention and Chinese production ended the cartel. Roche wanted to meet directly with Daiichi in the spring of 1993, but Takeda said that Daiichi would not comply. When Takeda and Roche met in Basel on May 25, 1993, Takeda reported that Daiichi was trying to maximize the amount it could sell, disregarding the cartel's share agreement. Takeda's role as the intermediary reeks of double-dealing, because it had actually grabbed much more market share in 1993 than had Daiichi. Roche and Takeda decided to punish Daiichi by matching its prices. The prices being offered by Chinese companies were even lower, though events in the late 1990s would show that Chinese production was not based on low-cost technologies.[16] Prior to the start of collusion in 1991, Chinese production had languished at below 3% of the world's total. During 1991-1993 Chinese production value rose to 48% of the global total.

The last meeting between Roche and Takeda concerning vitamin B6 occurred in Japan on June 10, 1994; Roche met with Daiichi for the last time on June 15th. However, all the participants had recognized earlier that year that the cartel agreement had been ineffective for quite some time. In July 1994 Roche signaled the end of collusion by lowering its minimum

15 The shut-downs of the BASF and E. Merck plants look suspiciously timed. Both companies had produced vitamin B6 since 1982, reaching global shares as high as 11 and 16%, respectively. When their production ended, as if by prior arrangement Roche absorbed all of their production the next year. Their simultaneous withdrawals could have been part of a side agreement with another cartel.

16 When in 1996-1998 selling prices fell permanently 50% below peak collusive prices, Chinese production withered to a mere 10% of world output and the shares of the three former cartel members rose to heights not seen for more than 15 years.

DEM price by 28% to meet Chinese competition in the EU; in October 1994 price was cut another 13%. EU transaction prices fell 60% in 1996 from their 1993 peak and remained at less than half the 1993 level through 2003. The U.S. market displayed the same post-cartel price movements.

Vitamin B5

Despite the fact that Daiichi was one of its three members, the vitamin B5 (cal pan) scheme was the most durable of the B complex cartels. Like vitamin B6, the vitamin B5 cartel was a rebirth of an earlier conspiracy in 1985-1989. However, participants agreed that the earlier cartel did not approach the sophistication of its 1991-1999 successor. The disbanding of the first cartel in 1989 caused prices to decline so low that Roche was selling vitamin B5 at cost in 1990.

Roche made overtures to Daiichi about reviving collusion at a Tokyo meeting in late December 1990, proposing to adopt the mechanism and rules used in the vitamins A and E cartels. Implementing the cartel took about six months of negotiations. The first formal meeting among Roche, BASF and Daiichi took place in Basel in the first quarter of 1991; a few months later the firms were exchanging sales data. Using 1990 production as the basis of the agreement, the three companies agreed to set market shares within narrow ranges in Europe and worldwide for the 86% of world supply that they controlled. The decision to adopt quota *ranges* of about four percentage points was unique among the vitamins cartels; it was a substitute for the compensation sales used in most of the other cartels. In all other respects, the vitamin A model was imitated closely.

The vitamin B6 cartel had a small fringe of firms outside the cartel from Eastern Europe and Japan. The fringe's share rose and fell slightly during the cartel, but averaged only 14% of global sales; sales by fringe firms were kept to even lower levels in Europe and North America. Within the cartel, the three members carefully observed their agreed quota ranges. Except for a blip in 1996, Roche held on to a 41 to 45% intra-cartel share and BASF to 21 to 25%. Daiichi too was an exemplar of self-restraint.

The vitamin B5 cartel was highly effective in raising prices. EU prices rose by 50% from 1991 to 1993; at the peak in early 1998, prices were 75% higher than the year before the cartel was underway. Similarly, U.S, transaction prices reached a 1996-1998 plateau that was 80 to 85% above the 1990 price. As with other cartels, the members of the vitamin B5 cartel were active in countering the deleterious effects of international geographic arbitrage. The rule of thumb was to keep prices in one currency zone less than 10% above or below prices in other currency zones.

Roche and BASF at times caused dissent within the cartel because of their strategy of using price increases to squeeze rival premix sellers out of business. Daiichi, which did not make premixes, objected to a proposed 10% price increase in the spring of 1998 because it judged that fringe producers in Eastern Europe would flood Western Europe with vitamin B5. This would reduce the cartel's market share in straight vitamin B5, but would have benefited the premix operations owned by Roche and BASF.

Meetings of the B6 cartel persisted even after the U.S. vitamins investigation intensified in 1998.

Vitamin C

In terms of annual sales the vitamin C market was the biggest of the 15 straight vitamin markets. Global sales were 50% higher than second-ranking vitamin E and were about 85% larger than all five of the B complex vitamins just described. The short history of vitamin C collusion resembles that of vitamin B1.

In 1975, Roche and Takeda controlled about 84% of the global market, but 15 years later they shared only 71%. In 1990 E. Merck and BASF sold about one-eighth of world sales. However, the two leaders were not in direct competition with their two smaller rivals. Roche and Takeda emphasized the production of the dominant segment of the market, human-grade product, whereas E. Merck and BASF specialized in animal-grade. The remaining 13% of the 1990 world market consisted mainly of fast-growing Chinese manufacturers of feed-grade vitamin C.

With about 90% of world production, the same four top producers had carried off a moderately successful cartel in 1995-1989. Prices of human vitamin C had risen by 30% in the United States in the late 1980s, but prices of feed grade had not been so responsive.

The establishment of the second vitamin C cartel was explored a meetings of top executives of Roche and Takeda in Basel on April 7, 1990 and on September 4th in Zurich. Prices in Europe had declined by 10% from the previous year and had also weakened slightly in North America. Negotiations must have been difficult, because two more sessions were required to nail down the details: a Swiss meeting among Roche, BASF, and E. Merck in early January 1991 and a final one in Tokyo between Roche and Takeda officers on January 30th and 31st.

The finalized agreement incorporated a familiar set of features: freezing the four producers' 1990 global shares of the "available market" (i.e., the 87% they controlled), four tiers of management and control, and setting target and minimum prices. In vitamin C the minimum price spread was 7 to 9% below the target, which is an indicator of the relative weakness

of this cartel. Meetings occurred quarterly, alternately in Basel and Tokyo. Takeda met bilaterally with Roche, as was its habit in four other cartels, until a May 1993 meeting at Zurich Airport.

One aspect of the vitamin C arrangements that set it apart from the other cartels was the extensive attention paid to several large customers. Buyer concentration was higher in this market than the other vitamin markets. The purchases of these "key clients" were individually allocated, sometimes exclusively and sometimes jointly, to one or two of the cartel members. Examples of such "key accounts" are Coca Cola, Pfizer, Kellogg, and Bayer. The cartel managers indicated that their rigged prices for Coca Cola should be carefully calibrated across countries so that the company could not engage in international *intra-firm* geographic arbitrage. "If this were not done, Coca Cola would always attempt to conclude all of its contracts at the lower market price" (EC 2003: p. 409).

The vitamin C cartel engineered a 30% increase in prices from 1990 to the late 1993 peak. Already keen on expanding their world shares, Chinese producers found the higher prices an added inducement to expand sales at a furious pace. Several capacity expansions in Chinese plants that used a new low-cost all-fermentation technology had been ongoing for a few years. Most of the product was feed-grade vitamin C, so E. Merck and BASF were especially hard hit by Chinese expansion. The cartel seems to have underestimated the pace of Chinese competition. Already in 1992 the two smallest members of the cartel had sold about 13% less than had been planned in 1991. By 1993 the cartel had lost 29% of the global market to fringe producers, and the difficulties of coping with the Chinese challenge became a major irritant at cartel meetings. Worse, the Chinese manufacturers had begun to make human-grade vitamin C, which began to hurt Roche's sales.

At an early 1993 session, the cartel considered purchasing a large enough portion of Chinese-made vitamin C to stabilize prices. Instead, consistent with the general policy of "price before quantity," Roche proposed price increases of about 4% for each quarter of 1995 and an immediate 5% cut in cartel production; the others agreed to the plan. In April Roche announced the planned price increase.

Despite the stress on the cartel from fringe entry, its internal market-sharing agreement proved to be remarkably robust. Throughout the 1991-1995 cartel period, Roche strictly adhered to its 51 to 53% share of cartel production, Takeda never wavered from a 29 to 31% share range, and the two smaller members stood by their quotas.

Chinese incursion intensified later in 1993, and by the end of the year prices began to drop quickly. In their August 1993 meeting, the European members of the cartel renewed their call for a 5% across-the-board

reduction in sales volume. Over Takeda's vociferous objections, the plan was adopted. The adjusted quotas for 1993 assumed that the cartel would command only 74% of global production. Takeda returned to its complaint about equal percentage reductions in a November 1993 cartel meeting, but was once again rebuffed. Although it ostensibly remained an active cartel member until the end, Roche began to see more and more evidence of Takeda's cheating in 1994. The combination of price cutting by Takeda and the Chinese producers caused EU transactions prices of vitamin C to decline by 33% from the end of 1993 to 1995 and by 45% in 1996-1999.

The vitamin C case illustrates the difficulty of identifying precisely when a cartel ends. Although Takeda only pretended to adhere to the cartel agreement from about late 1993, the three European members observed their relative quotas throughout 1994. The last formal meeting of the vitamin C cartel took place in Hong Kong on August 24, 1995. Roche claims that it renounced its involvement in the conspiracy at about that time, but this assertion cannot be verified. The four companies continued to exchange sales information and set regional prices at the August meeting, and market projections were updated through December 1995. Guilty pleas registered in U.S. courts assert that the end of the conspiracy was the fall of 1995; pleas in Canadian courts admit to December 1995; and the European Commission was only certain that the cartel had ceased affecting prices by mid 1996.

Biotin (Vitamin H)

In the early 1980s, the global biotin industry consisted of one dominant firm, Roche, and two others, Sumitomo and E. Merck. This pattern suggests that the technology of production was a formidable barrier in the early 1980s. In 1980 Roche had a near monopoly of 86% of global production, but Sumitomo's expansion in the early 1980s had brought about a precipitous decline in biotin prices of nearly 60% in 1985. By 1985 Roche's share had slipped to 79%.

During the first three years of collusion, prices rose 45%, but this rise only recaptured about one-third of the 1980-1985 loss of price. The cartel of 1985-1990 was a weak one with no strict market quotas. Not only did Sumitomo's market share expand during the collusive period, but Tanabe entered on a large scale in 1986 and doubled its global share to Sumitomo's level by 1990. A fifth firm, South Korea's Il Sung opened a plant in 1988 that would eventually supply up to 8% of the world's biotin. The last company to enter the industry, Lonza of Switzerland, opened a plant in 1990 capable of supplying 9% of world demand in the 1990s.

This onslaught of new capacity drove down the biotin price from mid 1988 to early 1990.

Thus, in 1990 the world industry consisted of six good-sized manufacturers. When the cartel of 1991-1995 was formed, Roche had 47% of market sales, but there were four other companies each with global shares that averaged 12%. These five participants controlled 95% of global sales throughout 1991-1995, but comprised the largest number of conspirators of any of the vitamin cartels. Moreover, BASF became a sixth member of the biotin cartel by proxy. Unlike most of the other vitamins cartels, new-firm entry was never a problem at any time from 1991 to 1998. Yet, with six participants the biotin cartel was quite unstable.

The decline in biotin prices in 1988-1990 was the major motive for reestablishment of overt collusion. Initial contacts were made by Roche and Tanabe in March 1991. This bilateral meeting in Japan principally concerned technical matters, but the idea of setting target prices was also broached in an indirect fashion for the first time. A similar meeting occurred in Japan in May 1991 and biennially for four more years thereafter.

In Europe, Roche organized a summit for five firms (Roche, Lonza, Sumitomo Chemical, Tanabe, and E Merck) in Lugano, Switzerland on October 14, 1991. The world's fifth largest producer, Il Sung of South Korea, did not attend and did not cooperate with the cartel. Another seller of biotin was absent. Under a co-production agreement with E. Merck, BASF obtained all its biotin only from E. Merck. Roche ordered Merck to represent BASF's interests in the cartel.

At Lugano the first order of business was to exchange each firm's previous year's sales volume, all expressed in 100%-biotin equivalents. Shares were broken down for Europe, North America, and the rest of the world. The figures were communicated orally so that there would be no written record. Then, the companies' 1990 production shares were adopted as quotas for the 1992 marketing year with only a few small adjustments. As a sweetener the two largest manufacturers, Roche and Sumitomo, agreed to cede about 3% of the 1992 market to the three smallest firms, most of the increase going to Tanabe. Because of a "significant degree of mistrust" among the participants, it was understood that renegotiations might have to be rescheduled every quarter or every six months. Merck in particular threatened to keep its production high if it detected deviations from the agreed shares.[17] These quota arrangements were a significant departure from the vitamin A blueprint.

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[17] A confidential note kept by BASF referring to agreements made at the Lugano summit states: "*MERCK + BASF will nicht zurückfallen, wenn andere steigen*" ("Merck and BASF will not cut back if others increase") (EC 2003: ¶493). While called "the principle

Although the market-share agreement seemed to be makeshift, it turned out to be quite stable in practice. The intra-cartel share of Roche from 1991 to 1995 barely wavered from its original 47% allocation. The combined shares of the two expansionist Japanese firms also barely moved; from 38% in 1991, it climbed gently to 40% in 1993-1995. Only E. Merck's share slid to accommodate the Japanese firms' expansion.

At Lugano, the participants also agreed to raise target and minimum prices for biotin to be made effective January 1, 1992 and to raise them again on April 1, 1992 (*ibid.*). List and minimum prices were also set for both a diluted (2%) feed-grade product and a 100%-pure pharmaceutical version. As in other cases, the principle was "price before tonnage."

Besides the usual bickering about other members selling at low prices or stealing customers, new price levels and quotas were negotiated about every six months at meetings in luxury hotels in Zurich, Geneva, Nara, Osaka, Tokyo, and similar cities. Sales data were gathered in advance by means of telephone calls. In a departure from the pattern in the other vitamins cartels, the multi-tiered management structure was abandoned. For biotin meetings all the participants were from the top reaches of the companies' management structure. Roche sent its head of worldwide vitamins marketing. The engagement of top-level executives may have been prompted by an unusually high degree of mistrust.

From the start transactions prices were below targets. In early 1992 Lonza was charging biotin prices that were 8% below the January targets, and the two Japanese firms were 11% below. Although the evidence is sketchy, it appears that by early 1994 the cartel was achieving a weak but positive effect on prices in Europe. Using the prices being offered by the maverick Korean manufacturer Il Sung as a benchmark, members of the biotin cartel were selling at prices inflated by 7 to 8%.

In the U.S. market the price of feed-grade biotin barely budged in the 1991-1995 period. This was no doubt disappointing to the biotin conspirators because feed-grade biotin accounted for 73% of U.S. commerce. However, the cartel had more success with the human grade product. Its prices rose by 15 to 20% from 1990 to 1992-1995. Thus, weighting the two grades together, U.S. prices of biotin also increased by 7 or 8% from more competitive levels. Compared to most of the other vitamin cartels, the biotin agreement produced a weak result, but compared to the prices that had preceded the cartel, the profits may have been satisfactory.

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of fair burden sharing," in game theory this promise of retaliation is a "trigger mechanism."

Like the vitamin C cartel, it is unclear when the biotin cartel ceased to function. The European Commission comments that after April 1994 "contacts may have been desultory" (EC 2003: p. 514). Tanabe says that it continued to apply the cartel's target prices until January 1995 and that it was given target prices by telephone in December 1994. At a meeting organized "sometime in 1995" by Roche at its new headquarters in Basel, both Merck and Lonza announced that they were no longer prepared to meet. This fact suggests that two of the members thought that the agreement was still in force at least through the end of 1994. In the United States, plaintiffs filing private suits claimed that the biotin conspiracy lasted until the fall of 1995.

Even assuming the longest collusive period of 55 months, the biotin cartel was the briefest of the 16 vitamin cartels. Unlike most of the B complex cartels, the threat to cartel was internal cohesion rather than external price competition. The participants were unable to construct the kind of elaborate management structure that contributed to the effectiveness of the other cartels. Despite the unusual dependence of the biotin cartel on the involvement of top executives, the records of its meetings suggest a high level of discord. Because its price effects were relatively weak, it seems to have generated small, if positive profits for its six members. The small size of the competitive fringe was in the end unable to compensate for the strong centrifugal forces associated with large collusive groups.

The determination of the termination date for formal collusion was critical in this case because under EC rules there is a five-year time limit from the date the violation stopped to the date of the EC's first "action." The relevant action date is the day the Commission begins its formal investigation (the day it sends out written requests for information). The biotin investigation began on August 20, 1999 – about three months after U.S. guilty pleas were made public. In fact, all six companies were guilty, but the time limit was exceeded by *four months,* thus sparing them significant EU fines. Had the Commission decided on December 1994 as the date of cessation of collusion, six fines could have been imposed.

Summary of Vitamins B1 to B9, C, and H

This section discussed the cartel conduct of European and Japanese manufactures for seven of the class of water-soluble vitamins: B1, B2, B5, B6, folic acid, C, and biotin. Five vitamins cartels (A, E, B12, and two carotinoids) had been initiated in late 1989 and early 1990 the seven conspiracies just discussed comprised the second wave of cartel building by the three founding members of Vitamins, Inc.

Like the vitamin A and E cartels, the second-wave cartels were part of the family of schemes initiated and dominated by the biggest manufacturer, Hoffmann-La Roche, ably assisted by its two willing partners, BASF and Rhône-Poulenc. Each of the seven cartels was constructed from the vitamin A and E templates, but each was designed with subtle differences to accommodate variation in environmental or compositional variation.

Vitamin D3

It appears that the Roche-Solvay duopoly operated a vitamin D3 cartel from 1985 to 1988. There was no third producer. Prices in the late 1980s display the classic hump shape seen in all successful cartels periods. However, pricing discipline broke down in the year before a new collusive episode began, though this dip in price was modest and confined to the larger feed-grade segment of the market. One reason that prices weakened in 1989 was the impending entry of a third producer, BASF, which practically overnight went from zero to a 13% global production share. BASF's rapid ascension corresponded almost exactly to Roche's decline in share. This suggests that Roche transferred capacity to its friendly rival BASF and that little or no *new* capacity was created in the industry.

The formation of the second cartel is a bit opaque. A Roche document discovered in an EU raid dated March 1991 states that vitamin A pricing was to be done in conjunction with vitamin D3 pricing, but Roche denies having originated the D3 cartel. Solvay, on the other hand, blames Roche for instigating collusion.

Around 1990 a number of structural changes took place in the industry. Belgian chemical manufacturer Solvay was and remains the dominant global producer of vitamin D3. Solvay stopped making vitamin A before 1990. At about the same time BASF, then colluding with Roche in the market for vitamin A, began to manufacture vitamin D3. BASF's entry into D3 caused Solvay to lose 25% of its sales in 1990. Moreover, Roche had, after years of doing so, refused to supply Solvay with vitamin A beginning in 1991. Thus, Solvay became unable to sell the vitamin A and D3 compound that many of its customers would want. To all appearances, Roche and BASF were squeezing Solvay.

Plaintiffs in the civil suit in the United States tell a different story about the origins of the D3 cartel. They claim that the second cartel began in January 1990. Two bits of circumstantial evidence support the earlier date. First, despite BASF's large-scale entry in 1990, U.S. prices rose dramatically in 1990 and 1992, by 30% in the feed-grade market and by 25%

in human grade. While prices rose from time to time during 1993 to 1998, none of the later increases were close to the earlier ones. Second, market-share stability was almost as high during 1990-1993 as during 1994-1998.

According the EC, the three companies initiated their collusion on January 11, 1994 in Basel, Switzerland. At that meeting, Solvay, Roche, and BASF agreed to split the feed-grade market in the ratio 41:38:21. This split was not much different from the actual shares in 1993. In the much larger feed-grade segment, Roche and BASF agreed to shares of about 30% each. Target and minimum prices were set for three regions: Europe, the United States, and the rest of the world. With control of about 100% of world supply, the prospects for a durable cartel were rosy.

The D3 conspirators met only twice each year in February and September. Solvay acted as Rhône-Poulenc's agent at the meetings. Rhone-Poulenc gave Solvay its sales data in advance of the biennial tripartite meetings. Thus, the cartel had four members, one that participated by proxy. The EC decision states that the cartel raised prices only twice, in April 1994 and in August 1997. BASF was the designated the "price leader" for the first price adjustment and Solvay for the second. U.S. prices hardly reacted to the first announcement and not at all to the second. The anemic price response suggests that the January 1994 meeting was a renegotiation of a much earlier agreement.

As is generally the case with the oil-soluble vitamins, the vitamin D3 cartel expressed no worries about fringe firms, and in fact the degree of cartel control was 100% for the conspiracy's five to eight years. It did, however, discuss concerns about grand-jury investigations in the United States. Roche representatives brought up the topic at the cartel's August 1997 meeting, telling the others that Roche's management had instructed employees to stop regular meetings. Nevertheless, the four conspirators continued to meet at least three more times bilaterally (Rhône-Poulenc with Solvay, Solvay with Roche, and Roche with BASF) until at least June 1998. Collusion may have persisted to February 1999.

Cartels without Roche

Niacin and Choline Chloride

Relatively few details have surfaced about the origins and operation of the niacin price-fixing conspiracies. What little is known must be pieced

together from court documents containing only minimal facts filed in U.S. and Canadian courts. However, much more is known about the inner workings of the choline chloride cartel because of a trial held in the United States in 2004 and the decision of the EC released in late 2005.

These two cartels were different in several ways from the others that have been discussed. The participants in the niacin (B3) and choline chloride (B4) conspiracies were almost a completely different set of companies from those in the "Roche cartels." In both cases only one company was a member of both the Vitamin B3 or B4 cartel and simultaneously one of the Roche cartels. In addition, both cartels are unique in having had participation by manufacturers that were headquartered in North America. The vitamin B4 conspiracy began having market effects in 1988. No other vitamins cartel began on this date.

Niacin

The ringleader of the global niacin cartel was the Swiss firm Lonza, which is loosely part of the Alusuisse conglomerate. Lonza had captured two-thirds of global production in the early 1980s. In the early 1990s Lonza still dominated global sales from its single plant in Switzerland that supplied almost 60% of global production and had a 70% share of European sales. The German metals and specialty chemicals company Degussa had a strong and growing second position in the niacin market. Degussa's share of world wide production of vitamin B3 grew from only 8% in 1981, to 21% in 1990, to 27% in the late 1990s.

It is possible that Lonza and Degussa began colluding on European sales and exports to North America in 1985. While the U.S. guilty plea agreements are vague on this point, U.S. prices trace the characteristic hump shape associated with an effective collusive period from 1985 to the end of 1988 followed by a pause in collusion from early 1989 to mid 1990. From 1985 to 1988, the two leading firms enjoyed a nearly constant 80% global share that was certainly sufficient to support overt collusion. However, the U.S. private plaintiffs did not claim damages from a late 1980s cartel in vitamin B3, and no U.S. or EU convictions have been forthcoming. Therefore, the evidence concerning the existence of an earlier cartel is mixed.

A global cartel of four firms certainly operated in global market for vitamin B3 through most of the 1990s, but there is some uncertainty as to the starting date. It appears that Lonza and Degussa initiated discussions to establish the vitamin B3 cartel in mid 1990 and later pulled two smaller U.S. companies into the conspiracy. The U.S. companies, Reilly Industries and Nepera, joined the two European companies to form the cartel

sometime between mid 1990 and early 1992. Price data favor the earlier date. U.S. prices of feed-grade vitamin B3 fell by 25% in the 18 months prior to July 1990 and then climbed 35% in the 18 months following July 1990. No other steep price changes of that kind occur in the 1990s.

Reilly Chemical ran two vitamin B3 plants, a large one in Indianapolis and a smaller one in Belgium. Sometime in the early 1990s Degussa and Reilly became co-owners of a niacin joint venture known as Vitachem, but when the partnership began is not exactly known. Until late 1994, the pricing of vitamin B3 was Degussa's responsibility while Reilly's management confined itself to production decisions. However, in September 1994 Degussa pulled Reilly into the conspiracy.

Nepera is a small chemical maker headquartered in New York State; it sold most of its niacin in North America. Nepera held a North American share approached 30%. From the U.S. guilty pleas, it is clear that Nepera had an active role in the conspiracy beginning by at least January 1992. In July 1995, about the time it was acquired by Cambrex Industries, Nepera withdrew from the U.S. conspiracy. Cambrex was never charged with any wrongdoing. So, from July 1995 to March 1998, Lonza, Degussa, and Reilly continued with U.S. price fixing on their own. Without Nepera's support, U.S. prices did begin a slow slide from 1995 until the end of collusion in 1998.

There are few signs of stress in the B3 cartel. The cartel was protected by technological barriers and operated in a highly concentrated industry. From 1990 to 1998 the four top vitamin B3 manufacturers controlled 86 to 95% of global supply. During the three-firm stage of the cartel, intra-cartel market shares were quite stable. Lonza maintained a 65 to 67% cartel quota in most years, Degussa-Reilly 24 to 26%, and Nepera 10%. Lonza and Degussa loosely coordinated the vitamin B3 conspiracy with the main group of vitamin price fixers associated with Hoffmann-La Roche (Barboza 1999). Even after Nepera left the cartel, the remaining three conspirators held on to 84 to 86% of global supply and maintained their 1991-1995 production quotas. Fringe firms did not expand during the collusive period.

Choline Chloride in North America

There were three distinct price-fixing episodes in the markets for choline chloride (vitamin B4).

The first choline chloride cartel began at a meeting in Toronto, Canada in January 1988. There the longtime vitamin B4 sales manager for Chinook, Ltd. (Russell E. Cosburn, employed from 1967-1992) hosted a meeting of the other two manufacturers of the vitamin in North America:

the Cleveland, Ohio firm Bio-Products (owned by Mitsui of Japan) and DuCoa of Illinois. DuCoa was formed in 1987 as a joint venture of DuPont and ConAgra. DuCoa's principal line of business was choline chloride. ConAgra was assigned principal management responsibility over DuCoa.

North America was the locus of the largest vitamin B4 supply in the world. The three manufacturers controlled 47 to 49% of global production in the mid 1990s, and before the global cartel was formed in 1992, their exports to Europe accounted for 9% of European demand. The five European producers shipped little choline chloride to North America in 1991, so it appears that the three U.S. and Canadian firms were more efficient than their European counterparts.

At the Toronto meeting, the three North American companies agreed to raise the North American list price of choline chloride, to allocate specific customers, to rig bids, and to share the market equally. By the spring of 1989, market prices of choline chloride began to rocket upward – by 40% above 1987 levels in the first year. Thus began the "North American branch" of the global choline chloride cartel. In general, U.S. prices of choline chloride remained 40 to 65% above 1987 levels for the entire ten years of effective collusion. Prices did decline modestly from the 1995 peak through 1998, but they remained well above pre-cartel and post-cartel levels.

In 1997 DuCoa was acquired by a company named DCV. Based on the convictions in the United States and Canada, it appears that DuCoa's mid level sales managers continued to collude before and after DuCoa's acquisition without the knowledge of DCV's management. Neither DuCoa's old parents nor its new one were charged with price-fixing violations, but as the managing partner of DuCoa, ConAgra was held responsible for DuCoa's damages in U.S. civil suits. Except for Chinook, lack of involvement of top executives of parent companies is another feature of the choline chloride cartel that sets it apart from the Roche cartels.

The only criminal trial involving an individual participant took place in U.S. District Court in Dallas, Texas in 2004 (Barnett 2005: 6-16). The defendant was Daniel T. Rose, former President of DuCoa, who was found guilty by a jury and sentenced to 30 months in prison in March 2005. Five of Rose's co-conspirators testified against Rose. The trial record provides some tantalizing insights into cartel conduct.

The cartels held 20 to 30 face-to-face meetings in the Midwest from 1988 to 1998. The agendas usually involved reviewing market sales trends, planning to rig bids and thereby allocate major customer accounts, raising or maintaining list prices, and assigning one of the three to make the first price announcement to the trade press. A former president of DuCoa testified that:

> "The conspiracy was our way of life….that's what we had to do to sell the product and make the money we were making."(Barnett 2005:16).

The three companies "had a spat from time to time," frequently trading accusations of poaching particular customers (*ibid.* p.9). However, poaching was not a sign that their agreement was in jeopardy; rather it simply signaled the desire for a meeting to renegotiate the "protected customers" list. Each supplier's customer portfolio would be reconfigured on a regular basis to maintain the agreed sales quotas.

For example, in the fall of 1997 DuCoa and Chinook were concerned about Bio-Product's rising market share. In response, their representatives decided to implement a "Trojan Horse strategy." DuCoa would sell a large amount of choline chloride at a favorable price to a chemical wholesaler, South Central Products. In late 1997 Chinook and DuCoa bid high on a tender for one-third of Tyson Food's substantial choline chloride needs, and this allowed South Central to win the Tyson contract. That business had been previously allocated to Bio-Products, so the Bio-Products manager angrily insisted on a meeting. In January 1998, officers of the three companies met over dinner on the fringes of the Southeast Poultry Convention in Atlanta to discuss the engineered rift. At a follow-up meeting at the O'Hare Airport Hilton Hotel in Chicago, DuCoa and Chinook and DuCoa offered compensation to Bio-Products for the loss of its Tyson business. DuCoa offered to turn over its Roche account to Bio-Products, and Chinook offered its account with Cagle's. Rose's lieutenant Antonio Felix later testified that "…[T]he idea was to see how we can compensate …the balance that Bio-Products had lost with our takeover of Tyson" (*ibid.* p.13). Bio-Products apparently accepted the trade, thus ameliorating the brief tempest.

At the end of the Chicago meeting the conspirators decided to raise list prices by 4 to 5 cents per pound for liquid choline chloride and by 3 cents for dry product. This price increase of about 6% was to be effective on April 1, 1998. One of the companies was assigned to contact *Feedstuffs* magazine with the news. After the meeting, the attendees were careful to cover their tracks. The Bio-Products manager falsified his travel-expenses report by saying that he met with customers; similarly, the Chinook representative claimed in his expense report that he had met with Continental Grain; and the DuCoa president ordered his assistant to report that they were in Tennessee rather than Illinois.

At a third meeting at the TWA Ambassadors Club at the St. Louis Airport on March 9, 1998, the conspirators met to confirm that the proposed

customer trades had been carried out and that prices had been duly raised by all. Both changes had gone off smoothly and effectively. Despite the stated objective to fix North American shares equally, there were some fairly large shifts in intra-cartel positions. Bio-Product's share nearly doubled and DuCoa's was cut by more than half.

The St Louis meeting was one of the last to be held by the North American branch of the choline chloride cartel. In June 1998, Bio-Products suddenly withdrew from the cartel, and in September FBI agents raided the offices of the remaining companies. The post-cartel plunge in choline chloride prices was the most dramatic of all the cartels; from July 1988 to January 1989, prices fell 40% (equivalent to an 80% annual rate).

The Global Choline Chloride Cartel

Fast-rising European imports of choline chloride in 1989-1992 alarmed the North American manufacturers. However, the event that that triggered the formation of the global cartel was an aggressive move by DuCoa into the Mexican market.

The three big European makers of choline chloride were BASF (a plant in Germany), Akzo Nobel (the Netherlands and Italy), and UCB (Belgium). In the mid 1990s these three companies supplied 35% of global demand and 78% of EU consumption. In the 1990s they built plants abroad: BASF in Mexico, Brazil, and Thailand; and Akzo and UCB each built plants in China. The first choline chloride plant built abroad by a North American producer was DuCoa; it began production in Mexico in early 1992 even though BASF already had a plant there. DuCoa goaded BASF further by announcing that it intended to take 40 to 50% of the Mexican market. BASF retaliated by arranging to sell under favorable terms 400 tonnes of choline chloride to the United States from its plant in Mexico in early 1992. The effect would be to reduce the North American cartel's high prices.

To address this problem, DuCoa and Bio-Products officers met with BASF managers in Mexico City in October 1992, in order to "…complain about [BASF's] pricing and to suggest setting limit prices in the US" (EC 2004: 25-26). A month later, at a second meeting in Mexico City, BASF agreed to stop exports to the United States, close its Mexican plant, and purchase its entire local supply from DuCoa's new plant. The *quid pro quo* for BASF's capitulation became clear at a summit of the big six manufacturers at the third Mexico City meeting in October 1992. There they all agreed to cease exporting from the United States or Canada to Europe and *vice versa.* To finalize the details of the global cartel, the six met again in November 1992 at the headquarters of BASF in

Ludwigshafen, Germany. The six companies affirmed their intentions to stop exporting to each other's continents, to allocate exclusive world sales territories, and to raise the price of choline chloride all over the world.

The Ludwigshafen protocol was quite specific (*ibid.:* 28-34). North America exports to Western Europe would cease by June 1993 and exports to Eastern Europe by June 1994. The three European members would stop all exports to North America by June 1993, and BASF would close its Mexican plant by the same date. By 1994 each sub group would have hegemony over its respective continent. In Latin America BASF would be compensated for its losses in Mexico by permitting it to open a new Brazilian plant and use that plant to capture all future demand growth in that region. The remaining five manufacturers agreed to freeze all exports to Latin America at 1992 levels. In Asia, the plan was to allow Chinook and Bio-Products to capitalize on all future growth in that continent. The other four producers would hold annual exports to Asia to no more than 375 tonnes. Production quotas were expected to stay roughly constant, but no precise market shares were specified. Production levels were to be audited by CEFIC, the large European chemical trade association. As for prices, three EU increases were planned for January of 1993, 1994, and 1995 to $0.66, $0.73, and $1.05 for full container loads, respectively; U.S. prices were expected to be about 5% less than those targets.

The six continued to meet as a group from January 1993 to April 1994 in Atlanta, Amsterdam, Toronto, Bruges, and Malaysia. At the last meeting in April 1994 Chinook announced that it would no longer attend meetings of the big six. After April 1994, DuCoa and some of the other companies no longer met about the global arrangements (*ibid. p.* 35). However, to monitor the territorial-exclusivity agreement continuous bilateral contacts were maintained throughout the 1990s. UCB and Chinook in particular met frequently to ensure the smooth operation of global partitioning.

Several indicators began to reveal the global cartel was not fully living up to expectations. Global price increases were less than had been hoped. Prices in the United States averaged about $0.73 per pound (100% basis), which was the cartel's planned price target for 1994, but apparently versions on silica or grain bases. Control of the converters' selling prices small companies that purchased liquid choline chloride and prepared dry versions on silica or grain bases. Control of the converters selling prices was proving difficult. Considerable dissention arose when Chinook opened a new plant in Singapore in April 1994. In late 1994 DuCoa itself started to undermine the prohibition against exporting from North America to Europe; Mexican exports grew from 66 tonnes in 1994 to 1000 tonnes in 1997-1998.

Although there were no more six-party talks after April 1994, smaller groups and some bilateral meetings were held between members of the North American and European branches until as late as December 1996. This date may be taken to mark the end of cooperation between the two branches. Choline chloride prices slipped a bit from 1995 to 1997, but plunged by 40% from 1997 to 1999. By the early 2000s prices were so low that BASF and probably other producers were suffering from negative operating profits on chlorine chloride sales.

Choline Chloride in Europe

The "European branch" of the choline chloride conspiracy was the last to be formed. It was far more tightly organized than the two others that preceded it. The three leading European manufacturers stated to the EC that they began agreeing to *global* price-fixing at a meeting in Ludwigshafen, Germany in November 1992, but at the European level the cartel may have been launched as late as a meeting in Schoten, Belgium on March 14, 1994. Thereafter, meetings were held in various cities in Belgium, Germany, and the Netherlands every three months and telephone calls every week or two. The specific locations and persons attending the 16 meetings are known from minutes supplied by the three companies (EC 2004: 35-36). Most of them were scheduled immediately before or after the regular meetings of CEFIC, the European chemical-industry trade association. Target contract and spot prices were specified in local currencies for various grades of choline chloride. Prices were set for four quarters in advance. Besides raising prices, the European branch allocated specific customers to one of the vitamin makers. Shares in the EU were set at 35% for Akzo, 28% for UBC, and 15% for BASF; actual shares tracked these allotments closely. A compensation system was implemented to punish cartel members that exceeded their quota. At the meetings confidential business information was shared about customers, sales, and prices.

The European branch of the choline chloride cartel was apparently still colluding effectively until its last meeting in October 1998. It disbanded only after prosecutions of the vitamins cartel erupted shortly thereafter in the United States. A Dallas, Texas grand jury had begun investigating the choline chloride market in late 1988. Moreover, the largest U.S. manufacturer began cooperating with DOJ investigators in June, and the other two North American members of the cartel had been raided in September 1998. The fact that a European meeting took place at all in October is testimony to either risk-loving behavior or to the wide separation of the two branches of the chlorine chloride cartel.

Meeting Challenges to Collusion

Like the I.G. Farben cartel in the 1930s, the vitamins cartels employed almost every trick in the price-fixer's book. Large managerial resources were expended on complex price-fixing structures. After getting underway, in order to continue to be effective a cartel must deal with five problems: reconciliation of disparate member interests that may require renegotiation of the agreement, adaptation to a changed environment, unilateral defection (secret price cutting by members), entry by nonmembers, and avoiding detection by either customers or antitrust authorities. The purpose of this section is to show that conduct of the vitamins cartels addressed these problems.

Renegotiating Agreements

It is virtually impossible to write a contract that can foresee every eventuality, and cartel agreements are no exception. There are many recorded instances of flexible behavior among the cartelists that helped resolve disputes and thus preserve the fruits of collusion. The first example is the reestablishment of the 1985-1988 cartels. Roche and BASF learned from the breakdown of those agreements, principally by working out new rules and management structures for vitamins A and E in 1989-1990. These two contracts became the models for the others, but in some cases with significant alterations of details.

Quarterly meetings were standard for most of the cartels. At these face-to-face meetings complaints about the division of the spoils could be expressed, prices and quotas could be adjusted and other solutions devised. The cartels almost always involved top managers with the authority to implement significant changes in a cartel's strategy. When prices did not respond sharply enough, it was not unusual for the original members to recruit new members, such as when Eisai was added to the vitamin E cartel after one year.

To attract new capacity to the club, the leading members would at times diplomatically yield some of their production to give the newcomer an increase in its market share. Roche went to great lengths to accommodate BASF's desire to replicate most of Roche's broad product line; the long-term deal in carotinoids was only the most extreme example of Roche's generosity. Of course, it made sense for Roche to keep BASF happy, because BASF was in the strongest position to retaliate.

The cartelists showed flexibility in other ways. In general the vitamins cartels did not engage in rigging bids, but because the vitamin C market had a few large buyers, an exception was made. The geographic

regions selected for setting different prices usually was limited to three (Europe and the Middle East, North America, and the rest of the world). However, some cartels identified up to five price zones. If production was interrupted, such as the fire at Rhone-Poulenc's vitamin E plant, the cartel seized the opportunity to raise prices far higher than had been planned a few months earlier.

Monitoring Adherence to Quotas

Checking prices on transactions was not feasible, so the major technique for detecting cheating was for the members to share their internal sales records with each other at the quarterly meetings. These data were used to compute company shares globally or in some cases regionally. Shading price would be revealed by a market share in excess of an allocated quota.

Occasionally such data would not be sufficiently reliable, and they would be supplemented with third-party data. The members knew the location of each member's plants and frequently a country would have only one producer for a given product, so national exports could serve to cross-check members' production claims. Takeda was confronted with such evidence in the vitamin B2 cartel. Another related technique used in the choline chloride cartel was to create exclusive territories for two semi-autonomous branches. Trade data would detect departures from the hegemony agreement.

Even the best-intentioned criminals will exceed their grasp. Therefore, most of the vitamins cartels had compensation policies. Whenever a company exceeded its quota, that firm was obligated to sell the excess production at cost to an under-achiever in the cartel. Resale of the transferred product would restore the planned division of monopoly profits. Thus, increases in interfirm, intra-industry sales are indicators of cartel activity.

Punishing Cheaters

Roche frequently took upon itself the role of the bully. The EC decisions frequently refer to displays of anger directed by Roche representatives toward alleged cheaters or arbitrageurs. A punishment strategy suggested by cartel theorists is the "trigger mechanism" – a threat announced at the beginning of a cartel to revert to competitive pricing if cheating is detected. Only in one cartel history is such a threat cited (by E. Merck in biotin), but it was not particularly credible. At the end of the first wave of cartels in the late 1980s, mild price wars may have occurred, but in the collusion of the 1990s nothing like full-blown wars are observed. If prices were sometimes used to punish deviants, they were applied with finesse. For example,

when evidence of cheating surfaced in the vitamin B5 cartel in 1993, Roche and Takeda decided to punish Daiichi by matching the latter's price cuts.

Dealing with Arbitrageurs

The managers of Vitamins Inc. were well aware that international geographic arbitrage was capable of causing prices to fall below an optimal level in one of its regions. Vitamins are storable commodities, cheaply transported, and subject to uncontrollable price changes because of multiple currency regimes. The vitamin B5 vignette is the clearest example of the cartelists' fear of arbitrage. The rule adopted was to keep price in one currency zone less than 10% above or below the prices (when converted to a common currency) in all other currency zones. If the geographic price spreads were kept below 10%, international transshipment would not be profitable. Exactly the same point was made in an internal Roche memorandum to its vitamins A and E sales managers. And in the vitamin C cartel, the Coca Cola Company was identified as a likely arbitrageur because of its centralized procurement policy.

Containing Aggressive Fringe Producers

The record is rather incomplete, but various tactics were employed to try to inhibit the expansion of fringe production.

Testimony to the European Commission admitted that even in cases where the fringe was miniscule, the cartels considered measures to eliminate imports from fringe producers. Fringe production often was initially of low quality suitable only as feed grade, and there are occasions when the cartels price discriminated against this grade. That is, they developed sub standard products or sold feed-grade vitamins at a significantly lower price on a 100% basis than the human grades that had less fringe competition. Another trick was for Roche and BASF to raise the prices of selected straight vitamins to premix makers because these buyers would then be at a price disadvantage in premixes compared to Roche and BASF. Indeed, there are statements in the record that suggest that the intent was predatory. In the vitamin B5 market this strategy caused Daiichi to complain to Roche and BASF about excessive selling prices. Finally, side payments were at times proposed to deal with troublesome fringe rivals. In 1993, Roche proposed that the biotin cartel purchase all of Il Sung's output as a way of boosting prices.

Perhaps the most blatant example of rival containment is Roche's 1981acquisition of the Danish vitamin maker Grinsted. This manufacturer had global production shares large enough to foil effective price fixing in the markets for vitamin C, B1 and B6. A few years later Roche and others formed cartels in all three markets. There are similar anomalies in other industries. E. Merck, Glaxo, and other European producers with seemingly snug positions in the vitamin B2 and B12 industries suddenly and conveniently exit just before a new cartel begins operations.

However, the vitamin conspirators were feckless in the face of some fringe producers. ADM's refusal to play ball in the vitamin B2 market is one example. In several markets the cartels were unable to quash Chinese producers.

Maintaining Secrecy

The members of the vitamins cartels went to extraordinary lengths to hide their activities. The announcements about price increases were by prearrangement rotated among sellers to give the false impression of mere price leadership. Sensitive data on production levels was reported verbally at meetings so as to avoid a paper trail. Many incriminating documents found in raids were supposed to be destroyed. Misleading information was given to in-house counsel trying to detect illegal behavior. False testimony was given to government investigators so as to stymie investigations. When investigators were close to discovering business records about the conspiracies, the participants turned to storing cartel records in unlikely places beyond the reach of the authorities.

Endgame: The Conspiracies Unravel

The vitamins agreements resemble wheels within wheels. Working groups organized around various combinations of vitamins and their principal suppliers were formed, each of which can rightly be identified as cartels themselves. The vitamin B3 and B4 cartels discussed below were operating on nearly separate tracks, but the 14 Roche cartels were overlapping and intermeshed. The difference between these interlocking cartels and a Swiss watch is that when one cartel wheel broke, the other parts kept spinning.

A high proportion of the Roche cartels' meetings took place in Switzerland and Japan. Swiss cartel laws exist on the books, but in the 1990s the Swiss antitrust authority rarely prosecuted international cartels,

could only impose fines if a cartel has been previously warned, and meted out only modest fines in any case. Japan's Fair Trade Commission operates in a similarly shy fashion. Thus, the members of Vitamins Inc. must have felt comfortable meeting in Japan and Switzerland. However, cartel meetings also took place occasionally in Germany, France, and other European venues. The European Commission did not begin investigating until after the U.S. DOJ made collusion public in May 1999. The vitamins cartel brushed off a 1993 raid by French competition authorities as inconsequential, a correct judgment as it turned out. The companies in Vitamins, Inc most feared discovery U.S. Justice Department and its investigative arm the FBI. As a consequence, they avoided meeting on U.S. soil and took other steps to hide their activities.

Causes of Death: Natural or Legal?

The 16 vitamins conspiracies ended in one of two ways. Some cartels sowed the seeds of their own destruction by raising prices in industries where the members of the cartels could not prevent the market entry or expansion by fringe producers. The elevated prices gave even inexperienced or inefficient vitamin manufacturers sufficient expected profits to justify investing in plant capacity. In most of these cases the fringe producers were located in China. It is likely that the firms that formed these cartels underestimated the competence of their potential rivals or overestimated their own abilities to cow or co-opt the outsiders. It is also possible that the collusive groups knew that their collective market power would erode after a few years of high prices, but reasoned that a few years of handsome profits were better than a continuation of pre-cartel conduct.

The second and more numerous set of vitamins cartels was terminated by private and government investigations in the United States of allegations of illegal price fixing. Credible complaints by vitamin premix companies about the putatively predatory behavior of the two dominant sellers, Hoffmann-La Roche and BASF triggered a private investigation by an intrepid class-action law firm in mid 1997. The results of the private investigation were shared with DOJ prosecutors who decided to reopen an investigation of vitamins price fixing out of their Dallas, Texas office. The big break in the DOJ investigation came in late 1998 when Rhone-Poulenc, the world's third-largest vitamin firm, decided to take advantage of the Division's relatively untested Corporate Leniency Program. This program offered practically automatic amnesty for qualified price fixers on

condition that the applicant provides sufficient evidence of illegal collusive behavior about which the DOJ was not aware.

It is noteworthy that none of the vitamins cartels ended because of a breakdown in internal cohesion. Disagreements among cartelists are inevitable, but the dissention among the members of the vitamins cartels never reached intolerable levels. As far as is known, Rhone-Poulenc was not unhappy with its market share or the financial performance of the cartels in which it participated. Nor did any other participant in the vitamins cartels actually stop cooperating and either complain to competition authorities or become an aggressive, price-cutting outsider. Absent legal intervention the majority of the cartels might have continued indefinitely.

Short-Lived Cartels

Six of the vitamin conspiracies ended relatively soon. All six of these cartels began in early 1991 and ended in either 1994 or 1995. The mean duration of the short-lived vitamins cartels (B1, B2, B6, B9, H, and C cartels) was 3.9 years. Except for Vitamin C these cartels were quite small. In terms of affected sales, the six short-lived conspiracies accounted for only 21% of the 16-cartel total. Five fell apart because producers outside the cartel cut prices and captured large shares of the market. The sixth brief cartel, biotin, seems to have been fragile because it had too many participants.

Chinese producers had a profound impact on the termination of four cartels (Connor 2006c: Table 11). In the vitamin C market they already had a 3% global share in 1980 that grew to 8% by 1990. As the vitamin C cartel was getting underway in 1991, Chinese manufacturers were adopting a new low-cost fermentation technology that put them in a formidable price position. Chinese production tripled between 1991 and 1994, the peak year for vitamin C prices. Moreover, during the last difficult year of the cartel as prices plummeted, China's vitamin C manufacturers added an unprecedented 10 percentage points to their global market control.

In the case of vitamin B1 Chinese incursion into this market was already significant in the 1980s (global shares ranged from 9% to 14%). When collusion began in 1991 the high prices prompted Chinese manufacturers to ramp up output very quickly. From 1990 to 1994, the last year of the cartel, China's production grew an average of 35% per year. However, when prices plunged by 40% from early 1993 to 1998, China's share fell back to below 30%. This seems to indicate that costs of production in China were not much lower than those of Roche and Takeda.

In the folic acid (vitamin H) industry China's share of world production in the 1980s languished in the 2 to 3% range. Collusion began in 1991 and by the time the cartel reached its apogee of pricing effectiveness in 1993-1994, the Chinese had captured one-third of global production. However, when prices crashed by 55% over the next five years, the share of Chinese factories stabilized at around 20%. The folic acid industry is one of the few in which Chinese expansion was paralleled by long term growth of small Indian vitamin manufacturers.

In vitamin B6 Chinese firms did not enter until 1986 and achieved only a 4% share of world production by 1990. However, as soon as the cartel raised prices in 1991, the Chinese fringe increased that share by 250%. In the cartel's last year (1994) Chinese producers accounted for an astounding 43% of world supply. This impressive tenfold surge in share of supply was the largest of the four markets discussed in this section. With the end of high prices the Chinese industry fell back to a mere 10% of global production by 1998.

There were a few vitamin industries in which non-Chinese vitamin makers had significant shares, but only one of them hastened the demise of a cartel in the 1990s. Archer Daniels Midland Company grew quickly in the vitamin B2 market through the application of a new fermentation technology. ADM's 5% share at the end of the vitamin B2 conspiracy in 1995 grew to 12% three years later. In all other vitamins industries, non-Chinese fringe firms with significant market shares appear to have been passive followers or constrained by capacity.

Another common feature of these five product markets was the participation of Takeda or Daiichi. Perhaps these companies were less committed to the cartel agreements and more troublesome about their assigned quotas.

The End of the Durable Cartels

The ten other vitamins cartels endured for six to ten years in the 1990s. Most of the cartels were operating smoothly up to the end, despite increasing signals to outsiders that collusion was afoot. According to one source, U.S. investigators first got wind of the vitamins cartel and Roche's role in it in late 1996 from sources at ADM cooperating with the DOJ in its investigation of the citric acid cartel. At that time ADM was making vitamin B2 and biotin (vitamin H). As a result of the tip, the FBI interviewed Dr. Kuno Sommer in March 1997 (Barboza 1999).

Dr. Kuno Sommer was at the time president of Roche's Vitamin and Fine Chemicals division. Sommer had to agree to the interview

because of Roche's promise to the DOJ to cooperate in the citric acid case. During the FBI interviews Sommer denied the existence of any vitamin cartel, and the DOJ apparently decided to wind down its investigation for the meanwhile. What the investigators did not know at the time is that Sommer had pre-arranged his denial with other conspiring company officers at Roche. Their agreement to deceive the FBI constitutes obstruction of justice, a very serious offense under U.S. law.

More evidence of illegal price fixing began to appear. In late 1997, a partner of the law firm Boies & Schiller with experience in representing class-action plaintiffs' claims to have discovered evidence of vitamin price fixing in the course of preparing a patent-infringement suit. Soon after Roche dropped a counter-claim in the case, he began hearing many complaints from Roche customers. Vitamin buyers reported several instances of inexplicable behavior. Customers who habitually purchased from Roche would not be able to get price quotes from BASF or other suppliers, and vice versa. Buyers of vitamin C were threatened with unspecified retaliation should they try to resell purchased products. A manager of a small vitamin premix company in Little Rock, Arkansas quoted a BASF executive as threatening his company with the following words: "You need to remove yourself [from making premixes] or you'll be forced out of the business" (Barboza 1999). The Little Rock company and many others did in fact fail.

In late 1997 or early 1998, lawyers working for Roche heard about allegations that some managers in the company were fixing vitamin prices (Barboza 1999). Apparently, they discovered some corroborating evidence because a top Roche official issued a directive specifically ordering that the conspiracy stop. This directive was defied. The only effect was to move the cartel's meetings from hotels and other public places to the homes of the vitamins executives. This subterfuge extended the cartel's life by another year.

In March 1998, Boies & Schiller filed a civil price-fixing suit in U.S. District Court in Dallas, Texas on behalf of several direct purchasers of bulk vitamins. The buyers were a mix of animal-feed manufacturers and blenders of bulk vitamin premixes. Plaintiffs in civil suits against Roche and BASF alleged that predatory pricing forced many premix companies to fold; the vitamins sold to feed manufacturers as a premix were priced below cost at the same time bulk vitamins sold to premix companies were sold at monopoly prices. It would be more than one year before the government indicted Hoffmann-La Roche, BASF, and others for those crimes.

These allegations were forwarded to the DOJ because a grand jury was established in Dallas, Texas in November 1997 to investigate vitamin price fixing. The FBI interviewed officers of animal-feeds firms, but little

progress was made for the first year. In the summer of 1998, one of the vitamin manufacturers, the Swiss firm Lonza, began to negotiate a guilty plea agreement with the DOJ. Although signed in secret in September, it could not provide details about the "Roche Group" conspiracies.

On a somewhat separate track, the North American choline chloride cartel was derailed in June 1998. Perhaps because of customer complaints or an internal investigation, top executives of Bio-Products, Inc. got wind of the illegal collusion being carried out by Tom Stigler, vice president and general manager of Bio-Products feed ingredient group (Barnett 2005:8-15). Stigler was confronted by his supervisors. Stigler confessed his role and ceased contacts with his co-conspirators. Bio-Products immediately applied for and was granted amnesty by the DOJ. In return for immunity from prosecution for the company and its officers, Bio-Products cooperated by supplying information to federal prosecutors about the choline chloride cartel. That summer, the company began competing for customers the old-fashioned way, by offering lower prices. On September 23, 1998 FBI agents raided the offices of DuCoa and Chinook and carted off incriminating documents. While that police action effectively ended the choline chloride cartel, the information delivered to the DOJ would have had little of value in cracking the other 15 vitamins cartels.

The DOJ's biggest break in its investigation came in January 1999. Following brief negotiations, the third largest vitamin manufacturer, Rhône-Poulenc, was admitted to the Department's leniency program. As the first of the conspirators to come forward and admit its culpability, Rhône-Poulenc probably met all the conditions for full amnesty. Conditional upon satisfactory cooperation with the DOJ's vitamin price-fixing probe, Rhône-Poulenc would receive a tangible benefit: no U.S. government fine would be levied on the company and none of its officers indicted. Although Rhône-Poulenc's compensation was substantial, the DOJ's demands were likewise. Rumor has it that Rhône-Poulenc's managers were required to attend a conspiracy meeting in February 1999 and tape record it. In effect, Rhône-Poulenc became an FBI mole.

Whatever the evidence provided by Rhône-Poulenc, it must have been highly incriminating. Within two months both Roche and BASF had agreed to plead guilty and pay record-setting U.S. fines of $725 million. Within two years, 24 criminal convictions would be obtained. Rhône-Poulenc's motives were hardly pure. Not only did it save more than $100 million in U.S. fines, the company was now free to carry out its long-planned merger with Hoechst. In the end, it was the urge to merge that broke the vitamin cartel's cover.

Chapter 12: Effects of the Vitamins Cartels

The consuming public has a high regard for the benefits and efficacy of vitamins. There is something particularly reprehensible about price-fixing schemes that affect products destined for vulnerable populations. Children, pregnant or lactating mothers, the sick, and the elderly often need supplementary vitamins to achieve full health. These groups, as well as practically every household, ultimately paid the price of price fixing in vitamins. The purpose of this section is to document as precisely as possible the extent of these economic injuries.

Duration

Several factors explain cartel duration.[1] Among the most consistent hypotheses are that duration is positively affected by high market concentration or the degree of cartel control of production, product homogeneity, barriers to entry, information asymmetries between cartel members and fringe producers, steady market growth, simple channels of distribution, a prior history of collusion, helpful trade associations, low fringe capacity, and the absence of credible cartel policies. The few empirical studies of cartel duration have confirmed some of these hypotheses (Levenstein and Suslow 2004, Zimmerman 2005).

In the vitamins industries several of these factors appear to explain differences between short-lived cartels like the water-soluble vitamins and long-lived conspiracies like vitamins A and E (Figure 12.1). The more durable cartels had higher degrees of supply control, many buyers, high barriers to entry into manufacturing, capacity constrained fringe producers, and membership drawn from at most two business cultures. Most of the short-lived cartels were threatened from the outside by fringe production, and this in turn instigated internal dissention.

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[1] Hypotheses are generalized from Posner (2001), Scherer and Ross (1990), Carlton and Perloff (2004), Martin (2002), Grout and Sonderegger (2005), and Jacquemin and Slade (1989).

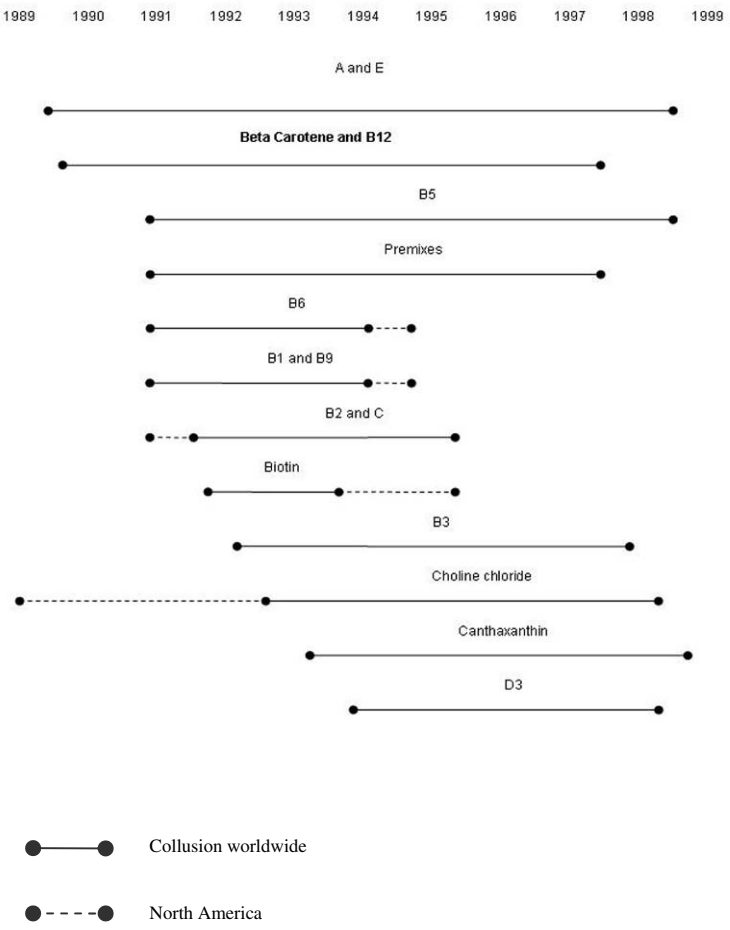

Figure 12.1 Collusion in the 1990s: The Long and Short of It

Price Effects

Bulk vitamins are homogeneous products with highly inelastic demand. Given the high concentration of sales in the hands of the cartel and the cartel's

elaborate methods for detecting cheating, the ability to raise buyer's prices would be expected to be very high (Connor 2006b).

In the case of the short-lived cartels like vitamins B1 and C, prices peaked at 20 to 40% above their 1989 levels (Figures 12.2 and 12.3). Annual transaction prices in the U.S. and European markets move closely together over time. Only rarely do the dollar-based prices in the two regions depart by more than 10%. In both cases, prices rose and remained moderate high from 1985 to 1988; then, after dipping slightly, prices rose again for three to five years. When collusion stopped, prices crashed by 45 to 60% within three years, reaching levels lower than were ever observed in the 1980s. It is a safe assumption that international geographic arbitrage would ensure that prices in other parts of the world would track closely the movements in U.S. and EU prices.

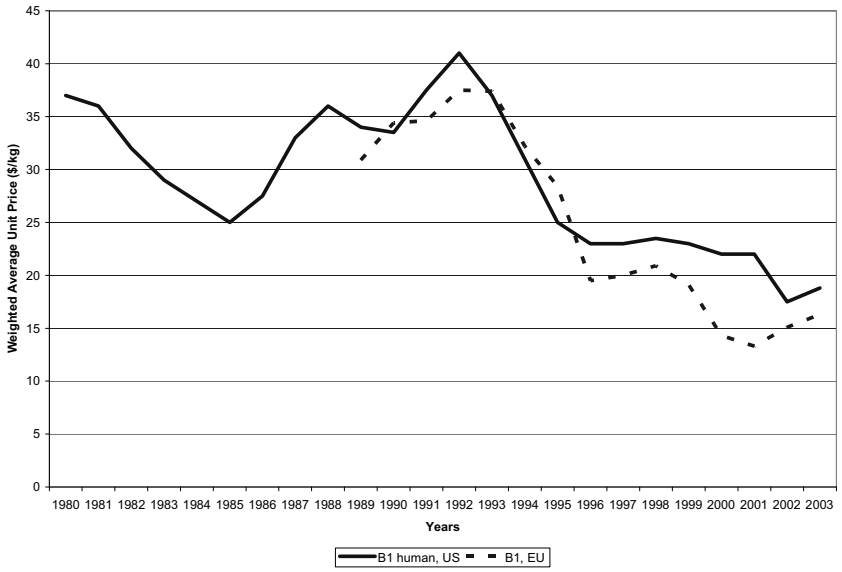

Figure 12.2 U.S. and EU Transactions Prices of Bulk Vitamin B1, Human Grade, Annual 1980-2003

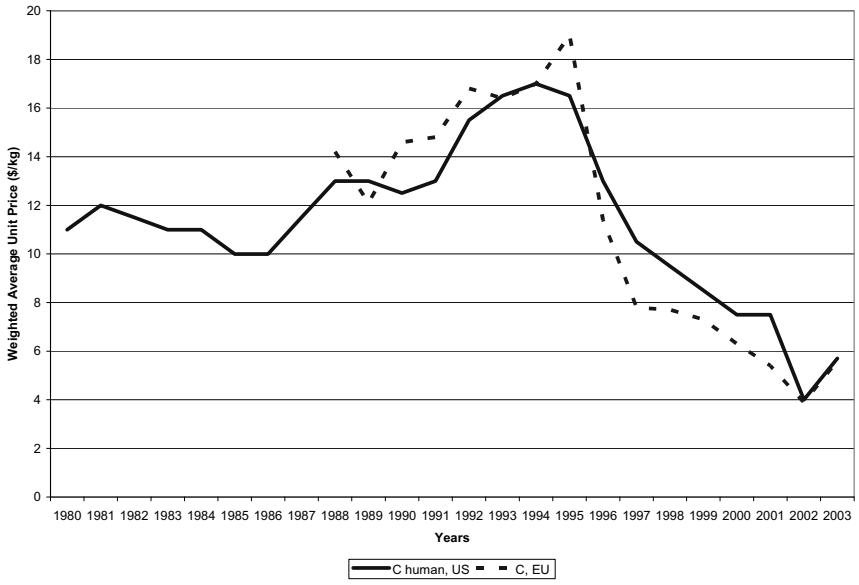

Figure 12.3 U.S. and EU Transactions Prices of Bulk Vitamin C, Human Grade, Annual 1980-2003

For the majority, more durable conspiracies peak prices were reached six to eight years after collusion began around 1990. These price increases typically were in the range of 50 to 90%. Figures 12.4 to 12.6 illustrate the transactions prices of three of the more disciplined and more durable vitamins cartels: vitamins E (human grade), A (feed grade), and B5 (human). Maximum U.S. prices were reached in 1997, and these apogees were 65 to 90% above the 1989-1990 starting points. EU prices traced similar, if slightly dampened paths.

Like an exciting roller-coaster, the decline in vitamin prices observed after the government announced the guilty pleas in May 1999 was much more precipitous than the earlier increases. This suggests that the post-conspiracy period was far more competitive than the pre-conspiracy period. The major members of the convicted cartels may have been trying to repair bruised customer relations and retain their market shares the old-fashioned way – cutting prices to the bone.

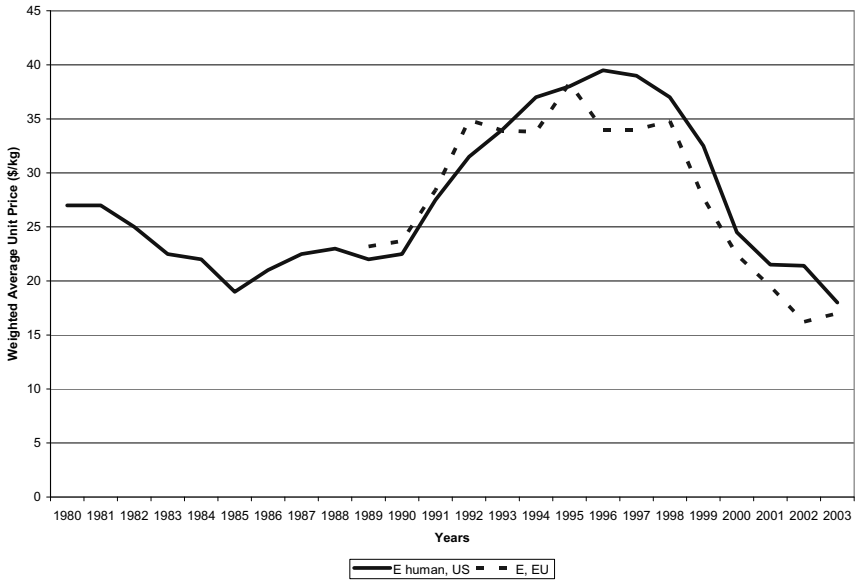

Figure 12.4 U.S. and EU Transactions Prices of Bulk Vitamin E, Human Grade, Annual 1980-2003

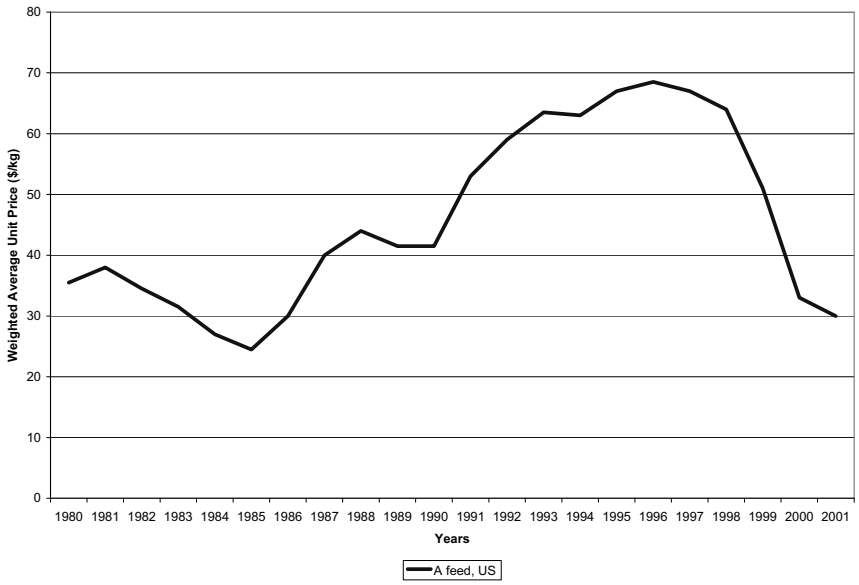

Figure 12.5 U.S. Transactions Prices of Bulk Vitamin A, Feed Grade, Annual 1980-2001

Figure 12.6 U.S. and EU Transactions Prices of Bulk Vitamin B5, Human Grade, Annual 1980-2001

There were just two exceptions to the roller-coaster price pattern in prices. Beta Carotene and the other carotinoids were unique among all the cartelized vitamins in that they were manufactured by a true duopoly, Hoffmann-La Roche and BASF. The two-firm structure persisted after formal collusion ceased at the end on 1998. The highly cooperative, indeed monopolistic behavior cemented during the lengthy collusive period seems to have continued after 1998, a result predicted for small-firm industries by dynamic game theories (Tirole 1990: 245-253).

Lags in downward adjustment of prices after the end of formal collusion were characteristic of all the other vitamins cartels, durable and fragile. Arriving at the low prices that signaled a new, more competitive equilibrium took from 12 to 36 months for all but the two carotenoid duopolies (Kovacic *et al.* 2006). The carotinoids were unique because there were no signs of a slackening of monopolistic pricing behavior a full three years after the cessation of collusive meetings. After 1998, the three largest manufacturers (Roche, BASF, and Rhone/Aventis) continued secretly to

exchange sales data for the purposes of monitoring "the previously agreed market shares" and avoiding "price deterioration."[2]

For several reasons, the increase in U.S. market prices from the initiation of price fixing in 1990 or 1991 may not measure accurately the effect of collusion *alone*. This may be true even if the managers of Vitamins Inc. truly believed that their agreements were the primary cause of the rise in prices. One reason derives from international financial considerations. The price changes just discussed were measured in U.S. dollars, but multinational companies generally seek to maximize the company's global profits. Over time profits accumulating abroad are repatriated to the company's home country and converted into the home country's currency. Because the principal members of the vitamins cartels were based in Europe or Japan, they would want to set local prices from the point of view of their home-country's currency. For example, Hoffman-La Roche is owned mainly by Swiss stockholders who would want to maximize profits in Swiss francs.

Another reason revolves around the pricing of imported bulk vitamins and the inputs needed to manufacture vitamins. More than half of the bulk vitamins sold in the United States in the 1990s were imported from Europe and Japan. When the U.S. dollar strengthened against the home-country currencies of the cartel participants, higher vitamin prices observed in the U.S. market could be due in part to currency-rate changes. For example, if a cartelized U.S. vitamin price rose by 70% and if the product was imported from Switzerland, a rise in the value of the Swiss franc of 20% over the same period would imply that collusion was responsible for raising the U.S. price by only 42%. A relatively rapid increase in Swiss manufacturing costs could further moderate the size of the collusive effect as measured by U.S. prices.

The vitamins defendants proffered three principal arguments to support their position that U.S. prices rose largely because of natural, competitive market forces (Bernheim 2002a: 122-150). The most frequent competitive explanation of ballooning prices in the 1990s was rising prices of raw materials, intermediate materials, transportation, or manufacturing expenses. In some cases the proximate causes of the putative cost increases were claimed to arise from government regulations concerning product quality or environmental standards. Second, the defendants argued that in the 1990s the U.S. dollar generally weakened against the Yen and most European currencies. Third, the vitamin manufacturers proposed that rapid increases in demand resulted in insufficient production capacity.

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[2] Quotations from deposition testimony of Dr. Thomas Wehlage, a BASF representative made on January 10, 2002 (Bernheim 2002a: footnote 139).

Bernheim (2002a: Chapter 9) demolishes these arguments by confronting them with market data and facts contained in the defendants internal records. First, with the possible exception of vitamin B1, variable costs did not vary significantly during the collusive periods for any of the vitamins. Costs were generally flat or slightly declining. More tellingly, variable costs were not relatively low in the years before or after the collusive periods. Second, the defendants' foreign-exchange arguments were not supported.[3] After adjusting for foreign-exchange movements, variable costs expressed in dollars were even closer to being constant before, during, and after collusion than was the case before such adjustments.

Third, there is no relationship between surges in the quantity of vitamins demanded and increases in U.S. vitamin prices. The major increases in consumer demand were the result of publicity about the health benefits of mega doses of vitamins E, C and beta carotene. Annual increases in global consumption of these three vitamins reached 15 to 20% in the early 1990s. While these rates of increase are quite high, similarly high increases in demand had occurred in the mid to late 1980s. Price increases from shifts in demand would only be observed if the demand shifts were unexpected. Moreover, when aggregated over species, changes in the demand for animal-grade vitamins were exceedingly steady throughout the 1980s and 1990s.[4] Nor were there significant shifts in the ratio of human to animal uses of vitamins.

In general, one observes a highly predictable demand environment for bulk vitamins, a situation that lends itself to accurate planning for capacity expansions well in advance of needs. Shortages that drive up prices are unlikely to develop in such markets. In fact, the defendants' own estimates of global capacity utilization tended to decline during the collusive periods for the major vitamins.[5] Therefore, surges in demand were predictable,

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3 Two features of international trade tend to suggest that fluctuations U.S.-dollar exchange rates have little explanatory power. First, it is generally accepted that the pass-through of changes in the prices of imported inputs to changes in domestic prices is generally around 50%. Second, many of the raw materials purchased for foreign production of vitamins were in fact denominated in U.S. dollars.

4 The principal basis for estimating the demand for animal grades was changes in the slaughter rates for meat animals. There are notable production cycles for hogs and cattle, but these cycles were not positively correlated. Some species have experienced alterations in genetic types that could absorb high intensities of vitamins in feed rations, but such alterations were gradual.

5 Capacity is an elusive concept. It depends on engineering estimates of maximum possible output, and assumptions about operating days of production per year, maintenance schedules, substitutability among plants for alternative outputs, and strategic decisions about optimal excess capacity. An interesting comment by a deposed Hoffmann-La Roche expert is: "…[A]ctual output is a fact. Capacity is an opinion." (Bernheim

and changes in capacity constraints do not correlate with price changes in the 1990s.

The U.S. average price increases of the vitamin cartels are summarized in Figure 12.6. The method of calculating the overcharges are predictions from richly specified econometric models that explains monthly variation in prices of 37 vitamin products from 1980 to 2001. The list of proxies for demand and supply shifters is quite extensive and tailored to the specific vitamin product. Except for the two duopolies in carotinoids, the model was fitted to prices prior to the conspiracy period and for the periods one year after the conspiracy periods. Then the estimated parameters for these relatively competitive periods were used to predict the conspiracy-period "benchmark prices," the prices that would that have been observed absent explicitly collusive conduct. The difference between the benchmark price and the actual price is the estimated cartel overcharge for each month.

Price increases in the 1990s averaged 44% and varied from 16 to 80% across the 16 vitamins cartels. Many factors explain the height of the overcharges, duration being one. There is a difference between the six cartels that were under stress and fell apart fairly quickly (about four years) and the ten more durable agreements. Duration does not only result from a failure of fringe producers to mount serious challenges to cartel control but also seems to signal the cohesiveness and discipline among the members of some of the cartels. On the one hand, the six more fragile coalitions achieved mean overcharges of only 27.4% during the plea-periods of the 1990s; for the extended, dual-episode conspiracy period the mean was a similarly below-average 30.3%. On the other hand, the ten long-lasting cartels achieved significantly higher mean overcharges of 43.3% and 51.0% for the plea-period and extended-period, respectively. The greater price effects of the durable cartels are important, because they accounted for 79% of plea-period affected sales.

There were 14 cartels alleged to have had collusive periods in the late 1980s. Except for vitamins E and B6, the overcharge rates in the late 1980s were higher than in the 1990s. Thus, the 16-product average price effect that includes the 14 extended conspiracy periods (roughly mid 1985 to the beginning of1999) was one-tenth higher: 48.2%.

2002a: 145). Roche's own estimates of global capacity utilization for vitamins A, E, and C tended to average 75 to 80% in the 1990s (*ibid.* 148-150).

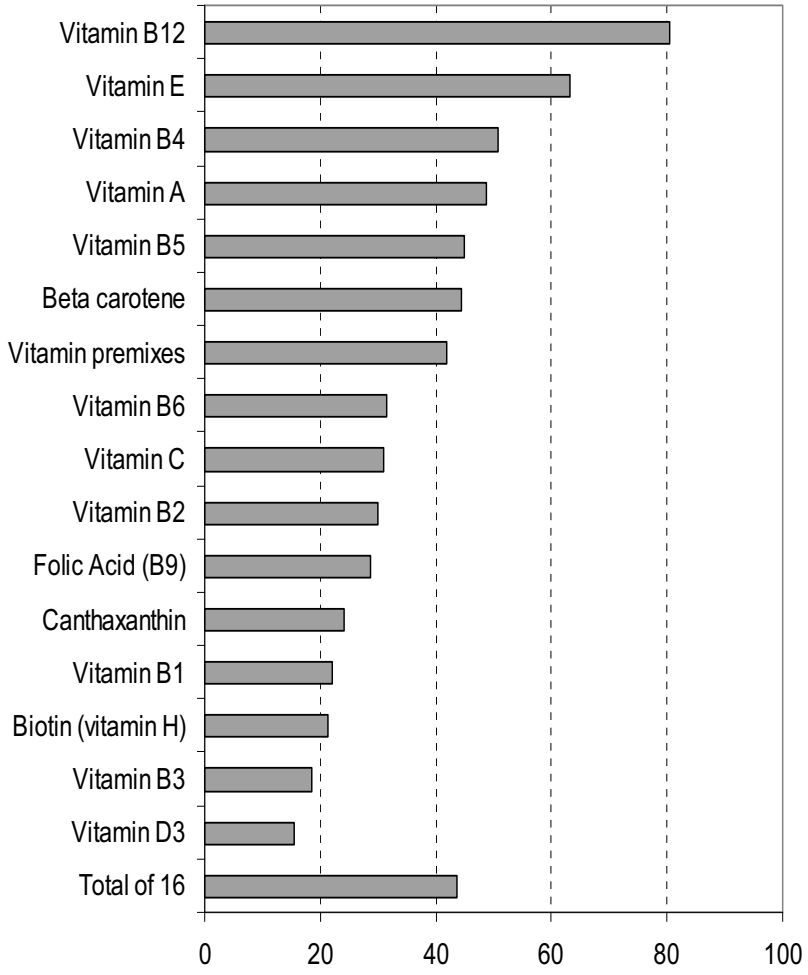

Figure 12.7 Average U.S. Cartel Mark-Ups, 1990-1999

Source: Connor (2006b: Table 12)

The econometric estimates were cross-checked by using two simpler methods that are accepted by U.S. courts (Connor 2006c). One method is called the cost-based or constant-margin approach. To obtain benchmark prices, the analyst assumes that the ratio between price and variable costs during non-conspiracy periods would stay the same during

the cartel period (absent explicit collusion) as they were before and after the conspiracy. Costs are taken from the internal production records of the defendants; if members of a cartel fail to minimize costs, this approach would tend to result in under-estimates. The constant-margin analysis generally produces reasonable price-cost patterns in the post-cartel periods. That is, when costs fall, so do prices, and prices usually stop falling when they approach costs.

In general, the constant-margin approach produces estimates that are quite close to the econometric-model estimates (Connor 2006b: Table 12A). The mean cartel mark-up for the 1990s is 42%, and the mark-ups most of the individual vitamins are within a few percentage points of the econometric results.[6] The constant-margin approach also verifies that the six less durable cartels had mean overcharges that were less than half the overall average.

A second alternative method for calculating overcharges is the simplest. It is called the before-and-after method. A straight line is drawn between the price in the month before the first collusive price increase is announced and the price 12 months after collusion ceases. The vertical differences between the actual market prices and this line are the overcharges. Normally, the before-and-after method is of suspect accuracy because it fails to take account of changes in costs of production and demand shocks. Also, the choice of the end points of the line is a matter of judgment. However, because supply and demand conditions for vitamins were so steady in the 1990s, the results of this before-and-after analysis appear to be quite similar to the econometric estimates for most products (Connor 2006b: Table 12B). The mean price effect in the 1990s is 48% and most individual estimates are within a few percentage points of the econometric computations in Table 12.[7] The mean of the overcharges for the six short-lived cartels is much lower than the all-products average.

The before-and-after method can be applied to price data taken from public sources. Estimates were prepared for 12 bulk vitamins from data on U.S. list prices or import prices (Connor 2001: Table 12.1). List and spot prices are derived from announcements in *Chemical Market Report,* the chemical industry's main source of trade news. International trade

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6 Excluding vitamin D3 and premixes, the simple correlation of the plea-period overcharges is strongly positive (0.93).

7 Bernheim (2002a:250-251) judges that the before-and-after method actually produces superior and more conservative estimates for beta carotene and the other carotenoids because of spurious correlations in the data caused by strong pre-cartel and post-cartel trends in prices. The simple correlation between the econometric and before-and-after estimates of overcharges is positive and large (0.80).

data provide a fairly good proxy for U.S. transaction prices for vitamins B3 and B4. In most cases only pre-cartel but-for prices were available.

Book prices are crude substitutes for transaction prices. Generally, when a cartel is formed transactions prices will tend to rise proportionally to but greater than list prices (Connor 2001). That is, as industry pricing discipline rises during a cartel, the gap between list and actual prices narrows, partly because overt collusion eliminates discounts and rebates. Nevertheless, such surrogates may be the only sources of price data in the immediate period after a cartel is unmasked. Thus, it is of some interest to examine whether preliminary estimates are comparable to more polished numbers that have the benefit of time, detailed analysis, and access to true transaction-price data.

The public-data estimates of average conspiracy-period mark-ups in have a simple mean of about 31%. As expected, the cartel mark-ups calculated from list-price changes are lower than the estimates from transaction-price changes. Also as expected, the price increases calculated from the two data series positively correlated ($r = 0.74$). The pairs of estimates are very close for the seven more durable cartels, but the public-data overcharges are underestimated by about 40% for the five short-lived cartels. What this pattern of list-price changes seems to indicate is the cartelists were overly pessimistic their abilities to raise prices when the collusion proved to be fragile. On the other hand, list price announcements were realistic predictions of actual price effects for the cartels that lasted a decade or so.

What about price effects in Europe? Annual 1988-1999 transaction prices for the EU are shown in the European Commission's vitamins decision (EC 2003). These price series are shorter than those available for the United States, but tend to track U.S. prices closely. Before-and-after estimates were made for price effects for 12 of the bulk vitamins (Connor 2006c: Table 13). Price increases are quite sensitive to the choice of benchmark years. When the benchmark is price before or in the first year of collusion, the cartel mark-ups are generally not dissimilar from comparable U.S. estimates. However, the collapse in vitamin prices after collusion stopped in Europe was more drastic than in the U.S. market. Therefore, benchmarks derived from post-cartel prices result in much larger overcharge estimates than pre-cartel prices, and the estimates rise with the distance from the terminal year.

The last source of information about price effects of the vitamins cartels is empirical studies by academic economists and economic historians. Suslow and Levenstein (2002) cited North American overcharge figures of 20% and 30% in their survey of modern cartels. An econometric model of world trade in bulk vitamins also yielded similar conclusions

about collusive price effects (Clarke and Evenett 2002). What is of special interest about this study is that the authors are able to calculate overcharges for the 19 countries outside the EU and North America with the strictest antitrust laws separately from those countries with weak antitrust enforcement; the former had overcharges averaging 13% while the latter incurred a 33% overcharge. Therefore, it seems likely that monopoly profit rates from collusion in the rest of the world were higher than in the United States, Canada and the EU. Finally, a dynamic simulation model fitted to parameters drawn from the vitamin C industry predicted the U.S. price during fully collusive and non-collusive regimes (de Roos 2001). The main result is that U.S. vitamin C prices were 22% to 26% higher during the cartel period, which is quite remarkable given that this is was one of the weakest and most fragile of the vitamins cartels.[8] This figure is comparable to the overcharge for vitamin C seen in Figure 12.7.

Profits

Price increases of the type just described were bound to increase seller profits to extraordinary levels. What profit rates were prior to collusion is impossible to learn with any precision because the cartel members did not report operating profits separately for their vitamins lines of business. Vitamins were usually part of some broader corporate division called specialty or fine chemicals. Whole-company profits are not particularly useful indicators because they were affected by the high profits normally found in pharmaceutical businesses or the lower profit rates associated with commodity chemicals. Similarly, although during fiscal years 2001-2005 monopoly profits will have disappeared, these years are not useful benchmarks because of the impacts of large fines and civil settlements on profit statements.

Roughly speaking, for the largest publicly listed chemical firms operating profits on vitamins in the 1980s were in the range of 5 to 15% of sales (Connor 2000: Appendix F). Production costs were generally stable before, during and after the cartel periods of the 1990s, and the additional management costs of operating "Vitamins, Inc." were small. It is likely

[8] The study's author is reluctant to apply his model for the purpose of deriving a cartel overcharge. In a personal communication from Dr. de Roos, the method I used to derive an overcharge he describes as "…a comparison of two counterfactuals, i.e., the difference between a world described by my model with collusion, and a world described by my model without collusion."

that in the mid 1990s vitamin profit rates rose two to six times the profit rates in more competitive times.

Customer Overcharges

Profits generated by price fixing are a transfer of income from customers to the stockholders of the companies in the cartel. With no available substitutes, vitamin buyers had no choice but to continue making purchases at the cartel-inflated prices. The amount of this overpayment is called the customer overcharge. The absolute size of the vitamin overcharges can be vitally important information for assessing felony fines in the United States and for judging the adequacy of civil antitrust settlements in the United States and Canada.[9]

Pronouncements by public prosecutors about the economic injuries spawned by the vitamins cartels were vague. On the day the DOJ announced the guilty pleas it had obtained from the three leading price fixers, the head of the DOJ's Antitrust Division was asked how large the U.S. overcharges were. He said that they were "hundreds of millions of dollars." At the sentencing hearing in federal court in Dallas, Texas the same day, the DOJ was required to be more precise when it submitted its sentencing memorandum to the court. The government's indictments specified price fixing on seven vitamin products. With information on Roche's U.S. market shares for the seven products covered in the guilty-plea agreement and the sales of other vitamin products for which guilty pleas were later made, it is possible to infer the DOJ's estimate of Roche's overcharges (Connor 2006b: 105). The total implied is $850 to $1,350 million or 15 to 25% of U.S. affected commerce.

The size of the vitamin overcharges was a major issue during settlement talks between the Big Six defendants and private plaintiffs. In November 1999, these defendants offered to pay members of the federal class

[9] In those vitamin markets where fringe production existed, purchases from nonparticipants can also harm buyers because of umbrella pricing effects. Such sales reached 40% of the market in the last years of a few of the short-lived cartels. Even if fringe firms were aggressively seeking increases in their market shares, their prices were elevated above competitive levels. Under U.S. law such purchases are not compensable harms because the fringe firms were not explicitly parties to the cartel, but as a matter of economic welfare theory these buyers do sustain losses.

$1.17 billion to settle the treble-damages suit brought as a federal class action. In public statements the lead counsel for the class opined that the recovery amounted to about 20% of U.S. purchases of vitamins during the affected periods. He stated that the $1.17 billion "somewhat exceeds" the overcharges paid by direct buyers.

There were differences of opinion between the federal class counsel, who ended up representing mostly smaller claimants, and attorneys for the larger buyers in the class. Counsel for the latter group asserted that the vitamins overcharges by the Big Six defendants were considerably larger: $2.3 billion or 33% of affected sales. Extrapolating the two plaintiffs' estimates to defendants beyond the Big Six and to all 16 products, the total U.S. overcharges amount to $1.6 or $3.1 billion. In sum, the government's and the plaintiffs' estimates fall within the range of 15 to 33% of affected sales.

More detailed calculations of U.S, Canadian, European, and world-wide overcharges are given for the cartels of the 1990s (Connor 2006b: Table 14). For all 16 vitamins products, the global total is about $7.6 billion.[10] The overcharges were allocated geographically roughly in proportion to affected sales. Buyers in North America paid 32% of the global price of price fixing, Europeans 37%, and the rest of the world 31%. Nearly half of the overcharges are accounted for by two products – vitamin E and premixes – and vitamins A and C for another quarter of the total.

Table 12.1 converts the overcharges from nominal currency (in the years the fines were imposed or the settlements paid) to a common year, 2005. Even though inflation was fairly low from 1990 to 2005, this adjustment makes quite a difference. Measured in 2005 dollars, the damages from the vitamins cartels of the 1990s amounts to $15.6 billion – a figure about double the "old dollars" of 1999-2003.

[10] These data exclude the probable vitamins cartels of the late 1980s. Connor (2006b: Table 14A) repeats the overcharge calculations for the 12 shorter cartels that operated in the late 1980s. Total overcharges in nominal U.S. dollars were $2.3 billion. Thirty percent of these damages were imposed on North American consumers and 39% on Western Europeans.

Table 12.1 Real Global Overcharges by the Vitamins Cartels, 1990-1999

Product	United States [a]	Canada [b]	Western Europe [c]	Other [d]	World [f]
			2005 million U.S. dollars		
Beta carotene	138.4	9.92	193.4	82.2	423.9
Canthaxanthin	25.95	1.73	104.4	274.6	406.7
Biotin (H)	30.4	2.19	21.4	45.0	98.9
Choline chloride (B4)	192.0	16.40	159.4	267.6	635.4
Folic acid (B9)	3.16	0.60	8.89	2.1	14.8
Vitamin A	319.9	24.05	417.0	246.0	1007.0
Vitamin B1	11.1	1.58	7.62	14.2	34.5
Vitamin B2	38.2	3.02	55.75	28.1	125.1
Vitamin B3	49.4	2.73	43.14	45.8	141.0
Vitamin B5	67.5	5.09	101.7	29.7	204.1
Vitamin B6	15.8	4.37	25.4	39.8	84.6
Vitamin B12	60.8	1.58	54.3	110.1	226.7
Vitamin C	294.0	20.66	266.7	435.7	1017.2
Vitamin D3	11.2	0.81	9.8	10.8	32.4
Vitamin E	760.7	54.50	795.4	385.6	1996.1
Premixes	713.3	47.39	856.2	813.5	2430.4
Total 16 products	2731.7	196.6	3120.5	2830.2	8879 0

Source: Connor (2006b: Table 14B); includes umbrella effects. To allow for the opportunity cost of capital, adjusted by the U.S. prime rate of interest plus 1% from the midpoint of the conspiracy to the year the cartel was first fined; then from the latter year, the figure is raised to $2005 using the producer price index of the appropriate region.

Table 12.2 summarizes the overcharges for 16 products and four geographic regions relative to a conventional metric – affected commerce. On average, vitamins overcharges were 29% of global affected commerce.

Keep in mind that overcharges are measured at the producers' level. Mark-ups in vitamins sold for human use at *retail* tend to be very high. Thus, there is often a great discrepancy between vitamin sales at the manufacturers' "bulk" level and sales at retail. By the time consumers buy packaged vitamins in their grocery and drug stores; the mark-up on manufacturers' prices is more than 1000%. Put another way, only about 7% of

Table 12.2 Global Overcharges Relative to Affected Commerce, 1990-1999

Product Market	United States	Canada	Europe	Rest of the World	World
			Percent of current U.S. dollars		
Beta carotene	30.7	30.7	30.7	37.1	31.7
Canthaxanthin	19.4	19.4	19.4	23.4	21.9
Biotin (H)	17.5	17.5	14-15	19.2	17.3
Choline chloride (B4)	33.7	33.7	33.7	41.1	36.5
Folic acid (B9)	22.3	22.3	38-39	36.0	33.2
Vitamin A	32.8	32.8	20-22	33.3	28.9
Vitamin B1	18.1	18.1	5-8	15	12.2
Vitamin B2	23.0	23.0	20-22	26	22.9
Vitamin B3	15.6	15.6	15.6	15.8	15.7
Vitamin B5	31.0	31.0	29-31	37.7	31.1
Vitamin B6	24.0	24.0	29-31	32	29.8
Vitamin B12	44.7	44.7	31	46	40.9
Vitamin C	23.6	23.6	17-23	26	30.8
Vitamin D3	13.5	13.5	7-12	14	12.1
Vitamin E	38.7	38.7	31-35	43	36.8
Premixes	29.5	29.5	29.5	28.7	29.2
Total	30.4	30.4	23-24	28.3	28.5

Source: Connor (2006c:Table 15)

the retail purchase price of vitamins by consumers can be attributed to the cost of the raw vitamins, the rest being accounted for by advertising, packaging, assembly, and distribution costs. Assuming that the overcharges on bulk vitamins in the 1990s were passed on 100% to consumers, they were bulk vitamins in the 1990s were passed on 100% to consumers, they were overcharged only about 2% the value of retail purchases.

Chapter 13: U.S. Government Prosecutions

The United States Department of Justice (DOJ) began investigating allegations of price fixing in the market for lysine in late 1992.[1] Tape recordings made by an informant of conversations among the lysine conspirators contained language that suggested that parallel conspiracies were ongoing in the citric acid and corn sweeteners industries. Separately, information about possible price fixing in the markets for bulk vitamins came to the attention of the DOJ. In 1995-1997 four grand juries were formed to consider the evidence held by the DOJ. Three of the four grand juries determined that there was probable cause for indicting certain companies and individuals for criminal violations of the Sherman Antitrust Act. The DOJ negotiated guilty pleas with a large number of companies and key managers of those companies. However, three executives who refused to such a plea bargain were tried and found guilty in a 1998 federal court. In the late 1990s, officials in an unprecedented number of countries piggybacked on the DOJ's indictments and brought charges against many of the same defendants for violations of their competition laws.

The purpose of this chapter is to recount and assess the investigations and prosecutions of three alleged price fixing schemes by the DOJ and its investigative arm, the FBI: lysine, citric acid, and vitamins. The following chapters 14 and 15 will consider enforcement actions overseas and civil suits, respectively, against the same set of defendants.

The Antitrust Division

The Antitrust Division is an agency of the U.S. Department of Justice. The head of the division, the Assistant Attorney General for Antitrust, is nominated by the President, confirmed by the Senate, and reports directly to the Attorney General. The Division is relatively small as federal agencies go, with less than 1000 employees, but it has formidable legal powers to enforce the Sherman and Clayton Acts. It is in effect the sole federal agency

[1] Source citations can be found in Connor (2000).

empowered to bring criminal indictments for alleged antitrust violations.[2] The Antitrust Division has a cadre of experienced career lawyers and economists serving in positions just below the political appointees, aided by a select group of younger attorneys, many of whom spend a number of years with the Division before leaving for positions at private law firms. When a possible criminal violation of the nation's antitrust laws come to its attention, the Federal Bureau of Investigation (FBI) assists the Division by collecting information from witnesses and other sources.

Beginning in the early 1980s, the Antitrust Division experienced deep cuts in the size of its professional staff of lawyers and economists and in the real size of its budget (Preston and Connor 1992). Although none of the formal authority of the Antitrust Division was diminished, the cuts imposed by the Reagan administration were concrete indicators of a desire for less aggressive enforcement of many areas of the federal antitrust laws. By the late 1980s during the Bush administration, the Division's resources had stabilized and the pace of enforcement had quickened somewhat since the early part of the decade. While the DOJ had never departed from its formal commitment to rigorous enforcement of the price fixing laws, relatively few important cartel cases had been launched since the electrical-equipment conspiracy cases of 1960.

In 1992 Anne K. Bingaman was appointed Assistant Attorney General for Antitrust in the new Clinton Administration. Bingaman often said that she wanted to restore respect for the antitrust laws. She was perceived as more populist and activist than her two immediate predecessors and more prone to pursue difficult prosecutions. In retrospect, Bingaman's tenure may be seen as a watershed in antitrust enforcement. As pointed out by Eleanor Fox of New York University's law school, the main shift in priorities in the 1990s was a greater emphasis in global antitrust enforcement (*Washington Post* March 30, 1997: C1).

However, as the DOJ learned to its dismay in 1994, the prosecution of global cartels is fraught with practical difficulties. One of Bingaman's first decisions was to approve the indictment of General Electric and De Beers Consolidated for global price fixing in the market for industrial diamonds. De Beers, a South African company, did not show up for the trial that began in November 1994. Moreover, key witnesses in France and important documents located abroad were beyond the reach of U.S. subpoenas. After the DOJ presented its case the presiding judge dismissed the case.

Another challenge to global cartel prosecutions was some legal uncertainty about conspiracies that took place entirely offshore. U.S. legal

[2] Technically, U.S. Attorneys are also empowered, but they almost always seek the Division's approval to bring criminal antitrust cases.

authorities had always maintained that offshore conspiracies were actionable if they affected U.S. trade and commerce. However, this extraterritoriality theory was placed in doubt in the Japanese thermal fax paper case (Daniel *et al.* 1997). It was only after in March 1997 that this decision was overturned re-affirming the offshore reach of the Sherman Act.

Thus, when the lysine investigation turned up solid evidence of international price fixing, the DOJ may well have had some trepidation about leaping forward into another risky global venture. After the major and humiliating loss of the industrial diamonds case, it would be vitally important to win lysine convictions in order to restore the Division's reputation.

The Biggest Mole Ever Seen

The lysine investigation was the result of serendipity.

More than a year after ADM's Decatur plant had begun manufacturing lysine, the company continued to experience production problems. Large vats in which the dextrose mixture was being fermented became contaminated from time to time. Each time a vat was dumped, ADM incurred unrecoverable costs of millions of dollars. These episodes had been more frequent in the first year of operation but had continued sporadically in the summer of 1992. In late October 1992, Mark Whitacre went to Michael Andreas and told him that he suspected that an ADM employee was sabotaging the fermenters. Moreover, Whitacre further claimed that a Mr. Fujiwara, an employee of Ajinomoto, had telephoned him to inform him that Ajinomoto had placed a mole inside ADM's plant. The mole would continue to sabotage the lysine production process unless $6 to $10 million was wired to Fujiwara's Swiss bank account. In return for the money, the saboteur would stop the mole and provide ADM with Ajinomoto microbes that were resistant to contamination (Eichenwald 1996).

That Michael Andreas readily believed that its arch rival Ajinomoto was capable of such wicked industrial espionage is rather revealing of ADM's perception of business methods in the industry. Andreas acted decisively. After seeking his father's counsel, Michael almost immediately telephoned ADM's representative in Europe, his cousin G. Allen Andreas, and asked the executive to inform a CIA acquaintance in London about the international extortion demand (Eichenwald 2000). Andreas later explained that he believed that if he had the cooperation of the CIA, then ADM would be able to make a payment legally to the extortionist. The CIA informed ADM that counter-espionage is the responsibility of the FBI. In early November, the extortion allegation was turned over to FBI Agent Brian Shepard.

Shepard, 43, had served more than 20 years in the FBI and had been in charge of the three-person FBI office in Decatur, Illinois since 1983 (Tr. 2805-2837). Investigations of sabotage and price fixing allegations would be far from run-of-the-mill activities for the FBI in a small Midwestern town like Decatur. Indeed, Shepard initially had no idea whether price fixing was a federal crime or whether the FBI should get involved (Eichenwald 2000). Eventually, Shepard would be able to rely on a large team of additional agents and attorneys from the DOJ for guidance, but at the beginning some of the investigative techniques were improvised.

On November 4, 1992, at Michael Andreas' suggestion, Shepard and two other FBI agents interviewed Andreas at this home. During the interview, Andreas confirmed that he had indirectly alerted the CIA to the so-called extortion attempt. Andreas had also contacted a lawyer in Europe who knew experts in industrial sabotage (Tr. 2805-2810). At one point during the interview Andreas volunteered that ADM had been meeting with some Japanese lysine manufacturers because ADM was trying to break into the industry.

On the same day, Agent Shepard interviewed Mark Whitacre in the FBI's Decatur office. In a departure from normal procedures, ADM's Director of Security was also allowed to be present. During the interview, Whitacre confirmed his story about the alleged extortion demand, which he said had been made in a telephone call to his Decatur home. Whitacre did not mention his role in the ongoing lysine conspiracy. [3]

Whitacre's motives for concocting the sabotage/extortion tale have been the subject of much speculation. One leading candidate suggests that Whitacre, who was depressed at times and habitually loose with the truth, made up the story in order to draw attention away from his own incompetence. However, his position at ADM was secure. In October 1992 Whitacre was about to get a raise and promotion to corporate vice president at ADM. Whitacre was well regarded by ADM's management. Dwayne Andreas would later say: "We trusted him completely – a good man, a good salesman for us" (Carlson 1996). Moreover, the frequency of contamination incidents had slowed significantly since 1991. Within ADM contamination incidents were generally viewed as regrettable but inevitable in the early stages of production of a new fermentation product.

A second explanation seems more cogent. Whitacre had already begun embezzling funds from ADM, and the extortion payment would fit in well with those plans. He could take the money, claim to pay the extortionist, and pretend to spend the money on new fermentation technology.

[3] In an famous article he wrote for Fortune magazine in 1995, Whitacre alleged that Michael Andreas ordered him not to reveal anything about the lysine conspiracy.

What neither Whitacre nor Andreas counted on was the CIA's decision to alert the FBI.

At about 8:00 p.m. on November 5, 1992, FBI Agent Shepard showed up at Whitacre's large estate. Shepard had come to install a device on Whitacre's telephone that would record the origin of incoming calls, a fancy version of "caller ID." Instead of a quick visit, Whitacre asked to talk to Shepard in his car. Whitacre had by now realized that the device would prove that he had been lying about the espionage and extortion attempt. For the next five hours, Shepard would listen to a series of the most incredible and bizarre tales in his long career. Mark Whitacre was about to become the highest-ranking executive mole in the history of the FBI (Tr. 2813-2817).

Mark Whitacre was only 35 years old when he began confessing to Brian Shepard (Lieber 2000). By all accounts, Whitacre was talkative, engaging, brilliant, hard working, and prone to exaggeration and to gratuitous departures from the truth. After fast-track positions with Ralston Purina and Degussa in the 1980s, ADM hired Whitacre in 1989 to become manager of its fledgling Bioproducts Division, for which ADM was already building a state-of-the-art lysine manufacturing plant. Whitacre's job would be to oversee the plant's startup, work out its initial production bugs, and market the lysine. Large investments – more than $1 billion – would be made by ADM to expand into additional biotechnology products in the early 1990s. By 1995, Whitacre had been named President of the Bioproducts Division and ADM corporate Vice President, would be earning a salary of $320,000 per year, and would be supervising more than 120 employees. Whitacre was a rising star at ADM.

Like many whistle-blowers, Whitacre would turn out to be an unreliable witness. While many of his allegations of unethical behavior at ADM would be corroborated, he also had a tendency to spin tales that were pure fantasy. One of his counterparts at ADM gave credible court testimony about some of these stories. Later, it became obvious that Whitacre relished his FBI role of "secret agent." During 1993 Whitacre revealed several of ADM's trade secrets to an international business consultant who was not employed by ADM; the secrets included lysine production targets, production costs, customer lists, and division earnings reports (Tr. 4360-4375). That consultant sold the information to one of ADM's lysine rivals. Whitacre later claimed that he was a victim of bipolar disease, which might explain some of his bizarre behavior.

November 1992 was a pivotal month in Mark Whitacre's life. On November 1st, he was officially appointed President of ADM's Bioproducts Division. In that same week his boss Michael Andreas was taking action to set up a payment of millions of dollars to an extortionist that would end the sabotage of ADM's lysine production processes. On November 4th,

local FBI agent Brian Shepard and two other agents visited ADM headquarters during the day and Michael Andreas' home that night to begin the extortion investigation (Tr. 715-716). On November 5, 1992, Mark Whitacre was confronted at work by ADM's general counsel and its security chief about inconsistencies in Whitacre's extortion tale. (ADM had installed sophisticated security devices on both of Whitacre's home phone lines, part of a company-wide system thought to be necessary to prevent rival grain-trading companies from gaining illegal access to commercially important information. It is likely that the company had been unable to find any incoming calls from the phantom extortionist.) Faced with this evidence, Whitacre recanted (Tr. 5640-5650). For more than a month afterwards, ADM did not inform the FBI that the suspected extortion was a hoax. Instead, ADM simply ceased cooperating with the FBI's investigation (Lieber 2000). Of course, Michael Andreas knew about Whitacre's flip-flop, yet for three years he did nothing to punish Whitacre.[4] He did nothing because he could not. Whitacre knew too much.

So on the night of November 5, 1992 Whitacre spilled the beans about the lysine conspiracy to FBI Agent Shepard. Whitacre, fearing that his house was bugged by his employer and realizing that no telephone evidence of the extortion story will be forthcoming, went to Shepard's car and unloaded a series of accusations that were scarcely believable to the agent (Tr. 2813-2817). Over the course of the five-hour confession, Whitacre laid out a long list of illegal activities and practices at ADM. Among the allegations that have proven accurate were the lysine cartel, the citric acid cartel, and the attempted theft of a lysine biotechnology by ADM officers. However, many of Whitacre's allegations about illegal or unethical behavior by the Andreas' or other ADM officers have not been corroborated. No indictments were made on Whitacre's more colorful allegations, though in some cases government may have been prevented from doing so because the statute of limitations had been exceeded.[5]

Whitacre's tendency to mix facts with fantasy called into question his motivation for cooperating with the FBI. Creating diversions to cover up his embezzlements seems likely to have been one of his motives. At various times he demanded money from the FBI for his services, at one time demanding 10% of ADM's fines as a bounty (Tr. 3389). Whitacre's unreliability became an issue at his criminal trial in 1988. Several commentators have suggested that Whitacre was naive and out of his depth at

4 In a 1996 interview, Dwayne Andreas confirmed that the company had been aware of Whitacre's embezzlement of ADM for three years (Carlson 1996). Failing to inform the authorities about this federal crime is in itself a crime. Failing to stop it is gross mismanagement.

5 The attempted thefts of technology (bacitracin and lysine) and obstruction of justice by ADM's director of security Mark Cheviron are three examples (Tr. 3383-3388).

ADM, that it was he who was subtly drawn into an existing web of dishonesty at the higher echelons of the company. In the end, Mark Whitacre's motivations remain a mystery wrapped in controversy. In the view of one newspaper columnist who closely followed the case:

> "Mark Whitacre . . . streaked across the business world like a meteor – spectacular and mysterious but ultimately crashing and burning" (*Chicago Tribune* 9/17/98).

Enter the FBI

The FBI wanted proof that ADM was engaging in illegal price fixing with three Asian manufacturers of lysine. To do so eventually a team of more than ten investigators would be assembled to surveil Whitacre. Three nights later Shepard and another agent interviewed Whitacre about the price fixing allegations. For the first time, the FBI got some verifiable facts from Whitacre. He gave them specific dates of four meetings between ADM and its Asian rivals in the lysine market. Moreover, Whitacre handed over copies of expense reports that supported the dates, and he showed the agents the lysine department's profit statements that confirmed the increase in lysine prices and profits in September and October. Finally, Whitacre made a telephone call to a co-conspirator in Tokyo openly discussing their lysine price fixing. Agent Shepard recorded the conversation on tape (Tr. 2834-2835 and 716-718). With this evidence, the FBI must have concluded that there was sufficient probable cause to open an official investigation.

The lysine investigation, later dubbed "Harvest King," did not at first go smoothly.[6] Within days of offering his proof to the FBI, Whitacre too had ceased to cooperate with the FBI, giving a number of patently incredible excuses. For four months after the November 9th interview and taping session, Whitacre became increasingly agitated about his role. On the night of November 16th, Whitacre called Shepard and complained that the FBI was "destroying him" and that he wanted to end his role as an FBI mole (Eichenwald 1996). However, his admissions of illegal behavior gave the FBI considerable leverage over Whitacre. Moreover, by this time the FBI too had begun to doubt that there was an extortionist, so on December 21, 1992 Whitacre was required to take a polygraph test. Whitacre failed the test miserably. He admitted that day that the whole extortion story was

[6] Identifying cases with obscure titles is standard practice in law enforcement so as to avoid revealing a secret investigation to other parties. Was Harvest King a sly reference to Dwayne Andreas?

a hoax intended to explain away the start-up contamination episodes (Tr. 2864-2866).

Despite Whitacre's unsteadiness, the FBI had Whitacre sign a contract in January 1993 to serve as a "cooperating witness" in the lysine investigation. Signing that agreement would prove to be a major blunder for Whitacre, who naively did not hire a personal attorney. Although the agreement granted him conditional immunity from prosecution, Whitacre was immunized only from November 5th onwards. Because the FBI knew of illegal meetings prior to that date, the FBI had a powerful tool to force Whitacre's continuing cooperation. In January 1995 Whitacre had hidden from the FBI a January 1993 conspiracy meeting with two Japanese lysine makers, but the FBI found out about it. As a result, Whitacre agreed once again to begin taping conspiracy-related events beginning in March 1993.

Mark Whitacre turned in to the FBI more than 100 audio tapes that he personally recorded from March 1993 to mid-1995. Many of these were telephone conversations with Japanese, Korean, or French co-conspirators. Others were made at formal price fixing meetings around the world or at informal meetings of fellow ADM employees. In addition, where local laws allowed it, four formal meetings of the lysine cartel were videotaped in hotels by FBI agents in adjacent quarters. All these recordings would become the "smoking gun" evidence that secured guilty pleas and convictions of the lysine conspirators, both corporate and individual.

By the end of 1993, the FBI judged that there was sufficient evidence to prosecute ADM, its officers, and others for fixing the price of lysine. However, Whitacre's taping continued for more than a year longer because from time to time there were statements about price fixing in other markets, notably citric acid and corn sweeteners.

Besides Whitacre's propensity for manufacturing stories, his embezzlement of ADM funds made him highly unsuitable as a witness for prosecutors. Most of the embezzlement occurred by means of cash kickbacks from vendors to ADM's Bioproducts Division. In some cases, Whitacre forged the signature of ADM's president. It is surprising that a company with such a good reputation for management quality would have such loose accounting controls. Whitacre's embezzlement of ADM began in April 1991. To facilitate the theft, he opened two bank accounts on the Cayman Islands in August 1991 and a Swiss account in January 1993 (Tr. 4872). The schemes involved phony invoices for new fermentation technologies for the Bioproducts Division or kickbacks from vendors for legitimate services. All told, Whitacre stole almost $10 million, with some help from three salesmen in the Bioproducts Division working in Mexico,

Germany, and Atlanta.[7] Because Whitacre lost his federal immunity, he was made a defendant together with Michael Andreas and Terrance Wilson in a 1998 criminal trial in Chicago. This was a stroke of luck for prosecutors because Whitacre could not be compelled to testify for the prosecutors and prosecutors had realized for some time that he would be unconvincing on the stand.

Whitacre, the government's star whistle-blower was convicted and sentenced to 30 months in prison for lysine price fixing. Federal whistle blowers beware: only those willing to keep their whistles clean need apply.

Grand Juries

Criminal federal trials are heard by "petit juries" of twelve or fewer citizens in open court. However, grand juries, so-called because they have up to 23 citizens, operate under different rules. Although loosely supervised by judges, they are formed by federal prosecutors to assist in bringing indictments (see Chapter 3). The lysine grand jury was established in Chicago about June 1995, just a few weeks before the FBI raided the headquarters of the lysine sellers and companies selling citric acid and corn sweeteners. The government's lysine investigation was initially headed by James M. Griffin, chief of the DOJ's Chicago. It appears that the lysine investigation and subsequent trial was closely supervised by the Assistant and Deputy Assistant Attorneys General of the DOJ. Not only was special care being taken to ensure aggressive prosecution, but the arrangements signaled the political sensitivity of prosecuting Dwayne Andreas' company.

The lysine grand jury in Chicago never had to vote to indict the five companies in the cartel because prosecutors arrived at a negotiated settlement. However, four individuals failed to arrive at such a settlement. On December 3, 1996, the jury handed down criminal indictments for price fixing against four men: Michael Andreas, Terrance Wilson, Mark Whitacre, and Kazutoshi Yamada.

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[7] The FBI first became aware of the fraud by Whitacre in August 1995, the same month Whitacre was fired by ADM (Tr. 721). On October 10, 1997 Whitacre pleaded guilty to fraud, embezzlement, and tax evasion. In 1998 Mark Whitacre was sentenced to nine years in federal prison and required to pay $11.4 million in restitution. At his sentencing the judge excoriated Whitacre for his "socio-pathic behavior" and opined that he was motivated by "garden-variety venality and greed."

The FBI Raids

Shortly after the lysine grand jury was formed, the FBI was granted search warrants by an Illinois magistrate to search parts of the offices of many agribusiness companies that made or sold lysine, citric acid, or corn sweeteners. Subpoenas were also issued to be served to knowledgeable individuals to compel them to testify about possible price fixing in the three markets.

The multiple raids were carefully planned well in advance of the chosen night. Mark Whitacre had snooped around to find a night when all the principal targets would not be traveling on business (Eichenwald 2000). On the night of June 27, 1995, in a massive show of force some 70 FBI agents arrived at ADM's corporate headquarters in Decatur and began removing evidence in the offices of Michael Andreas, Terrance Wilson, Mark Whitacre, and several of their lieutenants. Other agents went to the homes of most of the ADM officers who had anything to do with the three products, served the subpoenas, and began interviewing the executives on the spot. Local residents of Decatur took to referring to the episode as "Gestapo Night."

From the audio and video tapes in the hands of the FBI, Michael Andreas and Terrence Wilson had already been identified as the chief perpetrators of ADM's price fixing activities, so they received special treatment that night. For Andreas at his home that evening and Wilson at his country club, the FBI played excerpts of incriminating taped conversations. Andreas listened calmly to the recordings but responded that they didn't prove anything. The FBI offered Andreas a chance to reduce his sentence by cooperating, but that offer was summarily rejected.

The ADM executives that were interviewed that night remained tight-lipped, yielding no useful information for the prosecution. However, the files in ADM's headquarters did yield documents that contained useful information. Besides travel and telephone records that would confirm attendance at conspiracy meetings, ADM's files contain the conspirator's "score sheets" kept by the lysine and citric acid associations. The score sheets display monthly sales data, both "budgeted" (i.e., goals of the conspirators) and actual, for each of the members of the cartel. These score sheets were the primary decision-making aid for the conspirators at their quarterly meetings. They provided confirmation that the cartels attempted to monitor their volume agreements and gathered the information necessary to implement year-end compensation schemes. Sharing information in this way may in itself constitute a crime, but shared for the purpose of detecting cheating makes it clearly a violation.

FBI raids continued that night and over the following days. The U.S. offices of at least nine other multinational agribusiness companies were affected. Many cartons of documents were removed, duplicated,

stamped, catalogued, and copies returned to the companies. Most of the participants in the lysine meetings other than ADM took copious notes at the meetings and prepared memoranda that were circulated to their supervisors. These minutes were highly damaging to the defendants, and might have proved sufficient to convict the price fixers even without the taped evidence. In the lysine criminal trial alone, the DOJ turned over more than two million documents to defense counsel prior to the start of the trial.

As the FBI raids became known a great deal of unfavorable publicity was generated for ADM and the other companies. On June 29th and following days, virtually all major newspapers and news organizations reported the news. Within a month leaks from the investigation suggested that suspicious documents had been obtained by the FBI that supported the existence of a lysine cartel. For ADM, the most prominent of the firms under suspicion, the immediate financial impact was enormous. From the day of the raid until October 1995 as the unfavorable speculation mounted, its stock market price fell by 24%, or by a market value of $1.4 billion.

The response of ADM and most of the affected companies to the searches was similar. They remained silent or issued brief press releases denying guilt and immediately hired lots of legal help. ADM's press release was two sentences long. Several law firms were hired for the company's management and for individual executives. Later, even the boards of directors hired separate legal representation. By September, more than 20 civil suits had been filed against ADM seeking compensation for buyers of lysine, citric acid, and corn sweeteners.

In the weeks after the raid, only one company failed to follow the standard scenario. Sewon America issued a statement saying that it had been coerced by its much larger Japanese rivals in the lysine business. This was the first tiny crack in the dam of solidarity that had been erected by the five lysine conspirators.

Lysine Guilty Pleas

After the FBI searched the offices of ADM and three other lysine sellers in June 1995, prosecutors from the U.S. District Attorney's office and the DOJ's Antitrust Division office presented the evidence obtained to the lysine grand jury in Chicago. While the evidence from the tapes was strong and the conspiracy documents provided useful corroboration, for well over a year the prosecutors had grave difficulties assembling sufficient evidence to bring *criminal* price fixing indictments against the five companies and key executives who operated the cartel. Criminal price fixing charges require that the prosecution prove "beyond a reasonable doubt" that the defendants knowingly and intentionally conspired to fix or control prices.

Whitacre's fraud made conviction difficult for the prosecutors. Without Whitacre's availability to testify, the government's case was hurt in two ways. First, the tapes he made, while graphic and convincing, would be regarded as potentially tainted. Whitacre had an opportunity to turn in tapes that would be damaging to the conspirators, but could have withheld tapes that might exonerate them (Daniel *et al*. 1997). Second, the government absolutely needed at least one credible participant who was prepared to testify that they knew that the purpose of their meetings and agreements was illegal market manipulation. Otherwise, defendants could claim that even the video tapes showed play-acting, management training, or some such innocent activity. For more than a year, no participant came forth to corroborate the intent of the meetings, phone calls, and documents. At ADM at most four or five men had detailed knowledge about the lysine conspiracy. Dozens of executives knew at the other four companies, but nearly all of them resided outside the United States, giving them personally a measure of immunity from U.S. prosecutors.

Plea bargaining between prosecutors and the lawyers representing the lysine makers began soon after the FBI raid. Negotiations were made difficult by the fact that the companies' counsel knew that the government's chief witness was a fallen star. Cooperation among the target companies' law firms during the first nine or ten months of this phase meant that they knew that none of their executives had agreed to cooperate with prosecutors. ADM hired one of the best known Washington law firms, Williams & Connelly, to defend itself in the lysine antitrust case and help coordinate a public relations lobbying effort that would restore some of ADM's former reputation. ADM spent lavishly on its legal defense; its filings with the Securities and Exchanges Commission (SEC) admit to legal costs of at least $40 million for the first year alone.

Negotiating a guilty plea agreement is a tricky business. The guilty party must admit to one or more specific acts that violated the antitrust laws and the dates of the violations. It must also promise to pay a fine and offer evidence against other guilty companies or individuals. Although the prosecution must follow the U.S. Sentencing Guidelines in arriving at the size of the fine, the DOJ has an important source of negotiating leverage: it may request a "downward departure" from the Guidelines fine range if the firm agrees to cooperate. It may also offer immunity from prosecution for cooperating witnesses, extend immunity to other indictable employees, reduce the number of counts in the indictment, or agree to phrase the dates of the conspiracy in a plea agreement in ways that are favorable to the guilty parties. The latter concession would reduce a company's exposure to what can be sought as settlements by civil plaintiffs. A time-honored practice of prosecutors is to try to identify and focus on the parties to a conspiracy that are most likely to cooperate and break ranks with the other conspirators. In

the lysine case, the company least able to withstand the financial consequences of a large fine was debt-burdened Sewon.

Behind the scenes, about three weeks after the FBI raid, the ADM board of directors formed a special committee to advise the management on the criminal and legal suits arising from the price fixing allegations. The board also hired a law firm to advise it, a firm different from the one advising ADM's management. M. Brian Mulroney, former prime minister of Canada, was chair of the antitrust committee and became chief negotiator of the ADM board with the prosecutors (Nicol and Ferguson 1999). ADM's special committee was permitted to hear some of the tape recordings made by Mark Whitacre that the DOJ considered to be incriminating. It is likely that some of its members became convinced that it was in ADM's interest to settle as early as possible with the government and private parties, but these directors faced one powerful obstacle. The chairman, Dwayne Andreas, took the position that the now undeniable meetings with lysine competitors were innocent affairs intended to collect information from their rivals about the lysine market. Moreover, Michael Andreas and Wilson were simply attempting to break the grip of a pre-existing Asian cartel in the global lysine industry.

It was in the Andreas family's interest that ADM delay settling and stonewall the government's investigation. No ADM employee was willing to cooperate with prosecutors until at least September 1996, some 14 months after the FBI raid. Perhaps in anxious to induce such cooperation, the DOJ made a very unusual move in March 1996. It announced that Dwayne Andreas was not the target of its price fixing investigations. If this was intended to shake loose an ADM employee, it did not work. However, the announcement may have emboldened the ADM board to press harder for a deal.

Meanwhile, prosecutors continued to apply pressure elsewhere in the wall of silence surrounding the lysine cartel. Cracks in its solidarity began to appear fairly early. In July 1995, an unidentified source inside Kyowa Hakko told a reporter at the *Wall Street Journal* that it viewed itself as a "minor player" in setting lysine prices; moreover, Kyowa blamed its bigger rival Ajinomoto for coercing it into colluding. Sewon too considered itself pressured into joining the cartel by its bigger Asian coconspirator. As the largest of the five companies, Ajinomoto knew that unless it confessed early, it potentially faced the largest criminal fines.

Ajinomoto, Kyowa, and Sewon caved in to prosecutors' demands for guilty pleas by July 1996. According to one source, the first manager to agree to cooperate with the government was Kyowa's long-time lysine sales director (Lieber 2000). Eichenwald (2000) gives a greater role to Sewon in cracking the case. As early as December 1995, Sewon began plea negotiations by offering the testimony of its chief conspirator as well as a

large number of documents about the 1986-1990 price fixing conspiracy as well as the 1992-1995 cartel. Ajinomoto offered its two lysine sales managers, but refused to compel its top official involved to testify.

The incentive offered by the DOJ for corporate cooperation was a generous offer to apply only the statutory maximum fine of $10 million for the two Japanese companies and only $1.25 million for Sewon. Moreover, except for two Ajinomoto officers, only one officer from each of the other two companies would be required to plead guilty and pay modest fines; all of the scores of other employees who assisted in the lysine conspiracy were to be immunized. Except for Kazutoshi Yamada, who may have left Ajinomoto by this time, no employees would face time in prison.

The reductions offered by the DOJ in monetary damages were indeed a bargain. Under U.S. Sentencing Guidelines, Ajinomoto, Kyowa Hakko, and Sewon could each have been required to pay up to $160 million in fines under the alternative sentencing statute. Instead, the DOJ offered Ajinomoto and Kyowa statutory fines of $10 million each or 6% of their maximum liabilities. Sewon got a 99% discount, which suggests that it was probably the first to offer cooperation in the case.

Although agreed upon in principle through proffer letters in early July, the DOJ held off making the guilty pleas public until August 1996. Before that happened, the good faith of the three companies was tested. On July 17, 1996 the recently retired general manager of Ajinomoto's Feed Division and his successor were interviewed in Hong Kong about their roles in the lysine conspiracy by the FBI (Tr. 1759-1765). Kyowa's chief cartel manager was interviewed at the same time. Sewon's representative was deposed in New York City in August. Their memories were sufficiently clear and consistent that the DOJ believed they would make good prosecution witnesses in any possible trial. With several potential witnesses now available to corroborate the intentions of the conspirators and interpret the taped evidence, prosecutors were able to pressure ADM itself. In August, they leaked the fact that the DOJ would seek a $400 million fine from ADM.

The guilty pleas of the three Asian firms were formally announced and presented in federal court in Chicago on August 27, 1996. Ajinomoto, Kyowa Hakko, and Sewon America and one officer from each company admitted their companies' guilt to one count of criminal price fixing in the U.S. market for lysine. The officers testified that their companies did not contest the facts mentioned in the plea agreements and they agreed to pay fines and cooperate with prosecutors in their investigation of the remaining cartel members, ADM and Cheil. Subject to court approval, the three voluntarily yielded their rights to jury trials.

The guilty pleas of the Asian firms must have been a shocking setback for ADM. It was now in a completely untenable legal position.

Should it refuse to plead guilty also, the government had overwhelming evidence of the conspiracy and a dozen participants in the cartel willing and able to testify as to intent. Worse, as the last holdout, ADM had no additional information about the lysine cartel to offer to the prosecutors.

Not surprisingly, ADM furiously negotiated a guilty plea agreement over the next couple of weeks with DOJ official Gary Spratling (Eichenwald 2000: 508-511). By September 10th, the government was demanding a $125-million fine and no immunity for four ADM officers: Dwayne Andreas, Michael Andreas, Terrance Wilson, and James Randall. A week later, ADM countered-offered a $35-million fine for ADM and indictments for only two officers. On September 17th the government traded indicting Dwayne Andreas and James Randall for an additional $65-million on the fine. The ADM board agreed to the $100-million fine as the price of avoiding a court trial for the company and its two most senior officers. While such prosecutorial horse-trading may not be pretty, it is probably necessary in order to conserve judicial resources.

By late September, all ADM employees except Michael Andreas and Terrance Wilson were presenting prosecutors with details of the lysine and citric acid conspiracies that satisfied prosecutors as to ADM's good faith. Prosecutors were especially pleased with Barrie Cox's deposition on October 12th, which was full of rich details about the citric acid cartel (Lieber 2000). Thus, on October 15, 1996, news of ADM's guilty plea covering lysine and citric acid were announced in three venues: Washington, D.C.; Chicago, IL; and Decatur, IL. In Washington, a press conference was held attended by Attorney General Janet Reno, her deputy Joel Klein, and a large number of DOJ officials involved in the case. These officials emphasized the precedent-shattering fine of $100 million placed on ADM. Reno said that the fine should "send a message worldwide" about the "tough, tough penalties" now likely for criminal price fixing. Klein called ADM's behavior "shameful" and motivated by "simple greed." Questions from the press that suggested the ADM had got off lightly were rejected.

ADM paid a fine of $70 million for its lysine infractions and $30 million for citric acid. The $70 million was only the second to exceed the statutory $10 million fine under the Sherman Act. The citric acid fine for ADM could have been $112 to $224 million had ADM not received a 73 to 86% discount for its cooperation on the case (Lieber 2000:37). For its cooperation in the citric acid investigation, ADM received a number of important concessions, not all of which were revealed in 1996. Both ADM's public-relations effort and the DOJ's press conference tended to gloss over these substantial concessions to ADM. First, the deal granted immunity from prosecution of all ADM employees for price fixing except Michael Andreas and Terrance Wilson. Although most ADM officers were required to be interviewed or to testify, an exception was made for the

company's top two officers. Second, the government agreed to drop a federal grand jury investigation in Springfield, Illinois that was charged with an investigation of allegations of theft of technology and trade secrets by ADM. Third, in a deal proposed by ADM's Washington law firm and worked out between the DOJ's Joel Klein and the Secretary of Agriculture but not revealed until years later, ADM would be allowed to continue signing sales contracts with USDA. Previously, companies guilty of felony violations had been disbarred for a number of years from government sales. Suspicions remain that the DOJ also agreed to quash the investigation by the fraud division into the many allegations made about ADM by Mark Whitacre (Lieber 2000). Finally, and potentially the most valuable concession, the government agreed to drop its investigation of price fixing in the corn sweeteners market. ADM was not granted immunity from prosecution because it was innocent of the charges, but because the DOJ judged that successful prosecution would be a challenging one with an uncertain outcome. The huge size of the market implied that even modest overcharge percentages would generate a huge liability for ADM.

Virtually simultaneously with the D.C. press conference, ADM's guilty plea agreement was being presented to Judge Ruben Castillo in U.S. District Court in Chicago. At that hearing prosecutors presented the terms of the agreement and outlined the evidence that supported the price fixing conspiracy. ADM's controller and a corporate officer, testified that the company accepted the terms of the agreement, waived its right to a jury trial, and did not dispute the facts about the conspiracy that were presented by the government. Mills pleaded guilty for the company, and Castillo accepted the plea. In his closing comments, Judge Castillo addressed the issue of deterrence of recidivism:

> "I'm hopeful that this black day will be overcome by the new behavior of the Archer Daniel Midland Co. . . Some will say that this fine is not high enough . . . [but] if a hundred million dollars doesn't send that message, I don't think there is a number on God's earth that I can set that would send that message."

At the hearing, a DOJ prosecutor had been interrogated by Castillo concerning the appropriateness of ADM's fines, $70 million for the lysine and $30 million for the citric acid conspiracies. Since they both exceeded the $10-million statutory cap, the prosecutor explained that ADM was one of the first price fixer that would be forced to pay a fine based on the "double the harm" sentencing rule. That is, the DOJ asserted that it was prepared to prove to the court that the cartels' U.S. overcharges exceeded $35 million in lysine and $15 million in citric acid. In fact, the

two overcharges were about $80 million and $200 million (Chapters 6 and 9). Thus, ADM's actual fine was less than 20% of the fine possible under the "two-times rule."

The corporate U.S. lysine fines totaled $83 million for a conspiracy that cost American customers $80 million. The three larger Asian companies received the largest discounts because they were the first to cooperate with the government. ADM's fine, while a record for the time, was also highly discounted even though ADM could not give the government with any information that the government did not already know. Instead, ADM was rewarded for offering valuable information about the citric acid cartel. Of the 40 *named* conspirators who worked at the five companies, three paid only modest fines, and after a lengthy criminal trial three were handed down prison sentences. The corporations and individuals paid less than 10% of the maximum fines that could have been requested from the courts.

The Citric Acid Prosecutions

The Investigation Phase

The FBI first learned about price fixing of citric acid on December 10, 1992 from ADM's Mark Whitacre. ADM's involvement was confirmed by a tape recording of a conversation with ADM manager Brasser made by Whitacre on December 21, 1992. On that tape Brasser said that Terrance Wilson told him not to worry about going to jail for price fixing in citric acid (Tr. 2868-2873). Soon afterwards, Brasser was fired because he refused to become involved in the conspiracy. Other sound recordings contained references about how well the citric acid cartel was organized. Wilson frequently extolled its ability to agree on volume allocations and monitor the agreement through the citric acid trade association ECAMA. While the June 1995 FBI raids turned up some incriminating evidence of monthly production targets and sales figures, without a witness to corroborate the purposes of the meetings and documents, such evidence remained circumstantial.

A grand jury was empanelled around June 1995 in San Francisco to investigate allegations of price fixing in the global market for citric acid. The grand jury worked with prosecutors from the local field office of the DOJ's Antitrust Division and the U.S. Attorney for the Northern District of California. Based on tape recordings of the lysine conspirators that contained fairly clear references to an ongoing conspiracy in citric acid, and

on the deposition of ADM's chief sales manager in citric acid, the grand jury issued subpoenas and obtained search warrants directed at five firms: ADM, Cargill, Haarmann & Reimer (a subsidiary of Bayer), the Austrian firm Jungbunzlauer, and the Swiss firm Hoffmann-La Roche.

The government's big break came on October 12-13, 1996. Behind the scenes, ADM and the DOJ had made a deal on a plea bargain that covered both lysine and citric acid. Solid evidence on the citric acid cartel was ADM's most valuable bargaining chip. ADM was the first member of the citric acid cartel to offer to cooperate with the DOJ. Within ADM the citric acid conspiracy had been managed by Terrance Wilson and his head of citric acid marketing, Barrie Cox. Wilson would not cooperate, but on October 12th Barrie Cox began to tell all to prosecutors in San Francisco.[8] Cox presumably had ADM's blessing at this point because without his full cooperation, ADM could be indicted for price fixing in corn sweeteners and Dwayne Andreas might be held accountable as well. As part of the ADM plea agreement, Cox would be immunized from prosecution for price fixing so long as he told the truth. Later, Cox would become in many ways the government's star witness in the criminal antitrust trial against Terrance Wilson.

Guilty Pleas

Cox divulged all the details of the conspiracy by the "G-4." The DOJ later said publicly that Cox "did cooperate and it is substantial." A couple of days later, ADM paid a $30 million fine for its role in price fixing in the market for citric acid, an amount that reflected a hefty discount for its cooperation with prosecutors. At the October 15, 1996 hearing in federal court in Chicago, prosecutors explained to Judge Castillo the amount of U.S. commerce in citric acid affected by the cartel from June 1992 to June 1995 was $350 million. The "base fine" under the U.S. Sentencing Guidelines was therefore $70 million. ADM's "culpability score" implied a fine range of $112 to $224 million. However, the government requested that the judge grant a downward departure because of "substantial cooperation." Thus, the $30 million fine represents a 73 to 87% discount from the

[8] Barrie Cox flew from England to be interviewed on April 5, 1996. Cox had been transferred to ADM's office in England by Michael Andreas. He was given a raise and told he would be given expanded duties, but these expanded responsibilities never materialized (Tr. 2652-2654). Some observers speculated that Cox's transfer might have been arranged to take him out of reach of U.S. subpoenas. Cox also told the FBI about some inexplicable payments he had seen concerning technology to produce monosodium gluconate (MSG), but the DOJ failed to prosecute (Lieber 2000: 316-317).

fine normally indicated by the Sentencing Guidelines.[9] No ADM officers were fined or imprisoned for their role in citric acid.

On January 29, 1997 the second and third conspirators entered a guilty plea in federal court in San Francisco. The defendants were Haarmann & Reimer Corp. and Hans Hartmann its president. The company paid a fine of $50 million, at the time the second largest in antitrust history. At its press conference, DOJ officials called the conspiracy "one of the largest, if not the largest, conspiracies ever prosecuted by the Department of Justice." They also asserted that Bayer's fine would have been larger had it not agreed to cooperate in prosecuting the remaining conspirators, but they declined to specify the actual overcharges. Private antitrust lawyers called the new higher fine structures "a staggering development for business." Haarmann & Reimer's fine, based on double the overcharge, represented an 87% discount. Hans Hartmann and Terrance Wilson were clearly regarded by prosecutors as the ringleaders of the cartel. Under the Sentencing Guidelines, Hartmann's offense implied a prison sentence of 24 to 30 months. Instead, because of his cooperation in providing information on the remaining members of the G-4, Hartmann received no prison sentence and a downward departure on his fine to $150,000.

Two months later, the remaining two members of the G-4 signed and submitted guilty pleas for price fixing. Hoffmann-La Roche and Jungbunzlauer agreed to pay $14 and $11 million respectively. Udo Haas, former managing director of the Belgian subsidiary of Roche that manufactured citric acid, agreed to pay a $150,000 fine, as did Rainer Bilchbauer, Chairman and President of Jungbunzlauer. Neither served time in prison.

One of the more curious aspects of the pleas was the time period in the agreements. The conspiracy was stated to have begun "as early as January 1993." Why the DOJ chose such a patently late date is unknown. As mentioned above in Chapter 4, the conspirators met and agreed to set prices in March 1991. Moreover, the Statement of Facts given to Canada's Court by the Attorney General (and co-signed by the defendants) gives July 1991 as the beginning date for the citric acid conspiracy. By suggesting that ADM's illegal activity might have begun almost two years later, prosecutors severely disadvantaged private plaintiffs who were in the midst of negotiations with the citric acid defendants in October 1996. A longer conspiracy period would have served deterrence by significantly increasing the damages claimed by plaintiffs.

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9 However, if the DOJ had based it fine on the cartel's overcharge on U.S. buyers of citric acid, then prosecutors could have requested even a larger fine based on double the over charge, which topped $400 million. Thus, this method implies that ADM's actual fine was 92% of its maximum liability.

Prosecution of the Vitamins Cartels

For government trust-busters, the vitamins conspiracies of the 1990s were the greatest catch in antitrust history. All previous international cartels pale in comparison to the vitamins case in scope, size, complexity, longevity, or nearly any other conceivable measuring stick. Twenty-one chemical manufacturers fixed the prices of 16 vitamin products in nearly every country of the world for up to 16 years. The cartels' global sales during the conspiracies amounted to grand total of $34 billion. Illicit profits made by the cartels totaled $10 billion. Fifteen corporations and 15 individuals would be judged guilty of price-fixing felonies in U.S. courts.

U.S. prosecutors did not punish the defendants for up to 14 cartelized vitamins in the late 1980s. No mention is made in U.S., Canadian, or EU documents that the earlier conspiracies may have existed. The case for price fixing rests with allegations made by plaintiffs in the U.S. treble-damages suits and some fairly compelling, if circumstantial price data (Bernheim 2002a, Kovacic *et al*. 2006). The absence of indictments for conspiracies in the late 1980s is not proof of innocence because it may simply be explained by the inherent difficulties of obtaining old business records, the unreliability of the memories of witnesses, or the absence of other evidence that can withstand the rigors of a judicial review.

Worldwide prosecutions of the cartels of the 1990s began in the United States in 1997. It was a nine-year odyssey.

In broad outline, an FBI investigation in 1997 that failed to turn up sufficient evidence of cartel activity was suspended. However, evidence provided by buyers of suspicious parallel behavior caused a private damages suit to be filed a year later, and the DOJ's interest was piqued once again. A formal grand jury investigation began in early 1998. In mid 1998, a U.S.-based member of the vitamin B4 cartel was granted U.S. amnesty; at the same time the European leader of the vitamin B3 cartel offered to plead guilty and cooperate with DOJ investigators. The *coup de grace* for the vitamins cartels came in early 1999 when a second European company was awarded amnesty. Canadian prosecutions soon followed, with the Canadian Competition Bureau (CCB) expanding the charges into new vitamin markets. In late 2001, the European Commission issued the first and most sweeping of three vitamins decisions that imposed record fines on ten manufacturers. Meanwhile, in the United States and Canada, private damages suits came to an end around 2004 mainly through negotiated settlements. Appeals Courts issued decisions on vitamin-cartel matters as late as March 2006.

The Investigation Phase

The U.S. DOJ had been busy prosecuting the lysine and citric acid cases throughout 1996 and early 1997. These investigations were centered in the DOJ's Chicago and San Francisco offices, respectively. In late 1996 the FBI had received information about a possible price fixing conspiracy in the vitamins industry (Hammond 2001). Initial suspicions focused on the vitamins B3 and B4 markets. In March of 1997, FBI agents working with the DOJ's branch office in Dallas, Texas interviewed Dr. Kuno Sommer in the United States about the matter Barboza (1999). Sommer was the global head of vitamins marketing for Hoffmann-La Roche, the world's leading manufacturer of vitamins. Sommer also served on Roche's small management committee that formed the pinnacle of the company's management structure. If anyone should have known about vitamins price fixing within Roche, it was Sommer.

Sommer denied that Roche was involved in any such illegal activity. He was interviewed under the March 1997 citric acid guilty-plea agreement in which Roche had promised full cooperation from its employees in any antitrust investigation, so Sommer's denial would have serious legal consequences if he did not answer truthfully. Not only is it a federal felony for the person being interviewed, but also misleading the FBI could cause the Department of Justice to revoke concessions given to Roche itself in the citric acid case. In particular, the DOJ had given Roche a large reduction in its fine, and it had immunized Roche officers from being personally indicted for their roles in the conspiracy. Later it came to light that Sommer had prearranged with others at Roche to lie about the cartel's existence. However, because Roche was the only vitamin co-conspirator with a cooperation pledge in 1997, Sommer's denials must have slowed the FBI's investigation considerably.

In November 1997, the DOJ investigation picked up speed again. Press reports revealed that numerous executives responsible for procuring vitamins for animal-feeds manufacturers were being interviewed about possible price fixing activities in the industry. Moreover, word leaked out that a grand jury had been opened in Dallas, Texas to assist the DOJ in its vitamins investigation. This grand jury would toil away in secret for another 14 months before the first fruits of the investigation would become public. Initial suspicions were focused on the vitamins B3 and B4 industries, but leads began to develop about the larger vitamins A, E, and C markets (Hammond 2001:6-7).

In December 1997, a civil antitrust suit was filed against a large number of vitamins manufacturers alleging a vast price-fixing conspiracy against U.S. buyers of bulk vitamins (Donovan 2005:188-194). The suit was filed by the class-action Birmingham, Alabama law firm of Bainbridge & Strauss following publication in November of an article in *The Wall Street Journal* about a grand-jury investigation of vitamins price fixing. In statements to the press couple of years later, the firm would take a great deal of credit for initiating the convictions of the mighty vitamins defendants. While the firm probably shared what information it had about the vitamins cartels, the Dallas DOJ office seems to deserve most of the credit.

By mid-summer 1998, strong and persistent rumors had begun circulating among Washington antitrust lawyers that indictments were likely for price fixing in a broad array of vitamins; Roche and BASF were mentioned as targets of the vitamin probe. In March 1998, it would become known that the Dallas grand jury had made considerable progress in two product markets, vitamins B3 (niacin) and B4 (choline chloride), both of which have their main applications in animal nutrition.

Two major developments took place behind the scenes. First, in June 1998 or soon thereafter the Ohio firm Bio-Products entered into the DOJ's amnesty program and began to turn over all that its employees knew about the choline chloride cartel. Second, in September 1998, the dominant manufacturer of vitamin B3 (and minor producer of biotin), the Swiss firm Lonza, agreed to plead guilty for criminal price fixing. Lonza's cooperation was secured by a fairly small fine (only $10.5 million) and by the DOJ's agreement not to seek criminal charges against any of Lonza's executives. The fact that Lonza did not receive amnesty from the DOJ probably reflects the fact that it initiated the conspiracy; ringleaders do not qualify for amnesty. However, in an unusual move for the DOJ, Lonza's indictment and guilty plea were kept secret under a court seal for six months. The most likely explanation for the secrecy is that knowledge about Lonza's cooperation would have alerted other, bigger targets in the vitamin industry and thereby imperiled the DOJ's investigation. Lonza's cooperation was a break for the DOJ's investigation, but it was only a small break.

Lonza's information on the vitamin B3 cartel did not lead the U.S. investigation directly to the main Roche cartels. None of the leading manufacturers in the world's vitamins industry make vitamin B3. However, Lonza does manufacture one other vitamin, biotin (vitamin H). Lonza, together with two German and two Japanese manufacturers, controlled about half of the world biotin market. The dominant world producer of biotin with about 45% of the market is none other than Hoffmann-La Roche. Biotin should have been the bridge for U.S. investigators to learn about the larger web of Roche cartels. Yet, oddly the United States, unlike

Canada and the EU, never prosecuted any of the five members of the biotin cartel.[10]

Convictions in Vitamin B3

In a very unusual delay, 21 months after Lonza pleaded guilty, in May 2000 three companies and two individuals pleaded guilty to criminal price fixing in the market for vitamin B3. The three manufacturers convicted were Degussa-Hüls of Frankfurt am Main, Germany; Reilly Chemicals, Inc. of Indianapolis, Indiana; and Nepera, Inc. of Harriman, New York. Degussa and Reilly owned a joint venture that made B3 in the United States and a small plant in Belgium. Nepera was a relatively small U.S. manufacturer of B3, but the fact that Nepera's President and Vice President for sales were the only two persons convicted in this cartel suggests that Nepera was one of the companies resisting a plea bargain.

The plea agreements for Lonza, Degussa, and Nepera admit that each of the companies began conspiring "as early as January 1992." U.S. transaction prices show a suspicious jump in 1991. Nepera and possibly Degussa seem to have resigned from the cartel in July 1995, but in Degussa's case it handed on its conspiratorial role to its joint-venture partner, Reilly Industries.[11] Prices declined for five years thereafter. When the conspiracy ended in March 1998, the two largest U.S. sellers of B3, Lonza and Reilly, were still conspiring. By May 2000, four companies had paid $33.5 billion in criminal fines, and two Nepera executives were to be sentenced to a total of 20 months in prison. No Degussa or Reilly managers were sanctioned.

The Big Three Plead Guilty

With fairly solid evidence of a broad conspiracy in several vitamins markets in the hands of government investigators by late 1998, in the time-honored fashion of prosecutors throughout history, they turned the screws tighter on the smaller vitamins manufacturers. Rhône-Poulenc was a vulnerable target. It was the smallest of the Big Three vitamin manufacturers,

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10 The biotin cartel ended in late 1995, so the statute of limitations does not seem responsible for the decision not to indict. Shortly after the biotin cartel ended, Lonza ceased production. Lonza might have qualified for "amnesty plus" in the B3 case by informing the DOJ about the biotin cartel.

11 There may have been a change in ownership or management of the joint venture, Vitachem, Inc. Reilly's participation began in September 1994. It paid the lowest fine of the four conspirators ($2 million). Nepera's exit may also be explained by its takeover in 1995 by Cambrex Corp., which was not charged by the DOJ.

holding about 9% of the global market. Rhône-Poulenc was amenable to a deal because it had previously announced its intention to merge with Hoechst, and such a merger could not be consummated if uncertainties about severe price fixing sanctions were not resolved. Whatever Rhône-Poulenc's motives, it agreed in late 1998 to cooperate with the DOJ's broader vitamins investigation. In fact, Rhône-Poulenc was formally admitted into the DOJ's amnesty program after it provided crucial evidence for prosecutors. Not only did its executives, who were deeply involved in colluding on vitamins A, E, B2, and B12, begin to provide incriminating details, but also its vitamins managers gave the DOJ the kind of evidence that is most persuasive with juries – tape recordings of an actual cartel meeting.[12] The meeting in February 1999 was one of "Vitamins Inc.'s" top-flight occasions, with all of the companies' top officers present. The cartel had at that time gone into deep cover, so this last meeting was probably held in one of the participant's private homes in Switzerland or Germany. When the DOJ approached the lawyers representing Roche and BASF with the overwhelming evidence provided by their former co-conspirator Rhône-Poulenc, the two cartel ringleaders quickly agreed to plead guilty.

DOJ negotiations in March to May of 1999 mainly involved the size of the corporate fines to be paid by Roche and BASF and the number of executives to be indicted. The DOJ was in a strong bargaining position because of its trial victory in late 1998 over three ADM executives in the lysine case. Under the twice-the-harm rule for sentencing of corporate felons, Roche was presented with the doubtless astounding news that their company was facing U.S. fines of up to $1.9 billion (plus even higher civil penalties).[13] BASF was liable for up to $640 million in U.S. fines. Although the third and fourth to agree to plead guilty, a major concession offered to Roche and BASF by the DOJ was the right for both companies to be designated in second place when applying for leniency.[14] A second place position confers the expectation that the applicants will receive the second largest discounts on their fines. The DOJ would later praise Roche and BASF for their exemplary cooperation.

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12 The existence of such tapes has not been formally acknowledged by the DOJ, but when asked about it at a press conference, the DOJ's Gary Spratling artfully avoided denying it. Barboza (1999) accepts the story.

13 Roche imposed an estimated $942 million in overcharges on U.S. direct buyers of vitamins in 1990-1999, an amount that can be doubled to calculate the government fine and tripled as an award to direct buyers (Connor 2006b: Appendix Table 13). Similarly, BASF generated $320 million in U.S. overcharges.

14 Spratling (2000) would later assert that Roche and BASF were "tied for second place" after Rhône-Poulenc, but he is not counting Bio-Products or Lonza for some reason.

The DOJ prosecutors likely pointed out the material benefits of a downward departure in their ultimate fines if only they too would cooperate. The decision to pay even the greatly reduced fines offered by the DOJ was obviously not an easy one to make for Roche and BASF. There is a revealing detail in the plea agreement signed by BASF, an appended letter from its general counsel to the DOJ dated May 18, 1999 committing BASF to plead guilty under the DOJ's terms: the meeting of BASF's Executive Committee at its Ludwigshafen headquarters to approve the deal must have been rancorous, because it lasted seven and one-half hours.

On May 19, 1999 the *Wall Street Journal* announced to the world that momentous guilty pleas of price fixing in the vitamins industry would be made public the next day. The announcement day was full of dozens of coordinated events. On the morning of May 20th, a press conference was held at the headquarters of the Department of Justice in Washington, attended by the Attorney General Janet Reno, the Assistant Attorney General for Antitrust Joel Klein, and many other top officials of the DOJ and FBI. At about the same time, officers of Roche and BASF appeared with DOJ prosecutors in U.S. District Court in Dallas, Texas to file their guilty pleas and explain to the Court how the fines and jail sentences were arrived at. The DOJ and the Big Three vitamins makers also released statements to the press. Rhône-Poulenc's statement admitted that it had engaged in criminal price fixing and would face harsh civil penalties in the future for its crimes; it also pointed out that it had been admitted to the DOJ's amnesty program and thereby would save tens of millions of dollars in potential U.S. penalties. Joel Klein spent much of the day being interviewed about the plea agreements. All major newspapers and the world's business press would be filled with news of the deal the next day.

The deals involved an almost unimaginable stepping up of price fixing sanctions. Hoffmann-La Roche agreed to pay $500 million in fines, almost five times the previous record antitrust fine. BASF paid $225 million. These fines were roughly proportional to each company's U.S. and global market shares. (Had Rhône-Poulenc been fined, it could have paid as much as $450 million). As the "second firms" to confess and with promises to cooperate, Roche and BASF were entitled to great leniency (Spratling 2000). Although a huge public relations coup for the DOJ, the fines reflected discounts of 74 and 65%, respectively, from the maximum possible fines. As odd as it may sound, settling for $725 million in fines was a good deal for the defendants.

Besides the corporate fines eight senior executives of Roche and BASF were indicted for criminal price fixing. The four Roche officials were Dr. Kuno Sommer (President of Roche's specialty chemicals division), Dr. Hugo Brönnimann (President of the vitamins division), Andreas Hauri (head of global vitamin marketing), and a former Roche executive

whose name is secret. At BASF, four officers with similar positions were indicted. In addition to these eight, ten more managers were listed by name as unindicted co-conspirators. While all eight top executives were fined, the DOJ saved its harshest treatment for Kuno Sommer. He had not only fixed prices but also made false statements to DOJ investigators in March 1997. In addition to a $100,000 personal fine, Sommer had to agree to a four-month prison sentence. This was the first time in U.S. antitrust history that Europeans had agreed to serve prison time for price fixing.

At its press conference, DOJ officials were grave and scolding. Janet Reno began by saying that the $500 million fine was ". . . the highest fine the Justice Department has ever obtained in any criminal case. We mean business." Joel Klein elaborated:

> "The vitamin cartel is the most pervasive and harmful criminal antitrust conspiracy ever uncovered . . . The enormous effort that went into maintaining the conspiracy reflects the magnitude of the illegal revenues it generated . . . These cartels . . . are powerful and sophisticated and, without intervention by antitrust authorities, will often go on indefinitely."

When asked by a reporter why he thought the vitamin cartel lasted so long, a DOJ official gave three reasons. First, the Antitrust Division had only stepped up its efforts directed at global price fixing since the 1995-1996 lysine cartel case. Second, the conspirators had gone to great lengths to cover up their conspiracy. Third, the DOJ's leniency program had been very useful in attracting Rhône-Poulenc's cooperation, but the 1993 revision needed years to become well known.

A day after the DOJ press conference, the Chairman of Roche, Franz Humer, and the company's CEO met with the press. Humer said:

> "I am personally absolutely shocked at what has happened. You will understand that this was not part of our responsibility. We really don't know what [the Roche price fixers] did."

He claimed to have learned of the conspiracy only in February 1999; two previous internal investigations by the company in 1997 and 1998 (in response to civil suits brought against Roche by vitamin buyers in the United States) had failed to uncover any skullduggery. Huber said that he would take steps to avoid a repetition of antitrust offenses, but his plan was rather vague. The only concrete step taken was firing Kuno Sommer

and Hugo Brönnimann; the six other managers mentioned in Roche's guilty plea agreement were left in their jobs.

Humer's performance at this press conference raised a chorus of critical comments. In an article laced with acid language, *New York Times* writer Edmund Andrews derided Humer's statements:

> ". . . the chairman and chief executive of Roche Holdings AG pronounced themselves blameless and clueless . . . "

An article appearing in the *Financial Times* of London commented that:

> "The fine is a severe blow to the reputation of Roche, one of the world's oldest and most conservative pharmaceutical companies."

Industry analysts were not long in issuing glum predictions about the financial implications for Roche *et al*. By June 1999, they were speculating that the total antitrust costs for the defendants would be at least $2 billion. Although promptly denied by Roche, one chemical-industry analyst estimated that Roche alone would face antitrust liabilities of $1 billion or more and might want to sell its vitamins/fine chemicals division. The analyst's statement would turn out to be prescient but short of the mark. Five years later Roche did sell its vitamins division, but its antitrust bill would amount to at least $2.5 billion. And Roche did dispose of its vitamins assets.

Smaller Firms Plead Guilty

The press releases of the U.S. Department of Justice make it clear that it regarded each of the punished nine vitamins cartels it fined as cogs in one vast machine of collusion. Although the fines meted out on the first three companies would account for 80% of the total, ten more corporate guilty plea agreements followed those of Lonza, Roche, and BASF. The fines came in three waves of public announcements.

The first wave of post-Roche guilty pleas came on September 9, 1999. Takeda Chemical Industries, Eisai Co., and Daiichi Pharmaceutical paid fines of $72, $40, and $25 million, respectively, for price fixing in the markets for vitamins E, C, B2, and B5. It is typical for conspirators that take longer to admit their guilt to be fined at a higher rate than companies that settle early and cooperate. Negotiations with these three companies had dragged on for about seven months. However, the fine paid by Eisai

was discounted by 75% -- the same rate as had been accorded Roche and BASF. That is, Eisai was treated as though it too was "second in line" for leniency. The other Japanese firms, Takeda and Daiichi, received generous discounts of 59% and 40%, respectively. Given that Takeda was the ringleader of at least six Japanese cartelists, the reason for its large discount is particularly difficult to square with DOJ fining policy. No officers of the three companies were individually sanctioned.

The large U.S. fines paid by the three Japanese chemical companies were widely reported in the companies' home country. Perhaps to counter the adverse publicity, the companies imposed on themselves additional sanctions. At Takeda Chemical Industries all employees were to be required to take new training in antitrust principles. The company's president took a 15% pay cut for three months, and members of the board of directors ordered a 5%, three-month pay cut for themselves. Daiichi and Eisai announced very similar sanctions for their boards, presidents, and employees on the same day. Although there is a certain ritualistic flavor to their public self-flagellation, at least it makes the point that the companies' entire governance structures accept some of the burden of responsibility for the companies' criminal behavior. In any case, the Japanese companies' responses stand in stark contrast to the "clueless and blameless" stance of Roche's top officials.

In September 1999, the second, much delayed corporate conviction for choline chloride was announced. Chinook Group Ltd. of Canada became the 8th firm prosecuted in the vitamins scandal. Recall that Chinook's co-conspirator had confessed to price fixing 15 months earlier and that the FBI had raided Chinook's offices one year earlier. These actions should have yielded considerable evidence against Chinook. On the other hand, previously two of its officers had been indicted for the same crime but had refused to plead guilty or otherwise cooperate. Moreover, it is also apparent that the third participant in the cartel, DuCoa, and its managers were also refusing to cooperate with prosecutors. DuCoa's owners did not agree to plead guilty until September 2000. These developments indicate that because of resistance by the company's owners and management the DOJ had considerable trouble obtaining corporate guilty pleas from both Chinook and DuCoa. At Chinook, two U.S. employees and one Canadian employee were found guilty of felonious conspiracies. Considerable evidence led a U.S. court to conclude that the two controlling owners of Chinook were also aware of and encouraged the price fixing, yet neither were indicted by U.S. or Canadian authorities.

Chinook agreed to pay a $5 million criminal fine for its role in the price fixing vitamin B4. Chinook was the largest member of and instigator of the North American branch of the choline chloride cartel. Under the double-the-harm standard, Chinook was liable for a U.S. fine of up to $145

million. Instead, its 97% discount suggests that the collapse of prices in the choline chloride market had driven Chinook into poor financial shape and it was unable to pay a large fine.

The DOJ winded down its investigation in 2000. The second wave came in May 2000. Four corporate and two personal price fixing convictions were announced that came close to tidying up the slate. The Darmstadt, Germany-based pharmaceutical firm E. Merck pleaded guilty to fixing the price of vitamin C and agreed to pay a $14 million fine. Roche, BASF, and Takeda had previously admitted their guilt in the vitamin C case, and E. Merck was the last member of this cartel to be punished. In addition, three companies were convicted in the vitamin B3 cartel: Degussa-Hüls (Germany), Nepera (a subsidiary of the U.S. firm Cambrex Corp.), and Reilly Industries (a privately owned Indiana firm). Degussa was awarded the smallest antitrust-fine discount of any of the 13 vitamin cartelists, a paltry 29%. The distribution of the $19 million in fines suggests that Degussa was a co-leader of the cartel, but its high fine may also have been a consequence of recalcitrance in settling with the government. Degussa's guilty plea came 18 months after the largest member of the B3 cartel (Lonza) had capitulated and agreed to supply the DOJ with information. Degussa's small discount is also surprising because its partner in crime, Reilly Industries, was granted a 78% downward departure from the maximum.

The fourth member of the vitamin B3 cartel was Nepera, which was the smallest company in the vitamin B3 cartel. Its $4 million fine was one of the most heavily discounted (83%). Its large discount probably reflects a low ability to pay the fine. Both of the men convicted and given prison sentences were Nepera executives. As the DOJ usually reserves the right to insist on prison sentences only for ringleaders of cartels, their imprisonment probably signals an initial refusal to accept responsibility for their actions.

Much later, in September 2002, the second member of the choline chloride conspiracy, DuCoa, pleaded guilty and paid $500,000, by far the smallest fine of the 13 convicted firms in the United States. Three of DuCoa's officers pleaded guilty, and its last president was convicted at trial in Texas in December 2004 (DOJ 2005). He received the longest prison sentence (30 months) of any of the convicted vitamins defendants. It appears from this turn of events that the new owners of DuCoa might not have been aware of the price fixing going on in the company's vitamin sales department. From 1988 to 1997, DuCoa was a 50-50 joint venture of the giant chemical company DuPont and the equally huge food manufacturer ConAgra. DuCoa was sold to a new owner, DCV Corp., during the middle of the vitamin B4 conspiracy. DCV maintains that it knew nothing of the price fixing. Indeed, DCV sued DuCoa's former owners, DuPont and

ConAgra, for failing to reveal a material fact prior to the acquisition of DuCoa. The imposition of a nominal fine on DuCoa lends credence to the notion that the company's new owners had no knowledge of the conspiracy.

To sum up, thirteen chemical companies were convicted by the United States for price fixing in markets for bulk vitamins. U.S. fines on the unlucky 13 accumulated to $915 million in nominal dollars or $677 million in 2005 dollars (Tables 13.1 to 13.3). In addition, 16 senior executives of the vitamins manufacturers were criminally indicted and received 16 personal sentences that averaged $110,000 in fines and 8 months in prison.

Ten That Got Away

Eleven of the 21 corporate participants were indicted by the U.S. DOJ. Two of the 11 pleaded guilty but were given amnesty for being the first to come forward with information to prosecute the remaining cartelists and their managers.

How can two firms be first? As related above, Rhone-Poulenc offered to cooperate in the DOJ's on-going vitamins investigation sometime around December 1998. Rhone-Poulenc had become an early participant in two of the largest Roche-organized cartels – vitamins A and E. The second firm to be designated first in line for amnesty was Bio-Products, an Ohio manufacturer of choline chloride controlled by the enormous Japanese trading company Mitsui & Co. (Barnett et al. 2005: 29). It appears that as a legal matter the DOJ, despite pronouncements to the contrary, viewed the chlorine chloride cartels as almost entirely separate from the other 15 vitamins cartels.

Bio-Products gave sufficient information to the DOJ to convict two North American manufactures, Chinook and DuCoa, for criminal price fixing. However, Akzo Nobel, BASF, and UCB, the three members of the European branch of the choline chloride cartel, were not indicted by the DOJ. By agreeing to stop exporting to the North American market from 1992 to 1998, these firms were directly responsible economically and legally for the price increases in the United States. Both Canada and the European Commission were well informed about the European branch, and the three European manufacturers paid substantial settlements to U.S. buyers to settle a class action. The DOJ's inaction is puzzling.

Table 13.1 Global Monetary Antitrust Sanctions, by Company 1999-2005

Companies	Fines [a]				Private Suits [d]	Total
	U.S.	Canada	EU	Other		
	Million nominal U.S. dollars					
Roche	500.0	42.0	410.0	9.3	1468-1736	2492-2697
BASF	225.0	16.2	308.4	4.3	441-521	994-1074
Takeda	72.0	2.8	32.9	0.0	383-454	491-562
Rhone-Poulenc	0 [b]	11.6	4.5 [b]	2.8	274-324	292-342
Eisai	40.0	1.7	11.7	0.2	93-110	147-164 [e]
Daiichi	25.0	2.1	20.8	0.1	64-74	112-124
E. Merck	14.0	0.55	8.2	--	50.7	73.5
Lonza	10.5	0.6	29.2	0	28.5	68.8
Mitsui/Bioproducts	0 [f]	0.4	--	0	53.4	53.8
Tanabe	0	0	0[c]	0	45	45.0
Akzo Nobel	0	0.55	28.0	0	7.5	36.1
UCB	0	0.0	13.8	0	9.0	22.8
Degussa	13.0	1.3	--	0	8.7	23.0
Sumitomo	0	0	0[c]	0	17.5	17.5
Chinook	5.0	1.2	0[c]	0	6.9	13.1
Solvay	0	0	8.1	0.01	--	8.1
Nepera	4.0	0.12	0[c]	0	3.5	7.6
Reilly	2.0	0.02	--	0	4.2	6.2
Hoechst	0	1.2	--	0	0	1.2
DuCoa	0.5	0	0[c]	0	0.4	0.9
Kongo	0	0	0[c]	0	0	0
Total	915 [g]	83.1	847.6	16.4	2966-3466	4821-5320

Source: Connor (2006c: Appendix Table 2).

-- No information, no sales in the jurisdiction, or pending

[a] Fines announced as of early 2005 by U.S., Canada, EU, Australia, and Korea. EU investigations of vitamins B3 and B12 may be pending.

[b] Amnesty for vitamins A&E.

[c] Guilty but saved by the statute of limitations.

[d] U.S. settlements widely reported to be more than $2 billion, possibly as high as $5.5 billion. Includes settlement by National Association of Attorneys General for $335 million for indirect buyers in 23 states ($305 mil.) and 43 states as direct buyers ($30 mil.). Legal defense fees are probably 5-10% more than settlements payouts. Also includes Canadian private suits totaling $105 million.

[e] Annual report 2000 said "total losses" were 5.7 billion yen (about $188 mil.).

f) Amnesty for vitamin B3.

g) Includes fines on 16 individuals.

Table 13.2 Real Monetary Sanctions by Vitamin Product, 1999-2005

Product Market	U. S. Govt.	U.S. Private	Canada [b]	Europe	Rest of the World	World
			2005 U.S. dollars [a]			
Beta carotene	52.4	118.9	8.2	52.7	0	232.2
Canthaxanthin	1.1	2.6	0.17	51.1	0	55.0
Biotin (H)	0	42.1	0	0	0	42.1
Choline chloride (B4)	2.4	43.0	4.58	35.4	0	85.5
Folic acid (B9)	0	6.6	0	0	0	6.6
Vitamin A	74.8	232.9	16.7	69.1	4.68	400.6
Vitamin B1	0	14.5	0	0	0	14.5
Vitamin B2	19.5	38.0	2.7	32.9	0	93.1
Vitamin B3	22.9	30.7	2.36	0	0	56.0
Vitamin B5	20.9	50.9	4.55	58.4	0.08	134.9
Vitamin B6	0	13.4	0	0	0	13.4
Vitamin B12	0	3.1	3.12	0	0	6.27
Vitamin C	111.9	218.6	18.1	51.0	3.74	405.3
Vitamin D3	0	0	0	24.7	0	24.7
Vitamin E	202.2	509.7	32.4	106.3	4.85	857.9
Premixes	168.5	348.5	52.5	0	0	569.6
Total	676.6	1673.8	145.6	481.7	13.36	2991.1

Source: Connor (2006c: Table 17A. To allow for the opportunity cost of capital (i.e., the absence of prejudgment interest), fines and settlements are adjusted downward by the U.S. prime rate of interest plus 1% from the midpoint of the conspiracy to the year the cartel was fined; then from the latter year, the figure is raised to $2005 using the producer price index of the appropriate region.
a) The EU assigns fines by product, but most other fines and settlements are allocated by the affected sales of the product and then within the product by company market share. U.S. Private is conservative. Converted C$1 to US$ 0.826.
b) Includes private settlements for single damages to direct and indirect purchasers that account for 51% of the total.

Table 13.3 Monetary Sanctions by Vitamin Product, 1999-2005

Product Market	U. S. Govt.	U.S. Private	Canada [b]	Europe	Rest Of the World	World
			Million nominal U.S. dollars [a]			
Beta carotene	62	187-220	9.9	81	0	339-372
Canthaxanthin	0	4-5	0.2	78	0	84-85
Biotin (H)	0	94-98	0	0	0	94-98
Choline chloride (B4)	5.5	98	9.9	88	0	202
Folic acid (B9)	0	14-16	0	0	0	14-16
Vitamin A	97	404-475	22.4	117	5.6	645-716
Vitamin B1	0	31-35	0	0	0	31-36
Vitamin B2	28	73-86	4.0	62	0	167-179
Vitamin B3	30	58	4.2	0	0	91
Vitamin B5	39	88-104	6.1	99	0.1	233-248
Vitamin B6	0	28-33	0	0	0	28-33
Vitamin B12	0	6.5-7.5	5.2	0	0	11.5-12.5
Vitamin C	175	463-533	29.2	104	5.4	776-846
Vitamin D3	0	0	0	38	0	38
Vitamin E	262	884-1039	43.4	180	5.8	1374-1529
Premixes	218	605-710	70.4	0	0	891-1056
Total	915	2860-3360	205	847	16.9	4845-5345

Source: Connor (2006c: Appendix Table 2).
a) The EU assigns fines by product, but most other fines and settlements are allocated by the affected sales of the product and then within the product by company market share. Converted C$1 to US$ 0.826. U.S. settlements may be as high as $5.5 billion.
b) Includes private settlements for single damages to direct and indirect purchasers that account for 51% of the total.

The DOJ declined to indict companies that arranged cartels in seven markets: vitamins B1, B6, B12, D3, folic acid, biotin, and canthaxanthin. This decision affected three Japanese manufactures of biotin and folic acid. Sumitomo, Tanabe, and Kongo Chemicals each held 15 to 20% global market shares in the two markets and caused an estimated $20 million in overcharges in the U.S. market. Neither the inability to pay nor the statute of limitations was a factor inhibiting prosecution of the sellers in these two cartels. Folic acid was an exceptionally small market (less than

$12 million in affected sales), but the biotin market was substantial ($144 million).

In the case of vitamins B1 and B6, the participants were companies fined for their participation in other cartels. Neither lack of information nor the statute of limitations explains the DOJ's inaction. Both cartels generated modest U.S. sales ($104 million) and equally modest overcharges (about $14 million). The vitamin D3 cartel had $72 million in affected commerce and $10 million in U.S. overcharges. By failing to prosecute vitamin D3 Solvay got a pass on U.S. fines.

Hoechst was the junior member of the global vitamin B12 cartel, which it dominated along with Rhone-Poulenc. Neither manufacturer was indicted for fixing prices in this medium-size market ($112 million in affected U.S. sales). As mentioned previously, the fact that Rhone and Hoechst were planning to merge was a likely factor in Rhone's decision to seek amnesty. It is likely that the DOJ's failure to press ahead with legal action in vitamin B12 was a concession to Rhone when it agreed to confess. Without such a deal, the two firms faced fines of up to $82 million.

Finally, the DOJ did not prosecute the cartel that fixed the prices of canthaxanthin and other carotenoids. The industry is a duopoly of Roche and BASF; their conspiracy generated $116 million in U.S. sales and $24 million in overcharges. Its omission is a mystery.

To summarize, ten out of 21 corporations that engaged in vitamins collusion in the 1990s received no fines in the United States. Two of them were large companies that sought and received full amnesty, while the remaining eight firms were generally small ones. Two of the three large European manufacturers that had by agreement withheld exports of vitamin B4 to the United States were unsanctioned by the DOJ. Moreover, no fines were imposed for price fixing in any markets with less than $150 million in affected commerce, namely, vitamins B1, B6, B12, D3, folic acid, biotin, and canthaxanthin. While each of these cartels was relatively small, the aggregate amount of affected U.S. commerce was significant -- $560 million or 7.4% of the total. As a result, eight cartelists escaped criminal prosecution. No impediments to prosecution were noted, so the reluctance to indict seems to rest upon in a decision to conserve prosecutorial resources.

Impact on Civil Cases

Guilty pleas in criminal antitrust proceedings can have a substantial impact on formally distinct civil antitrust cases. Historically, civil damages were filed after it became known that the government intended to indict violators and were concluded after guilty pleas or guilty verdicts were obtained.

Indeed, this expectation on timing was enshrined by Congress in Section 4 of the Clayton Act, which specifies that guilt determined in a criminal proceeding provides *prima facie* evidence for civil trials. Therefore, the scope and wording of the guilty plea agreement is crucial to the outcome of follow-on civil cases (see Chapter 15). The shape and content of these agreements are the result of careful negotiations between DOJ prosecutors, and counsel for the defendants will press for wording that will be favorable to their clients in any anticipated civil damages actions (Victor 1998).

Antitrust plea agreements negotiated by the DOJ tend to be terse and formulaic. They usually outline the nature of the product, legal name and abode of the defendant, the nature of the conspiracy in restraint of trade, conspiracy dates, and sometimes the size of the market's sales during the conspiracy. By the time the guilty pleas are composed, the government usually has assembled a good deal of evidence: subpoenaed documents, deposition, tape recordings, and public information on the structure of the market and business practices in the industry. This body of evidence will have been analyzed for sentencing purposes. In particular, DOJ prosecutors typically will have done at least preliminary estimates of the size of the affected market, the market shares of the defendants or major sellers, and perhaps the overcharges generated by the conspiracy. When guilty pleas are made, much of this evidence will be unavailable to private plaintiffs.

The DOJ sentencing memoranda contain affected sales, but only a small proportion of these memoranda are published. The fines themselves cannot be used to infer sales, market shares, or overcharges because discounts are not systematic and vary widely across defendants. Since 2005 the DOJ has published U.S. damages in selected guilty-plea agreements, but these numbers may be negotiated compromises between prosecutors and defendants.

Private plaintiffs should be consciously assisted by government plea bargaining because, just as is the case of government fines, one of the purposes of treble damages is to deter future violations. The greater the sum of public *and private* punishment, the greater the deterrence effect. Regrettably, public prosecutors in the global price fixing cases studied in this book often made compromises that disadvantaged piggyback private suitors. No plea agreements are released for amnesty parties. Plea agreements are vague on the initial date of the conspiracy, placing it as much as two years later than the actual date. The DOJ sometimes chooses to prosecute only those cartels with large sales or skip markets as part of unannounced side-deals. All these practices place private plaintiffs at informational and legal disadvantages.

A similar disadvantage occurs when private plaintiffs are offered settlements before criminal-guilty pleas are made public. When the

government is still negotiating a plea with defendants (or has sealed an agreement), plaintiffs are at a severe informational disadvantage. Not only is economic intelligence difficult to come by, but also there is great uncertainty about the guilt of the defendants themselves. In the lysine and citric acid cases, defendants dangled relatively cheap settlements in front of the federal class of plaintiff's months before the guilty pleas were announced. In the vitamins case class counsel offered a low-ball settlement to the Big Six on the basis of a hasty and overly conservative estimate of damages. Hold-outs from the federal class were rewarded for their patience, but the smaller companies remaining in the class paid dearly for their impatience.

Chapter 14: Antitrust Prosecutions Outside the United States

The Sherman Act was 115 years old in the year 2005. Because of active antitrust enforcement by public and private parties and frequent appeals of decisions, the United States has the richest body of legal decisions of any jurisdiction in the world. Even cartel cases, one of the more settled areas of federal antitrust law, often receive the attention of the high courts. Recent court opinions have addressed the extent of extraterritoriality and the limits of the *per se* rule in cartel cases. However, the changes in cartel laws and enforcement have been greatest outside the United States.

Profound changes have occurred because of the widespread adoption of competition laws outside of North America since the end of World War II (see Chapter 3). Some of these laws were instituted by countries that were under Allied occupation; Germany and Japan are examples. It was Germany that pressed hard to have competition laws included in the 1958 Treaty of Rome that established the then six-nation European Economic Community. The competition laws of the European Union (EU) were originally primarily enforced by DG-COMP to maintain free cross-border trade within the EU, but deterrence now seems to be the most important principle for horizontal restrictive practices. Since the 1990s, all EU member states have adopted national competition laws that apply to competitive effects on national commerce. Indeed, all recent entrants and many aspiring entrants to the EU have been required to form effective national antitrust agencies as a condition of membership in the EU. Mexico formed its competition agency upon joining the North American Free Trade Agreement area. Many other countries (e.g., South Korea, Russia, Chile, and Argentina) adopted competition laws as part of a package of institutional innovations that replaced centralized economic planning or enhanced the development of democratic institutions to serve civil society. Today, more than 100 countries representing more than 90% of the world's Gross Domestic Product have antitrust laws on their books, though enforcement remains weak in Asia and most low-income nations.

When U.S. investigations of global cartels that began in the mid 1990s became public, antitrust agencies in some countries began their own investigations. In other countries, these agencies had to wait for complaints

to be lodged from buyers in their jurisdictions. Some defendants in U.S. prosecutions scurried to be first to admit their guilt with antitrust officials so as to obtain leniency in sentencing. With the notable exception of Canada, public authorities are the first and often only bodies authorized to seek sanctions against alleged cartels. Either there is no statutory basis for private parties bringing civil suits to seek compensation for antitrust injuries, or such suits must by law follow findings of guilt by the government.

There are prospects of continuing evolution of cartel laws and enforcement procedures in the EU and elsewhere. Ireland, Estonia, Israel, and the UK have criminalized their anti-cartels statutes; other national jurisdictions are considering adopting criminal statutes for hard-core cartels or activating existing criminal statutes (Cseres *et al.* 2006). Frustration about the inability to deter recidivism in price fixing has led to the encouragement of private damages actions in a Green Paper issued by the European Commission in 2005. Many hurdles remain to the adoption of private rights of antitrust action in Europe, including substantive law, procedural rules, the standing of plaintiffs, legal costs, and the size of penalties (Gavil 2006). Specifically, typical laws and procedures in the early 2000s discouraged private actions by limiting the types of plaintiffs, restricting discovery of needed economic information, requiring the losers to pay court costs, excluding expert evidence of damages, and disallowing class actions. Nevertheless, some progress has been made. The codification of class-action rules already occurred in the common-law systems of Canada and Australia, and in 2005 Germany too adopted a new law that makes class actions easier to receive court approval.

This section summarizes the non-U.S. antitrust investigations and sanctions as they had evolved to late 2000 in the cases of the lysine, citric acid, and vitamins conspiracies. These three are simply among the better documented of hundreds of international cartels prosecuted by the world's antitrust authorities (Connor and Helmers 2006). In many cases these agencies release far more details about the conduct of cartels than does the DOJ (e.g., EC 2001, 2002, 2003, and 2005).

Lysine

Canada and Mexico

Guilty pleas by the four largest members of the lysine cartel were entered in the U.S. courts in August and October 1996. An investigation of lysine

price fixing began in Canada in the summer of 1995. In an interview with the Canadian official who headed the government investigation of the lysine cartel, Nicol and Ferguson (1999) reported that Canada worked closely with U.S. antitrust investigators under an existing protocol. By October 1996, Kyowa Hakko agreed to assist the Canadian investigation in return for immunity from prosecution; Sewon soon followed in Kyowa's footsteps. Officials from both companies met with both U.S. and Canadian investigators to be interviewed for ten days in Hong Kong in October 1997. Later that year, the Ministry of Justice sent letters to ADM and Ajinomoto informing them that they were targets in the lysine investigation.

In May 1998 ADM pleaded guilty to fixing the prices of lysine exports to Canada. The Competition Bureau proposed and ADM accepted a penalty of about Canadian $11.4 million (U.S. $7.9 million), which was six times the previous record Canadian antitrust fine (Figure 14.1). ADM's fine represented 23.8% of its 1992-1995 sales of lysine in Canada. In July 1998, Ajinomoto, Kyowa Hakko, and Sewon America also pleaded guilty to fixing export prices of lysine in Canada. Ajinomoto was penalized C$3.5 million and Sewon America C$70,000. However, Kyowa paid no fine because of its previous grant of immunity by Canada's Attorney General; Sewon also received a steep discount for its early cooperation. All four lysine producers had "prohibition orders" imposed on them by the federal court, which forbid the companies from any further price fixing. Measured by fines levied, Canada too has been getting increasingly tougher with global price fixers.

A lysine investigation was opened in Mexico in February 1997. The only U.S. source for this information was ADM's annual financial report released in September 1997. Two years later, ADM reported to its stockholders that it had been fined $125,000 by Mexico's Federal Competition Commission.[1] These fines are quite low by contemporary international standards.

The European Union

DG-COMP of the European Commission formally began investigating the lysine cartel in July 1996, one year after the U.S. investigation became public knowledge. According to the EC's 2001 decision, Ajinomoto approached the EC in July 1996 seeking leniency for its cooperation.

[1] It is probable that Kyowa Hakko, which dominated lysine sales in Mexico, had an even larger fine imposed upon it by Mexico. The FCC itself and major Spanish-language news sources have been silent on most cartel fines.

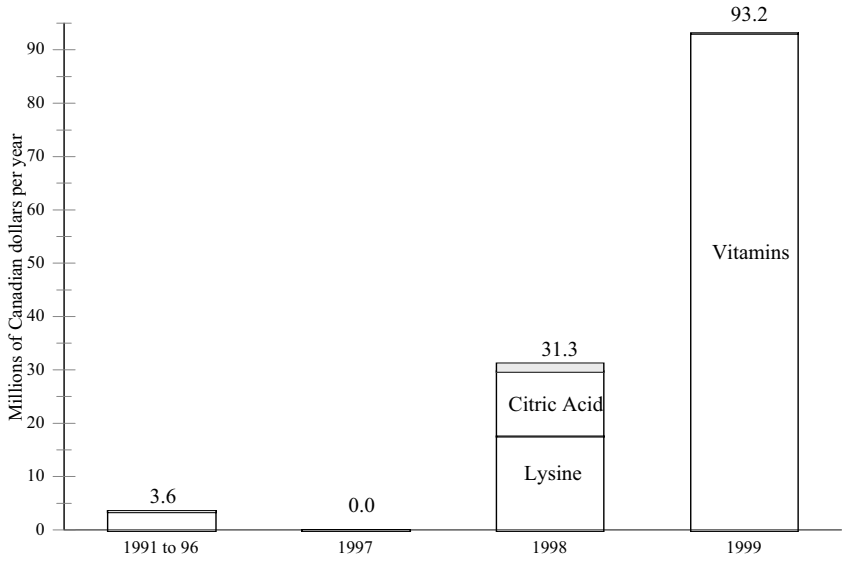

Figure 14.1 Global Price-Fixing Fines, Canadian Ministry of Justice, 1991-1999.

Source: Connor (2001: Table 14.A.1)

Under the EC's leniency policy at the time, as the first to inform the Commission about the cartel, Ajinomoto was entitled to a 50% reduction in the fines to be levied on members of the cartel on the basis of each company's sales.

Although most investment analysts who follow ADM and the lysine industry should easily have surmised that a quiet EC investigation was about to be launched, when that quiet was shattered the stock markets once again reacted adversely to the news. On June 12, 1997 an EC investigation of the lysine cartel was confirmed when investigators raided ADM's sales offices in Kent, England and Wiesbaden, Germany as well as Kyowa Hakko's offices in Dusseldorf. On that day, the price of ADM's stock fell 4%. A source within the EC confirmed that Ajinomoto was cooperating with the European competition law authorities. Later, it would be announced that the other three Asian members of the cartel also were cooperating with

the EC investigation. The second to approach DG-COMP was Sewon. Because Ajinomoto had failed to mention the lysine cartel that Ajinomoto, Kyowa, and Sewon had operated in the late 1980s, Sewon too was awarded the maximum 50% discount on its fine for its information on the earlier price-fixing. Kyowa and Cheil could only confirm certain details of what Ajinomoto and Sewon had already told the EC, so their cooperation was worth only a 30% reduction in their fines.

Strangely, ADM made no effort to cooperate with the EC investigation, despite the obvious monetary incentives to do so. However, when the Commission later laid out its case in a Statement of Objections, ADM did not contest the facts contained in the Statement, nor did the company contest the EC's final decision of guilt. For this minimal degree of cooperation, ADM was granted a 10% reduction on the maximum fine the EC could levy. In 2000, ADM announced that it would appeal the size of the EU fine.

The EC's fines for the five corporate members of the global lysine cartel were announced in June 2000. The five were required to pay €109.9 million or US $105.4 million. The EC's fines on the lysine cartel were high by the EC's historical standards. For example, ADM's fine of €47 million was the fourth highest ever imposed by the EC.

The EC has been opaque in the past in its standards for setting fines (Korah 1997). An interview with the EC's competition law commissioner verifies that there are no rigid rules for imposing fines. Although the EC has since published "guidelines" on fining cartels, the actual process for arriving at a fine is *by design* not transparent (Joshua and Camesasca 2004). The lack of transparency is considered a virtue by the DG-COMP (Alchin 1999). The EC's philosophy is to retain as much discretion as possible in order to induce the maximum uncertainty on the part of competition-law violators about the likely severity of their impending penalties. The only certainty is that the maximum fine for price fixing will be less than 10% of the global sales of each guilty company in the year prior to the EC's decision. Unlike the United States and Canada, the EC rejects basing fines on the affected sales within the European Economic Area; sales encompasses the company's total in all lines of business, not just the line of business that was cartelized.[2]

Sales of lysine in Western Europe were about $240 million per year during the price fixing of the early 1990s. Thus, the EC's fines represented about 15% of EU affected sales – lower than the ratio in the United States and Canada. Moreover, seven top managers were convicted of criminal price fixing in the United States, whereas the EC rules do not

2 In late 2006 the EC will implement new cartel-penalty guidelines that will be calculated as a function of EU affected sales, duration, and culpability factors (Veljanovski 2006).

permit imposing individual penalties. Nor were significant private damages likely to be paid in the EU.

However, one can *infer* the standards for fines by comparing the actual lysine fines with five possible sales bases. The "full" lysine fines (the amounts assessed before discounts for cooperation with the EC's investigation) were highly correlated with the 1994 *global* sales of lysine by the five cartel members (the correlation is r = +0.95). That is, the EC acted as if the harm caused by each firm worldwide was the basis of the relative sizes of the lysine fines.

Meanwhile, some other non-U.S. national antitrust authorities were taking action. For example in July 1999, the UK's Office of Fair Trading (OFT) announced that it would bring ADM and Cheil to court for price fixing of lysine and would seek a consent decree forbidding the two companies from future price fixing. This was at the time the maximum sanction the OFT could impose. The OFT did not have the authority to levy fines for antitrust violations until a few years later. Of the five cartel members, ADM and Cheil were singled out because the others had no assets in the UK.

Citric Acid

Enforcement actions against the four members of the citric acid cartel followed a pattern similar to that of lysine. In Canada, the Competition Bureau imposed a fine of U.S. $3.1 million on ADM in May 1998 (Figure 14.1). During the 1992-1995 conspiracy ADM sold $11.6 million of citric acid out of a total of $70 million sold in Canada. Thus, the fine represented 27% of ADM's citric acid sales during the conspiracy. Six months later, the remaining three "Swiss" companies in the cartel were fined $6.7 million or about 11% of their sales during the conspiracy.

In Mexico, the Federal Competition Commission began an investigation of ADM and other members of the citric acid cartel on February 11, 1999, three and one-half years after the U.S. investigation became public. No information is available on Mexico's sanctions in this case.

The EU's investigation into citric acid began in September 1997 (EC 2002). In December 2001, the EC's decision was announced. The five violators of the EU's competition rules were required to pay $120 million in fines. These penalties, 13% higher than the DOJ's fines in late 1996, represented about 10% of affected sales in the EU. However, private suits in the United States recovered about $240 million for direct purchasers. Thus, the EU fines were about one-third of all monetary sanctions in the United States.

Vitamins

The cartels in the global bulk vitamins markets attracted more coordinated enforcement activity outside the United States than any other cartel case in history. At least eight jurisdictions launched formal antitrust investigations of price fixing: Canada, the European Union, Switzerland, Japan, Australia, New Zealand, Brazil, and Mexico. No where was there a greater determination to prosecute swiftly and vigorously than in Canada.

Canada

The Canadian Competition Bureau (CCB) began its investigation of the vitamins cartels sometime before early 1999, aided by long-standing cooperative agreements and years of actual coordination in cartel matters with the U.S. DOJ. On September 22, 1999 the CCB recommended precedent-setting corporate fines for five vitamin manufacturers, and the Federal Court of Canada agreed to accept its recommendation. Officials said that prices of vitamins were pushed as high as 30% above competitive levels.

Fines of Canadian $85.5 million were imposed on Roche Holdings, BASF, Rhône-Poulenc, Eisai, and Daiichi for nine of the vitamins cartels in A, C, E, B2, B4, B5, B6, beta carotene, and premixes (see Tables 13.1 to 13.3 above). Unlike the United States, vitamin B6 was listed as one of the cartelized markets.[3] These were in absolute terms several times larger than the previous record criminal fines in Canadian legal history. However, as a proportion of affected sales, they were low. Affected sales in Canada by the five defendants totaled between C$650 and C$700 million. Thus the fines were only 13% of Canadian affected sales.

The federal prosecutor stated that these fines "were big enough to eliminate most illicit profit" made by the cartel in Canada[4], but he admitted that the defendants were given discounts below the maximum possible, mainly because the guilty pleas spared the Crown the expense of litigating a conviction. He noted that the defendants still faced monetary penalties from civil suits; class-action suits have been permitted in Canada since 1992 but seldom had been litigated at that time.

Additional corporate fines were imposed by Canada's courts over the next four years. On September 24, 1999, Chinook Group Ltd. was fined C$5 million; the VP for sales of Chinook was sentenced to nine

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[3] Another difference is that BASF was fined for its role in preventing exports of choline chloride to Canada, a violation ignored by the DOJ.

[4] In fact, in real terms only 25% of the profits were disgorged by Canada's fines (Connor 2006b).

months of confinement to be served as community service. The last participants in the choline chloride conspiracy to be sentenced (in August 2003) were Akzo Nobel and Bio-Products, which were required to pay C$1 and $0.8 million fines, respectively. Neither UCB nor DuCoa were indicted.

On October 20, 1999 Hoechst was fined C$370,000 for colluding in the market for vitamin B12. The other Canadian supplier, Rhone-Poulenc, was not punished for fixing the price of this vitamin. Neither the United States nor the EU fined any companies for the vitamin B12 conspiracy, though both firms did pay U.S. buyer's civil settlements for this product.

On February 24, 2000 Takeda agreed to pay a C$5.2 million fine for its role in the vitamins C and B2 cartels. On March 30th of that year E Merck was also fined C$1 million for vitamin C. Takeda and Merck completed the quartet of firms responsible for global collusion in vitamin C.

The next-to-last corporate prosecutions in Canada were announced on October 16, 2002. Degussa, Lonza, Nepera, and Reilly were forced to pay C$3.9 million in criminal fines in the vitamin B3 case. That amounted to a total of 15 corporate convictions and almost exactly C$100 million in fines for about C$824 million in Canadian affected commerce. In addition, four businessmen from Switzerland, Germany, and Canada were convicted and paid C$650,000 in fines. Converted to nominal U.S. dollars, the totals amounted to about US $83 million in fines and US $546 million in sales – approximately a 15% ratio.

The European Union

On May 20, 1999, the DOJ trumpeted its second and largest wave of sanctions on the vitamins cartels. Later that month the EU's antitrust chief, Karel van Miert, stated that Roche, BASF, and Rhône-Poulenc were cooperating with its investigation. Van Miert also prepared the European public for lower fines than those imposed by the United States. Shortly thereafter a new Competition Commissioner took over the helm of DG-COMP – Mario Monti.

The Roche Cartels

In the week before the DOJ's momentous vitamins-prosecution announcement, the Big Three vitamin manufacturers rushed to Brussels (EC 2001). The EC had just implemented a revised leniency policy that offered full amnesty for the first qualified company to apply. Already alerted to Rhone-Poulenc's membership in the DOJ's amnesty program, on May 4th

Hoffmann-La Roche wrote to the Commission and informed it of the company's intention to cooperate with any investigations of cartel activity; on May 6th BASF did likewise; and on May 17th Roche and BASF jointly visited the Commission and repeated their intention to cooperate. However, in what was a costly mistake, neither company handed the EC a written statement (a proffer) or documentary evidence that month.[5] Meanwhile, on May 12th Rhone-Poulenc announced in writing to the EC that it had violated the EU's competition law and that it sought leniency under the Commission's Leniency Notice of 1996. Later, the EC would decide that Rhone-Poulenc was qualified to meet all the conditions of its leniency program.[6]

The EC's investigation officially begins when it sends letters to targets requesting information about possible violations. From June to October 1999 the DG-COMP received letters and documents from 11 members of the vitamins cartels. All but Sumitomo admitted to anti-competitive behavior. After about a year of study DG-COMP had arrived at preliminary conclusions about the guilt of the responding corporations. In July 2000, the European Commission sent its Statement of Objections (legal warnings that are similar to target letters in the United States) to 13 vitamin manufacturers informing the companies that they were the objects of a price-fixing probe. The Commission's mailing included a redacted copy of its investigation file. The next step is for the targeted companies to respond to the Commission's preliminary factual findings, either in writing or at a confidential oral hearing. Ten of the targets attended an oral hearing held on December 12, 2000 and all but two accepted the Commission's findings.

The Commission's conclusions and its response to objections by the parties are contained in a dense 89-page decision dated November 21, 2001; a slightly redacted version was released on June 10, 2003. It is a treasure trove of information on the industrial structure, economic dimensions, and behavior of the vitamins cartels. Counting Rhone-Poulenc and Hoechst as two entities, the decision identified 14 violators as having cartelized the markets of 14 bulk vitamins from periods beginning as early as

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5 It was not until June 4th and June 15th that the two companies sent memoranda to the EC admitting their violations. BASF supplied a bundle of documents on June 23, 1999. Both Roche and BASF are judged to be instigators, which would have disqualified them for full leniency in any case.

6 Arlman (2005) criticizes DG-COMP for delaying launching its investigations even though public information of a cartel was available for some time. By the time the EC's decision was adopted in November 2001, Rhone-Poulenc had merged with Hoechst to become Aventis (now SANOFI Aventis). Aventis was granted a 100% reduction in fines for Rhone's violations but only 10% for Hoechst's cartel activities. Roche and BASF each received a 50% reduction for their cooperation.

December 1998 to as late as February 1999. Like other antitrust authorities DG-COMP did not investigate hints of vitamin cartel activity in the 1980s.[7] Unlike the U.S. and Canadian authorities, the EC regarded each of the 12 cartels as somewhat separate violations. This approach permitted the EC to impose considerably higher fines than a unified fine calculation. The decision did not address allegations of cartels in vitamins B3, B4, B12, or vitamin premixes.[8]

The EC ordered 11 of the 14 companies to pay fines that totaled an impressive $759 million, an amount about 17% lower that that imposed by the United States (see Tables 13.1 to 13.3 above). The lion's share (95%) of the fines was paid by Roche ($410 million) and BASF ($308 million). Rhone-Poulenc was granted amnesty for its participation in the vitamins A and E cartels, but its new parent Aventis was fined $4.5 million for its Hoechst subsidiary's collusion in D3. The amnesty provision was worth €217 million ($193 million) to Rhone-Poulenc.

In addition, the participants in the vitamins B1, B6, biotin, and folic acid cartels were not fined because of the Commission's five-year "statute of limitations."[9] The time that elapsed between the date the investigation began and the date the violation ceased ranged from five years and two months to five years and five months. As a result of its slow start, the Commission levied no fines on five otherwise guilty firms: Lonza, Kongo, Sumitomo, Sumika, and Tanabe. Roche, BASF, Takeda, and five other firms also benefited greatly from the five-year rule. The EC has been criticized for its tendency to delay the start of its investigations, which has allowed many cartel violators to escape punishment (Arlman 2005). The net reduction in fines from the EC's slowness to act benefited the 13 firms to the tune of €290 million ($257 million).

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7 Consistent with Bernheim's (2002a) analysis, at least one target firm admitted to "collusive contacts" in the 1980s that ended in 1989 when prices fell temporarily (EC 2001: endnote 21). Given the turnover among managers and unavailability of 15-year-old corporate records the lack of follow-up might be justified on pragmatic grounds. On the other hand, Roche's data books maintained information going back to 1980.

8 The decision contains a short paragraph that relates that the respondents (Roche and BASF) admitted discussions on fixing premix prices in Europe but that "…there had never been any effective agreements…since most sales were made as 'straights'" (EC 2001: p. 129). Under a conspiracy theory of cartels, such an excuse would not be tolerated. Even as a matter of simple logic it is suspect. A separate decision on choline chloride is discussed below.

9 Technically this is not a parliamentary act, rather, the rule is contained in Article 1 of the European Council's Regulation (EC) No. 2988/74 and Article 25 of Regulation No. 1/2003.

Choline Chloride (Vitamin B4)

The European branch of the global choline chloride cartel was investigated for slightly more than five and one-half years before being fined: from May 26, 1999 to December 9, 2004 (EC 2004).[10] After completing its investigation, the EC intended to fine all six members of the global conspiracy, including three North American companies, but again was foiled by its procrastination and the five-year "statute of limitations." In this instance, the EC seems to have blundered badly by not opening its investigation earlier. Even if the DOJ did not share the fact that Bio-Products had been approved for amnesty in June 1998, the EC must have been aware of Chinook's well publicized guilty plea in September 1999. Even more unsettling is the EC's own admission that Chinook's legal counsel met with the Commission a month later and that the company delivered considerable written information about the choline chloride cartel in December 1999 (EC 2004:17). Yet, the Commission inexplicably declined to investigate what must have been clear evidence of a global cartel with effects spilling over into the EU market.[11] Instead, the EC waited until late May 1999 to formally open its probe in response to a formal application of leniency from Bio-Products on April 28, 1999 (*ibid.*).[12]

From the EC's point of view, the choline chloride cartels operated at "two levels," a group of three sellers within the EU and a global organization of six firms (EC 2004: 21). UCB and Akzo argued that the global and European arrangements were separate infringements (*ibid.*). Yet, from a legal point of view the EC ruled that the multiple branches or levels constituted a "single and continuous infringement" of the EU's competition rules (*ibid.,* pp.50-53). A ruling that there were two infringements would

10 This 77-page decision was published in late 2005. It is the most complete source of information on the choline chloride market and the cartel's operations.

11 The documents submitted by Chinook totaled 255 pages (EC 2004: footnote 38). It is not known whether they contained information on the European branch of the cartel, but it is known that Chinook and UCB had many meetings and other contacts throughout the cartel's existence. Moreover, Chinook's submissions did describe Chinook's admission that it attended illegal cartel meetings and the 1992 agreement that prevented the North American members of the global cartel from exporting to Europe.

12 In letters sent July 1999 and October 1999, Chinook claimed that its November 1999 meeting with the Commission was in fact an application for leniency, and it disputed Bio-Product's right to qualify for amnesty (EC 2004: p. 52). The Commission replied in September 1999 that "„Chinook's legal counsel had insisted …on the provisional, exploratory and informal nature of the contacts." (*ibid.*). Memories of this meeting vary. When Bio-Product's counsel met with the Commission in April 1999, he specifically cited full cooperation under the 1996 Leniency Notice. It appears from this episode that it is necessary for counsel to specifically cite (perhaps in a proffer letter) the EC's Leniency Notice when applying for leniency. In this particular case the leniency decision was mooted by the EC's finding about the early ending date of the global-level conspiracy.

have favored the European firms, because the EC increases the fines for more durable cartels. The global group got started by November meeting in Germany in November 1992, whereas the European branch may not have begun anticompetitive discussions until March 1994. Price targets were discussed by the three European manufactures at its last meeting in Aachen, Germany in October 1998.

By contrast, the EC had no evidence of North American participation at price-fixing meetings after April 1994. This is the main factual basis for exculpating the North American conspirators from European fines. The EC's interpretation of the cessation of collusion by the North American producers is at odds with its view that there was only one collusive group. It is true that North American exports to Europe began soon after April 1994, but this is hardly conclusive evidence of a permanent, full, or irrevocable abandonment of the global agreement. Besides, there *were* collusive bilateral contacts between BASF and some American firms regarding Latin American sales (EC 2004:35). Moreover, Chinook and Bio-Products provided ample evidence of continuing successful collusion in the North American market. European buyers were harmed until at least September 1998, because absent the North American cartel geographic arbitrage on a much larger scale would have broken the European cartel.

The EU's choline chloride investigation lasted for 68 months. In the decision of December 9, 2004 the three European manufacturers of choline chloride were fined a total of €66.34 million or $88.4 million (EC 2004:60-75). BASF, the smallest of the three, received the largest fine of $36 million. The fines were calculated by starting at the minimum point for a "very serious" infringement (€20 million per firm), because the EU affected sales of $408 million were judged to be "relatively small." Then the Commission decided to create four firm-size categories based on the six companies' *global* market shares; as a result, the three European companies got fine reductions of 36 to 53%. Then, in the name of deterrence, the preliminary fines were raised by 100% for Akzo Nobel and 50% for BASF using the companies' 2003 global sales as a guide. A further increase of 55% was implemented for all three because of the cartel's 5.5 years' duration, and BASF received a further 50% enhancement for recidivism involving a 1994 EU decision. No attenuating circumstances were permitted to moderate the fines. The final adjustments were modest reductions of 20 to 30% for various degrees of investigative cooperation (timely delivery of evidence, degree of detail provided, or a decision not to contest the facts).

Four aspects of the EC's fining procedures appear to be arbitrary. The percentages applied for enhancements or reductions have evolved over time to become somewhat consistent across cases, but are nevertheless difficult to square with a deterrence framework. Relative to the harm caused in the EU market, BASF's fine ended up being three times harsher than

Akzo's (Connor 2006b: Appendix Table 2B). Singling out BASF for recidivism was also curious, because the other two firms were also recent recidivists. The reduction in fines because of the allegedly small size of the chlorine chloride market is difficult to accept; it was in fact the fifth largest of the nine vitamins cartels fined by the EU. Finally, the four market-share categories are arbitrary. Only two were used in the other vitamins cases; worse, the top two categories were populated by the North American targets that had already been eliminated from consideration.

Chinook, Bio-Products, and Nepera were not sanctioned simply because their active collusion was deemed to have ended more than five years before the EC's investigation began in May 1999.

Other Jurisdictions

Eight other nations[13] investigated the vitamins cartels, but only three of them punished a few members of the global vitamins cartels. In the aggregate the fines were small (Tables 13.1 to 13.3 above).

In March 2001, an Australian court approved fines recommended by the Australian Competition and Consumer Commission for three vitamin suppliers that admitted fixing prices of bulk vitamins A and E sold to animal-feed companies. The three Australian subsidiaries of Hoffmann-La Roche, BASF, and Rhône-Poulenc (now Aventis) agreed to pay penalties of Australian $26 million (US$14.3 million), a record amount under the country's 1974 Trade Practices Act. In fact, the A$15 million paid by the Roche subsidiary was more than double the previous record amount. The Commission Chairman stated that the settlement was a lenient one because of the defendants' cooperation in avoiding a costly trial. Price fixing allegations concerning human vitamins were under investigation in 2003, but appear to have been closed by early 2006.

Another antitrust authority that imposed monetary sanctions in vitamins is the Korean Fair Trade Commission (KFTC 2003). Korea is totally dependent on imports for its bulk vitamins, so obtaining evidence was especially difficult in this case. In April 2003 the KFTC announced that it was demanding $3.1 million from six foreign manufacturers: Roche, BASF, Aventis, Eisai, Daiichi, and Solvay. Affected sales in Korea were $185 million. The KFTC gave one example of price changes caused by the cartel. Compared to the year before the cartel, import prices of vitamin B5 rose to a 1997 peak 70% above the base price. Korea is an example of what a determined antitrust authority can do to help deter global cartels. This was Korea's second global cartel conviction.

[13] No information can be found about the French, Mexican, or Taiwanese investigations.

Brazil opened an investigation of the vitamins cartels in 1999 that focused on the three largest companies and their three largest products (UNCTAD 2002:5-6). These three products achieved more than $500 million in affected sales. Through interviews with managers of the three companies' Brazilian subsidiaries, the Brazilian antitrust authority issued an adverse decision in December 2002. In 2005, a study by one of Brazil's antitrust authorities (the SDE) found that the Big Three members of the cartel had caused Brazilian import prices for the seven largest vitamin products to rise by $183 million (30 to 37%). The companies' appeals were still active in early 2006.

One of the more surprising developments concerned Swiss reactions to the vitamin cartel. In early May 2000, the Swiss competition-law agency WEKO came to the fairly obvious conclusion that the global vitamin cartel had affected vitamin prices in Switzerland. Moreover, about half of the cartels' meetings took place in Switzerland. Therefore, WEKO issued an injunction against its national champion Hoffmann-La Roche and its co-conspirators to cease price fixing. This is in fact the maximum sanction WEKO could impose for a first-time price fixer. Only if Roche or its co-conspirators *repeat* their crime can they be fined under current Swiss law. With the weakness of Swiss sanctions so fully revealed to the world, to avoid the appearance of a cover-up for Roche both houses of the Swiss parliament passed motions in late May supporting the imposition of fines for first-time offenders. Swiss competition law is now aligned more closely with that of the EU Member States.

Among the jurisdictions with well established antitrust laws, Japan is notable for the near absence official actions taken publicly against foreign conspirators in international cartels; nor has it punished admittedly guilty domestic cartelists, namely, the two lysine or six vitamins companies headquartered in Japan. The two Japanese lysine companies (Ajinomoto and Kyowa Hakko) issued press releases apologizing for their actions, but did not immediately fire any of its employees involved in price fixing. After raiding the offices of ten vitamin manufacturers in January 2000, the Japan Fair Trade Commission (JFTC) found no evidence of cartel behavior by any of the European producers. However, three of the largest Japanese vitamin manufacturers imposed a number of sanctions upon themselves immediately after their guilty pleas in the United States. The presidents and all board members of the three companies voluntarily took fairly significant pay cuts; their presidents resigned from honorary positions in various Japanese trade associations. In April 2001, the JFTC issued warnings against Daiichi and Eisai for their collusive activities in the markets for vitamins B5 and E.

New Zealand took similar action. In January 2001 the Commerce Commission sent warnings to the local subsidiaries of Roche, BASF, and Aventis. A statement by the Commission said that bringing charges was not possible because the last New Zealand meeting about prices occurred in 1994, and the Commerce Act has a three-year statute of limitations.

Chapter 15: The Civil Suits

Introduction

Earlier chapters have recounted how low antitrust fines were prior to 1990 and how these fines have grown in the 1990s in the case of price fixing. This chapter will demonstrate that civil settlements for price fixing have grown apace. In part, the increased size of criminal and civil financial sanctions reflects the growth in the size of corporations and the markets that they exploited. In order to deter managers from contemplating the formation of future price fixing conspiracies, the penalties must be pegged to the size of the injuries that would be caused. However, there is evidence that the harmfulness of price fixing infractions has increased. The proportion of discovered cartels prosecuted since 1995 been international cases, and they are larger markets than the national or regional cartels discovered in prior years. Combined with the newly assertive stance of antitrust agencies and the expanded opportunities for private suits, fines and settlements have increased faster than the size of the affected markets.

Private antitrust suits provide deterrence complementary to public prosecutions. Civil class-action suits are a vehicle especially suitable for permitting small buyers – small firms or consumers – to win relief for the damages caused by price-fixing conspirators. The conspirators in cases brought in the late 1990s were mainly large, powerful corporations in highly concentrated industries. Their great wealth and access to legal resources generally brings a David-and-Goliath aspect to antitrust class actions. Yet, there are many legal commentators that have disparaged their use in treble damage cases.

In part, the debate over the desirability of class-action treble-damages suits reflects a wider debate on the social benefits of treble damages themselves. Some believe triple damages to be unnecessarily high to deter (Easterbrook 1986), while others argue that plaintiffs rarely receive more than single damages (Lande 1993). From a financial benefit/cost perspective, companies will be deterred from joining cartels only if the expected financial losses (the total fines and settlements multiplied by the

expected probability of conviction) exceed the expected financial gains from price fixing (see Chapter 2). If plaintiffs really do get closer to single damages, then civil settlements alone provide virtually no deterrence because only a small portion of all conspiracies are discovered and prosecuted.[1] Moreover, buyers who had to exit a market because of cartel-elevated prices are rarely compensated (Page 1996).

Another issue that troubles critics of class-action suits is the large size of the legal fees and the incentives they might give for lawyers to file frivolous suits. Calkins (1997:441) suggests that the rise in successful government prosecutions make the need for supplemental deterrence from civil cases much less justifiable. However, in Chapter 13, it was shown that the typical criminal fine imposed was one-fifth to one-half of the best estimate of actual overcharges, so the need for supplemental civil punishment would appear to be still strong. At present discovery rates, total penalties should amount to triple to quintuple the damages caused.

This chapter focuses on the civil cases generated by the lysine, citric acid, and vitamins cartels. Federal class-action suits were filed in the United States and Canada by direct buyers in each case and are fairly well documented. Some of the members of the federal class opted out of the purposed settlements, and many of them settled by means of private negotiation. Much less is known about the opt-out settlements because terms of the settlements typically include non-disclosure clauses. Indirect buyers of these products launched suits in several U.S. states and Canadian provinces with varying degrees of success. One *parens patriae* action by large number of state attorneys general was successfully concluded. Finally, related suits for fraud and mismanagement were decided in the lysine case. The global cartels chosen for inclusion in this book will allow the full panoply of civil actions to be illustrated.

The Federal Lysine Case[2]

The FBI raid on ADM's headquarters on the night of June 27, 1995 alerted buyers of lysine and law firms to the possibility of a treble-damages suit. Some feed manufacturers contacted their retained law firms, and in other cases law firms contacted lysine buyers to offer their services. The identity

[1] A couple of writers of industrial-organization textbooks, themselves experienced forensic economists, have speculated that as few as 10% of all price-fixing conspiracies are investigated or prosecuted. An informal survey by Frederick Warren-Boulton (conveyed to the author) revealed that experienced antitrust defense counsel believed the same. Bryant and Eckard (1991) find the probability of detection to be 13 to 17%.

[2] For an annotated list of sources for this section, see Connor (2000: Appendix A). A description of the events of late June to August 1995 can be found in Chapter 13 above.

of two of ADM's co-conspirators soon became known through pithy press releases by Heartland Lysine in Chicago and Biokyowa in St. Louis that denied wrongdoing and pledged cooperation with government investigators. On June 28th the *Wall Street Journal* reported on its front page that subpoenaed and seized documents found at ADM's offices showed "score sheets" of "sales targets" and the actual monthly sales of the world's three largest producers of lysine.

ADM's troubles with civil litigants began quickly to mount. By November 1995, ADM was facing 11 private treble-damages suits by lysine buyers, more than 30 stockholders' suits alleging "material mismanagement" of the company, and 30 private antitrust suits by buyers of citric acid or corn sweeteners, some of which combined two of the products. Several of the shareholders' suits sought structural reforms of ADM's governance structure. Among the demands were a smaller board and more board members that meet a stricter definition of outsiders. The board as it was constituted in 1995 was described by the *Washington Post* as ". . . handcuffed by company insiders, family members, cronies, and friends of the powerful chairman." Also open to criticism was the advanced age of many board members; nine of the 17 were 69 years or older in January 1996. By February 1996, the number of private suits against ADM alleging price fixing or related management failures had risen to 85.

In early 1996, the many plaintiffs in the lysine treble-damages suits were certified as a single federal class. U.S. Judge Milton Shadur in Chicago was assigned the task of certifying the class, arranging for its representation, managing pre-trial discovery, and approving of any pre-trial settlement deals offered to class members. Judge Shadur had many original ideas about how to expedite antitrust class-action suits. In February, he told the law firms representing plaintiffs that he had decided to *auction* the right to act as lead counsel for the class. The low bidder would be the winner. In order to further minimize the size of class counsel's fees, Shadur refused to accept bids based on the traditional percentage contingency fee. The winner of the unprecedented auction was the Philadelphia law firm of Kohn Swift and Graf. The firm's bid was a sliding scale capped at $3.5 million for any settlement agreement equal to or above $25 million for class members.

During the period February to April 1996, there was little movement discernable in the government's criminal case against ADM and the other alleged members of the cartel. At this point, Michael Andreas and Terrance Wilson had been informed by the DOJ that they would be indicted, but no formal filing had been made and both men were refusing to plea bargain. No ADM insider except the discredited Mark Whitacre was willing to provide useful information to the government. The officers of the Asian cartel members were similarly tight-lipped, and besides most of

them could not be deposed because they resided in Japan or South Korea. Although ADM hired the top-notch Washington law firm of Williams & Connelly to defend it against criminal charges in March, there was very little movement visible in the criminal case either. Even with a couple of resignations, the board was still very much the creature of Dwayne Andreas who was resisting settlement. Without a resolution of the criminal case, a civil settlement seemed less likely.

However, there were some signs that ADM was less resolute in opposing a civil settlement. In February, ADM stated publicly that it was willing to consider settling out of court. At about the same time, it became known that ADM had created a special reserve fund to pay suitors should the need arise. A key factor from ADM's point of view was the fact that a civil settlement requires no admission of guilt, nor can it be used as evidence in a criminal trial. From Dwayne Andreas' point of view, compared with a criminal guilty plea, approving a civil deal was by far the lesser of the two evils. Besides, it might help repair his eroding support of ADM's Board of Directors; by April the Directors' special committee was urging ADM's management to plea-bargain with the DOJ.

The likelihood of a deal on the lysine treble-damages suddenly increased in April 1996. On the 12th of that month, ADM, Ajinomoto, and Kyowa Hakko jointly announced that they had offered to pay the federal class of lysine buyers the sum of $45 million ($25 million from ADM and $10 million each from the other two). The law firm of Kohn Swift and Graf had spent only two or three months in negotiations for their 150 plaintiffs. Of course, any settlement above $25 million was equally lucrative to class counsel because of the cap on their fees. The fixed fee brought about the result Judge Shadur had wanted: a swift settlement with a minimum of fuss. The legal fees for class counsel were extremely low by historical standards.[3] No economic experts had been hired and no depositions taken of ADM officials – all standard procedure in civil negotiations. Legal experts considered a settlement offer at this early stage of discovery almost unprecedented. A major gap in the plaintiffs' knowledge was created by the too-early settlement: plaintiffs could not listen to the tapes. Even more critical a factor for the plaintiffs' decisions to consider an early deal was the uncertainty in early 1996 as to whether ADM would plead guilty, be indicted by the DOJ for criminal price fixing, or if indicted be found guilty. In other words, despite the mounting evidence that the DOJ intended to convict ADM, many plaintiffs calculated that there was a good chance they would get nothing in the future.

[3] After two more defendants paid another $4 to $5 million, legal fees were only 7% of settlement amounts, or about a third the conventional rate.

Judge Shadur set a "fairness hearing" for July 15, 1996. The purpose of the hearing was to hear arguments about whether the proposed settlement amount was fair and reasonable for the plaintiffs. The defendants' offer implied an estimated overcharge on lysine of $15 million of the "affected period." Defendants proposed that purchases for 1994 and the first half of 1995 would be the criterion for distributing the damages awards. As U.S. sales of dry lysine were about $250 million during that 18-month period, the three largest members were suggesting that lysine prices had risen by only about 6% during the apogee of the cartel's power. This overcharge percentage is quite low by historical standards (Connor and Lande 2005). Moreover, two months later these defendants would plead guilty to price fixing for a period of almost three years. The additional sales implied by the longer conspiracy period means that the overcharge rate was a pitifully low 3% of purchases.

A split developed within the federal class. The larger lysine customers generally reacted negatively to what they believed was a small offer. In some cases, these firms had prepared overcharge estimates in hours. Several of them took the advice of their own counsel and had an independent estimate of the overcharge prepared by a professional economist.[4] The smaller members of the class were generally satisfied or at least tempted by the offer. Also, smaller companies often have to worry more about keeping smooth relations with big suppliers of a hot product like lysine; accepting the defendant's first offer would be seen as more courteous than demanding more.

Working under great time pressure and with very limited information, the plaintiffs' expert calculated that the lysine overcharge was closer to $150 million than the $15 million proposed by ADM *et al*. There were several reasons for the larger plaintiffs' estimate. They believed that the conspiracy began at the Mexico City meeting in October 1992 (a position that would be taken by the DOJ in its criminal indictments later in the year). The earlier starting date than the one preferred by the defendants implied a lower pre-conspiracy price (Connor 2000, White 2000). Anecdotal evidence on lysine costs of production also suggested a non-conspiracy price of $0.66 to $0.70 per pound. The longer time period also increased the affected sales totals for the cartel. Despite its flaws, the plaintiffs' analysis was probably the best that could be done with monthly average selling prices as the sole available information from the defendants.

The yawning disparity in overcharge estimates had little effect on Judge Shadur's inexorable drive for a tidy settlement process. At the July fairness hearing, he signaled his intention to approve the $45 million

[4] The present author prepared such an analysis for the law firm of Dickstein Shapiro. Williams & Connelly hired two former chief economists of the DOJ to critique the analysis, Lawrence J. White and Frederick Warren-Boulton.

settlement for the federal class, and that decision was made final on July 19, 1996. However, on that day 33 companies, convinced that the amount was too low, opted out of the class. Although only about one-fifth of the number of class plaintiffs, the 33 represented a much greater share of lysine purchases. Most, if not all, went ahead and settled through private negotiations over the next year.

The amounts that the opt-outs received may never be known because all parties are generally sworn to secrecy. Moreover, the one defendant with a fiduciary responsibility to tell its shareholders how much it had to pay, ADM, decided that the small size of the settlement was not "material." However, an enterprising reporter did get one plaintiff's lawyer to talk off the record in a March 1997 piece. The opt-outs that pursued their damages later reportedly received about $20 million. This lawyer also characterized the lysine plaintiffs who remained in the class as "dumb as rocks," which may be taken to mean that the opt-outs did significantly better in their compensation than those that remained in the class. The major factor that explains the superior recovery by the opt-outs is that they settled after the lysine defendants pleaded guilty.

More than a year later the wisdom of the lysine settlements was still being debated in the pages of *The National Law Journal*. Noted columnist, Columbia Law School professor John C. Coffee, cited the lysine case as the egregious example of the flaws in allowing law firms to bid for the right to represent class-action plaintiffs. The biggest problem is that of perverse financial incentives. Auctions for fixed fees leaves the winner ". . . with little incentive to maximize the recovery for the class." Coffee cites four pieces of evidence supporting his contention that the lysine settlement was "a study in class action pathology." (1) As a rule, private settlements vastly exceed the criminal fines, but in lysine just the opposite happened. (2) The rapidity of "the race to settlement . . . was unusual and did little to benefit the class." That is, patience would have been rewarded. (3) The recovery rate (claimed to be 7% by class counsel but closer to 3% in reality) cannot be meaningfully compared to the averages of all antitrust class actions "because most private settlements . . . have the opportunity to piggyback on a criminal conviction." (4) Although the legal fees were modest (about 7% of recovery) in the lysine case, class members do not want to minimize fees, they want to maximize recovery. In a retrospective assessment of the lysine civil settlement after the conclusion of the Chicago criminal trial, the *Illinois Legal Times* (October 1998) called the $45 million "unreasonable."

How class counsel should be appointed by a supervising judge is still an issue. Often, a judge appoints the first law firm to file if the judge deems the firm competent to handle several, sometimes thousands of plaintiffs. Alternatively, the competing plaintiffs' counsel may negotiate one of

their number to become lead counsel for the class prior to certification, a sort of nomination process. Both of these methods may be criticized for failing to match the best possible firm to the task at hand, and neither addresses the perceived problem of excessive legal fees. Auctioning the right to represent is not in itself a bad idea, so long as the firms bidding are well qualified. Rather, the main problem is one of incentives for the winning firm. An auction that awards the lead-counsel position to the firm offering the lowest *percentage* fee makes much more sense because it forces firms to calculate their costs relative to expected revenues; winners will tend to be low-cost firms or those willing to accept lower profits. The monetary incentive to get the greatest recovery for their clients remains, as does an incentive to compromise to save time.

The Federal Citric Acid Case

At first the government's investigation of the citric acid cartel moved more slowly than the lysine investigation. Since June 1995 the DOJ's Antitrust Division office in San Francisco handled the probe, but it did not have nearly as much evidence as had been collected for lysine. Some suspicious documents on "target sales" had been obtained in the files at ADM's and Cargill's headquarters, and brief references to a citric cartel had been picked up in Whitacre's tapes of the lysine meetings. However, Terrance Wilson and Barrie Cox, who had handled the citric acid conspiracy for ADM, said nothing of value to investigators for more than a year. It was only when ADM's cooperation was secured by August 1996 that depositions started producing solid evidence of the conspiracy. ADM was the first member of the citric acid cartel to crack, and its co-conspirators took months to cave into prosecutors' demands.

In the lysine case, ADM, Ajinomoto, and Kyowa negotiated on a common front with counsel for the federal class; talks began in February 1996 and came to fruition in April. However, in citric acid, the first references to efforts to negotiate a settlement appear only in May 1996. Moreover, it seems that ADM was moving ahead in talks with plaintiffs with little coordination with its Swiss co-conspirators.

Fewer civil suits were filed against ADM *et al.* in citric acid than in the lysine case. In November 1995 there were seven. Movement in consolidating the scattered suits into one federal class was slow. The class was not certified in San Francisco until late 1996. Thus, it came as a surprise when ADM suddenly announced that it had reached a settlement with U.S. citric acid buyers on September 27, 1996. Changes within ADM may have contributed to its *volte-face*. Just two weeks before, ADM's board had undergone its second shake-up, bringing the total resignations to eight since

June 1995. ADM proposed to pay $35 million to the federal class soon after it was certified. It would take several more months for the European members of the cartel to make their offers. About four weeks later, ADM and the DOJ announced ADM's guilty plea and a greatly reduced fine of $30 million for its role in the citric acid cartel. Barrie Cox's substantial cooperation with the DOJ and the fact that ADM was the first to confess were key elements in the decision to award a large fine discount.

As in the lysine case, a split soon developed between large and small buyers of citric acid. Kenneth Adams, an attorney representing four of the largest users of citric acid, paid defense attorneys an indirect compliment when he slammed the DOJ's wording of ADM's guilty plea. Most evidence points to the citric acid conspiracy beginning during the first half of 1991 (see Chapter 5). However, after negotiations by defense attorneys the government's wording of the October plea agreement vaguely stated that the cartel began operating only "at least as early as" January 1993. Not only did this shorten the collusive period by 18 to 24 months, but the later date also implied that the "pre-conspiracy" price was arguably much higher than that implied by an earlier initial date. What may have appeared to DOJ negotiators as a minor concession had a great impact on the estimated overcharge and on ADM's civil liability.

If the cartel began to raise citric acid prices as late as January 1993 as the defendants claimed, then the cartel's sales volume was about 2.6 billion pounds through 1995, and the but-for-price could have been as high as $0.74 per pound. This scenario results in a global monopoly overcharge by the citric acid cartel of approximately $105 million during 1993-1995. If, on the other hand as the evidence suggests, the cartel began to raise prices around July 1991, then the volume it sold was about 3.7 billion pounds and the but-for price was close to $0.62 per pound. Under this scenario, the global overcharge rises to $573 million – more than quintuple the overcharge implied by the later date.

U.S. buyers of citric acid accounted for just about one-third of global purchases of citric acid during the affected period. Thus, if the plea agreement date of January 1993 is accepted, they suffered injuries of about $35 million. On the other hand, the better supported commencement date of July 1991 yields U.S. price fixing injuries of about $191. Because ADM held approximately 29% of the U.S. market, its settlement offer in September was predicated on an implied U.S. cartel overcharge of about $40 million (very close to the $35 million low estimate).

On December 9, 1996 the other large members of the citric acid cartel offered to settle with the plaintiffs. The amounts offered were proportional to ADM's offer and their share of U.S. sales. Haarmann & Reimer/Bayer offered to pay $46 million, Hoffmann-La Roche $5.7 million, and Jungbunzlauer International $7.6 million. Taking a page out of

ADM's book, none of the three "Swiss" firms had as yet pleaded guilty. Such pleas would not be entered until January or March 1997. Meanwhile, plaintiffs in the class were mightily tempted to take what seemed like a generous offer totaling $96 million. However, if the plaintiffs accepted, they would be misled by the late commencement date and the low but-for price.

ADM's $30 million government fine announced in October 1996 was a terribly poor guide to civil damages because it had received a huge discount for cooperation. Haarmann & Reimer also got a hefty discount. The cartel overcharge implied by their prediscount fines must be at least $227 million. Under alternative conspiracy periods and but-for prices, the estimated overcharge rises to well over $300 million. Lawyers representing federal class plaintiffs claimed $400 million.

In July 1997 the U.S. District Court in San Francisco approved a settlement of $86.2 million for the remaining members of the federal class. The total was slightly reduced from the four companies' initial offer because five large buyers had opted out of the class. Nevertheless, the striking fact is that class plaintiffs received compensation that is at most *one-third* of the overcharges imposed on them by the citric acid cartel.

Five companies withdrew from the federal class settlement in July 1997. Procter & Gamble, Kraft Foods, Quaker Oats, Unilever, and Schreiber Foods had purchased $350 million in citric acid from 1991 to 1995. Back in November 1996, the opt-outs' counsel had reacted with pique to ADM's low-ball offer to his clients and the poor guidance the DOJ had provided plaintiffs with the wording of ADM's guilty plea:

> "The Justice Department has allowed the facts to be covered up . . . It is clear what ADM and the DOJ got out of the [criminal] deal – reduced civil liability for Archer Daniels and a record settlement for the Justice Department." (*Bloomberg News* November 28, 1996).

A year and a half later, the three Swiss companies in the citric acid cartel settled with the opt-outs. While the terms of privately settled treble damages claims are normally kept confidential, some information came to light that allows reasonable inferences to be made as to the settlement size. ADM as a public company is required to report developments that materially affect its profits. Civil settlements previously made by ADM in lysine were deemed nonmaterial, but it did report the amount it paid to P&G, Kraft, Quaker, and Schreiber. The payment was $36 million. Assuming that ADM paid in proportion to its U.S. market share, all four conspirators must have ponied up about $89 million. Given that these four opt-outs purchased 15 to 20% of all U.S. citric acid during the conspiracy period, the

recovery rate for the opt-outs was three to five times higher than that for the federal class. More importantly, the opt-outs received a settlement that was definitely above single damages and probably close to double damages.

Confirmation of high recovery rates for the opt-outs came in a statement made at a 1998 press conference by the CEO of Roche Holdings, Franz B. Humer. He said that Roche had paid $10 million to settle U.S. civil suits in citric acid. It is public knowledge that of that $10 million $5.7 million was paid to the federal class. By subtraction, $4.3 million was paid to the opt-outs. Given their relative shares of U.S. market purchases, it is clear that from Humer's statement the opt-outs settled at a rate three to four times higher than the federal class.

Finally, a settlement with indirect buyers of citric acid in California was announced in July 1999. Most of the buyers were small food processors that purchased citric acid from chemical wholesalers. The plaintiffs' lawyer stated that the overcharge by sellers was 10 to 17% of sales; his clients were compensated at the rate of 27% of the value of their purchases, or about double the overcharge. Again, these plaintiffs got a settlement rate that was five or six times better than the federal class, though like the opt-outs they had to wait a couple of years longer to get paid. In total, U.S. settlements were $200 to $250 million.

The Federal Corn Sweeteners Cases

As mentioned above, ADM's plea agreement in October 1996 granted immunity from criminal prosecution for price fixing in the market for HFCS.[5] However, the government's investigation of price fixing by the other leading producers of HFCS continued for two years after the ADM deal. In August 1999, the DOJ announced that it had closed its criminal investigation of price fixing sometime during the first half of the year. The DOJ's abandonment of the criminal investigation may have been a pragmatic decision based on possessing only circumstantial evidence insufficient to prove price fixing beyond a reasonable doubt in a jury trial. The FBI's sound and video tapes contain incriminating statements by Michael Andreas and Terrance Wilson, both of whom reportedly refused to talk during their civil depositions in the HFCS case.

In September 1996, the plaintiffs got a small break. CPC International agreed to settle for $7 million. As is typical of negotiated settlements,

5 On the other hand, one tape made by Whitacre reportedly has Michael Andreas saying that his counterpart at Cargill would not participate with ADM in overt price fixing. All of Whitacre's tape recordings were ordered to be released to civil plaintiffs by the Appeals Court of the 7th Circuit Court on June 19, 2000. ADM, James Randall, and other ADM employees had resisted their release for years.

the first company to settle is often not one of the leaders (CPC was third or fourth in the industry), and plaintiffs are willing to settle for relatively low rates. An early settlement also helps finance the costs of plaintiffs' counsel. However, CPC's motive for settling may have been rather mundane. In December 1997, CPC International underwent the fashionable route of dismemberment and refocusing. CPC split itself into a consumer-products food company renamed Best Foods and an industrial-ingredients unit called Corn Products International. Settlement was a precondition for this restructuring plan to meet with investor approval.

Plaintiffs in the civil case persevered against the remaining four defendants. They believed that they had compelling economic evidence of substantial price increases in corn sweeteners for 1989-1994 that could not be explained by competitive market forces. The defendants hired battalions of pedigreed lawyers and squads of economic experts to defend themselves.

Termination of the criminal case initially strengthened the hands of the four defendants in the civil treble-damages case and encouraged them to delay settling. Cargill was delighted that they would not be indicted by the government. A company spokesperson said:

> "We're proud of our reputation for integrity. Our commitment to ethical behavior paid off with the conclusion of the sweetener investigation."

Cargill's statement proved to be too optimistic. *Nine years* after the FBI raid on the HFCS companies' offices, the remaining four defendants threw in the towel. In March 2004, with a trial fast approaching Cargill and American Maize broke ranks with the other two sweetener manufacturers and settled for $28 million. This was obviously a sweetheart deal designed to get ADM and Staley to settle, because under the legal principle of joint and several liability it left the two largest defendants exposed to nearly all of the billions of dollars in trebled damages alleged by plaintiffs. In June and July 2004, ADM and Staley (a Tate & Lyle subsidiary) agreed to pay $575 million to settle the suit. Assuming that the defendants had a 50:50 chance of losing at trial, the $611 million they paid was a reasonable outcome. I estimate that the trebled damages would have reached $4 to $6 billion, so in 1989-1994 dollars the defendants paid as little as 10% of their maximum exposure.

The Vitamins Cases

United States of America

Private treble damages suits filed in the United States resulted in the largest antitrust settlements in history. Scores of class actions were filed in many federal courts around the United Sates, and these were consolidated in one principal action[6] that was argued in the U.S. District Court for the District of Columbia in 1999 to 2003. This consolidated suit had approximately 4,000 plaintiffs, firms that had purchased bulk vitamins in the United States directly from the major manufacturers. Most were manufacturers of animal feeds, foods, pharmaceuticals, or vitamin premixes; some were farmers or farm cooperatives; and some were chemical wholesalers. Not all eligible buyers registered as plaintiffs.

Chief Judge Thomas Hogan was in charge of ruling on dozens of issues that came before the Court. One decision he made was to split off the main suit *Vitamins Antitrust Litigation* and create three other groups with somewhat different issues: the niacin and biotin group (with defendants Lonza, Degussa, Nepera, Reilly, Sumitomo, and Tanabe), the choline chloride group (BASF, Akzo Nobel, Chinook, Bio-Products-Mitsui, DuCoa, and UCB), and E Merck.

Each of the defendants had retained a couple of law firms, and the federal class was represented by scores of law firms. At least 500 lawyers feasted on fees that would top $250 million (Boies 2004:254). In May 1999 plaintiffs' firms chose three among them to act as co-lead counsel. One was well known litigator David Boies II (Donovan 2005). His firm had been mostly circumstantial evidence for more than a year and had been one of the first to file a complaint. Boies (2004) relates that Roche first offered to settle in December 1998, five months before their guilty pleas were announced. He also claims that he offered the Big Three a settlement offer of $400 million in April 1999, but at the meeting of plaintiffs' firms one month later he was told to settle for a minimum of $550 million. Roche and BASF were eager to accept, but Rhone-Poulenc was unwilling to pay at the same rate as the other two. A settlement agreement with the Big Three defendants was reached in about six months, which is very quick compared to most large treble damages cases. With the last-minute addition of the three largest Japanese defendants, Boies presented a

6 *In re Vitamins Antitrust Litigation* dealt with the Big Six defendants and their products. Prosecution of the "Little Twelve" and some of the smallest products (vitamins B3, B4, B9, and H) proceeded on separate tracks.

preliminary agreement for $1.17 billion to Judge Hogan on November 3, 1999. Fees of $123 million were added later.[7] The proposed settlement was hailed by many as the largest antitrust class-action sum in history. Later, Boies and company were able to obtain a further $225 million from the 12 smaller, but recalcitrant defendants.

Boies' (2004) inside account of the settlements reveals that the lead counsel of the federal class aimed at extracting at most single damages from the vitamins defendants (p. 250). However, the proposed class settlement amount was only about 18% of direct purchases of bulk vitamins in the 1990s and 51% of estimated overcharges.[8] Several of the largest buyers were dissatisfied with the amount negotiated by class counsel, partly because they believed that the overcharges were at least twice as high as represented by class counsel. Thus, in March 2000 about 300 companies formerly in the federal class decided to opt out of the main settlement. They then filed separate law suits (often called "direct actions") to recover treble damages.

Direct-action plaintiff's lawyers pressed the defendants to get as much information as possible to prosecute their claims. Most of the details about the scope of discovery requests are confidential and must be inferred from expert's reports that have come to light. Defendants' ended up divulging a great deal of financial and economic information to the plaintiffs (Bernheim 2002a, 2002b). Hundreds of thousands of transactions of vitamins products were revealed. Monthly prices from as far back as 1980 and as recently as 2003 were made available for scores of specific grades of bulk vitamins; these dates extended far beyond the longest guilty-plea periods. Internal data on plant locations, production capacities, quantity of output, input costs, and sales to various locations were given to plaintiffs for the purpose of expert analyses.[9] Scores of depositions were taken. From

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[7] These fees, as a share of the anticipated $1.17 billion, would have been a low 10.5%; adding the additional $225 million, the ratio would have been 8.8%. However, the reduced payout to the rump class after the opt-outs fled raised the fee rate to above 50%.

[8] Less than six months is insufficient time to obtain the type of data under discovery that would have allowed accurate economic estimates of the overcharges. Moreover, the initial settlement did not allow for price fixing that may have occurred in the 1980s. Class counsel claimed that the settlement was 23% sales (Boies 2004:254).

[9] Bernheim (2002: xxi-xxii) calculates that all plaintiffs incurred overcharges of $2.103 billion in current dollars ($3.507 billion in damages converted to 2002 dollars). Of that total, 47% was imposed on the direct-action plaintiffs and 53% on the remaining buyers. In addition, during the possible 1985-1989 collusive episodes damages for the opt-outs amounted to a further $209 million (2002 dollars) or an additional 21%; because of the greater lapse of time from the 1980's episode, the damages were an additional $465 million (in 2002 dollars) or 28%. Class plaintiffs made no claims of damages from collusion in the 1980s.

the time that plaintiffs' law firms first met to organize, three years elapsed until their expert's analysis was prepared.

In motions made to Judge Hogan, plaintiffs also attempted to obtain relevant records of written submissions by the defendants to the Canadian and EU antitrust authorities (Spratling and Arp 2005: 39-40). One set of documents was the amnesty applications made by some of the defendants. Both the Canadian and EU governments opposed turning over these documents. Judge Hogan ruled that the European Commission must provide the submissions, but the Canadian government did not. As a result of these and other discovery motions, Canada and the EU amended their leniency-program rules to permit entirely *oral* leniency applications and witness interviews.[10] These policies are consistent with U.S. practice.

The direct-action plaintiffs represented 75% of all plaintiffs' bulk vitamin purchases during the conspiracies of the 1990s (Denger 2005). Thus, the opt-outs were generally much larger buyers than those remaining in the federal class after March 2000. Counsel for most of these opt-outs later outlined the terms of settlement (Greene 2005). He asserted that his clients received a settlement of almost $2 billion. Thus, as a percentage of their nominal purchases in the 1990s the opt-out firms' settlement was about 77%.[11] This compares to the 15 to 18% received by the buyers who stayed in the federal class. That is, the opt-outs recovered *five times* as much per dollar purchased than the remaining members of the class.[12] Denger (2005:7) extrapolates these data to all the opt-outs and suggests a recovery of $3.6 to $4.3 billion.[13] Together with the recovery and fees of the federal class (mentioned above), direct purchasers were paid $4.2 to $4.9 billion.

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10 The EC prefers written submissions by companies applying for leniency (Spratling and Arp 2005:40-41). The oral applications are transcribed by the EC and are reviewed and certified by counsel for the applicant. The EC maintains that these transcripts are Commission documents, not company documents, and are hence not discoverable by U.S. litigants. The discoverability of "paperless" leniency applications is still in doubt.

11 However, as a percentage of nominal dollar purchases for the *extended* 1985-1999 conspiracy period, the opt-outs recouped only 61%. Comparing the $2 billion to the present value of the affected commerce of the cartels would further lower the percentage.

12 One of the largest opt-outs was Tyson Foods. In fiscal years 2002-2004 the company's distributions from various settlements were so large ($306 million) that they had to be reported in their annual stockholders' reports. Similarly, arch price fixer ADM reported distributions of $175 million.

13 Denger hints that the remaining opt-outs got from three to five times what they would have received ($350 million) had they remained in the federal class. This follows from his statement that the recovery of direct buyers from the Big Six defendants alone was $3 to $4 billion and the known $225 million from the smaller defendants. Legal and experts' fees exceeded $250 million.

Although Boies and the other class counsel may be open to criticism for negotiating a sweetheart deal with the Big Six without full information, they assiduously during 2000-2004 in pursuing many of the Little Twelve remaining defendants. Except for two financially weak firms in the vitamin B4 cartels, plaintiffs obtained much higher settlements per dollar of sales by exploiting the legal rule of joint and several liability (Boies 2004: 255-260). Although he may exaggerate, Boies asserts that the four vitamin B3 suppliers paid out 63% of their U.S. cartel sales.; that in 2002 Sumitomo agreed to an amount equal to 82% of its cartel revenues; and that E. Merck's $50-million settlement was 89% of the company's affected sales. The most lucrative victory for the vitamins plaintiffs was in a jury trial that was held because Mitsui refused to admit that it had managerial control over its 100%-owned subsidiary, vitamin B4 producer Bio-Products. With strong economic testimony by the plaintiffs' expert and a poor showing by Mitsui's legal team, the jury decided that Mitsui owed all the remaining trebled damages ($114 million).

Canada, Australia, and the United Kingdom

The most successful private suits were launched in Canada. Canadian courts began authorizing substantial recoveries in the late 1990s. The vitamins litigation was settled in the Supreme Court of British Columbia in April 2005 (for BC residents only) and in Ontario Superior Court (for the rest of Canada) in March 2005. There were 20 corporate defendants. Unlike the United States, the courts consider three groups of plaintiffs simultaneously: direct buyers, indirect commercial buyers, and consumers. Including fees but excluding prejudgment interest, the settlement aggregated to C$127 ($US 105) million on total Canadian affected sales of C$870 million (14.5%). The award was strongly affected by an analysis of a University of British Columbia economist that concluded that Canadian overcharges were 12 to 16% of affected sales. The settlement was by far the largest private antitrust suit in Canadian legal history. Approximately 75% of the funds were distributed to direct buyers and 17% to indirect buyers; the latter was handled through a *cy pres* process by giving the funds to selected consumer and trade associations.

In Australia, a class action was filed in 1999 against the three largest vitamin makers on behalf of buyers of eight animal-grade bulk vitamins. In July 2006 an historic settlement of US $23 million was announced; in addition, contingency legal fees of $8 million were awarded.

An important private antitrust case captioned *Provimi v. Roche Products* came before the English High Court (Olsen 2005). Provimi is

part of a German company that purchased bulk vitamins in Germany and the UK, while Roche Products is a UK subsidiary of Roche Holdings of Switzerland. In its 2003 ruling the high court said that EU law permits the plaintiff to seek compensation for damages on its German purchases in a UK court on the theory that Roche Products' conduct in the UK implemented the cartel throughout Europe. This decision might make UK courts the fora of choice for European victims of international cartels, so long as the buyer has some connection with the UK (Joshua 2005). The UK has liberal discovery rules that favor plaintiffs in cartel cases.

Indirect Purchasers' Cases

In a famous verdict in 1977, in the case called *Illinois Brick*, the U.S. Supreme Court decided that in federal price fixing cases indirect buyers of a cartelized product would have no standing. The principal reason for this decision was "conservation of judicial resources." The Court was concerned that with extensive chains of buying-selling relationships between manufacturers and the final consumers, the courts would be overwhelmed with damage claims by multiple categories of indirect buyers (farmers, wholesalers, retailers, consumers). Moreover, the Court doubted the feasibility of apportioning the direct overcharges among successive stages of a marketing channel because calculating the extent of pass-through by industries is not without economic uncertainties. The Court was also worried that multiple claimants for the same cartel overcharges might distort the Congressional intent that treble damages would deter the formation of future cartels. If direct buyers of some input did secure treble damages from a cartel, those who purchased from the direct buyers might argue that all or most of that first-stage overcharge was passed on in the form of higher prices to the next buyers. The possibility of direct buyers being sued by indirect buyers would lower the incentive for direct buyers to bring treble-damages suits in the first place, reasoned the Court, thus reducing cartel deterrence by private suits.

The economic models of overcharge pass-on do display some complexities. Under the simplest possible assumptions (constant returns to scale in production, a homogeneous product, and a linear demand schedule), buyers with no market power must pass on 100% of an increase in the price of an input (Harris and Sullivan 1979). Total pass-through of a cartel price increase will also occur in industries that sell according to a cost-plus contract. On the other hand, if the direct buyer is a monopolist, it will pass on only 50% of the overcharge to its customers. Oligopolies will display pass-through rates between 50 and 100%, depending on their degree of market power. Finally, pass-through rates are affected by the degree of

product differentiation (Cotterill *et al*. 2000). A powerful intermediate buyer of a highly differentiated product can pass on *more than 100%* of a price-fixing mark-up.

Although indirect buyers of cartelized products have no standing in federal antitrust suits, the Supreme Court has consistently recognized the rights of the states to permit indirect-purchaser suits under their state antitrust laws. Nowadays about half the states permit such suits. They are usually class actions and sometimes are filed in one state for indirect buyers in 20 or more states. Not all these states follow the treble-damages rule; some allow only single damages; and Alabama permits claims on the basis of $500 per transaction.

Indirect-purchaser antitrust suits are not widely reported by the mainstream press. From ADM's annual reports, it is known that in 1999 ADM faced 74 state-level class actions alleging damages by indirect buyers of lysine, citric acid, or corn sweeteners. Some of these cases were decided on terms that were costly for the cartels. For example, a suit by 20 feed manufacturers in San Francisco County Superior Court netted the plaintiffs in 1997 a recovery of $50,000 each plus 17% of the value of purchased lysine. The 17% figure was considered by local lawyers who were interviewed to be very high by historical standards in the state; most such suits are settled for one third that recovery rate or lower. Another class-action suit brought by indirect buyers of lysine in Michigan was settled in April 1997 for $2.1 million. However, a suit brought by buyers of citric acid in Alabama went badly for the plaintiffs when appealed to the state's Supreme Court.

The only recourse in federal courts for indirect buyers injured by price fixing conspiracies is for the attorney general of their state to bring a *parens patriae* case for them. In the case of the lysine and citric acid cartels, no such suits were filed, nor were any pre-trial negotiations announced. However, in 1999 a large group of attorneys general began negotiations with the six largest vitamin manufacturers seeking damages for indirect purchasers of bulk vitamins who were overcharged by cartelization.[14]

In early October 2000, a settlement between the Big Six vitamin makers and 24 attorneys general was widely publicized in the U.S. and European press. The six vitamin companies agreed to pay the 24 states $305 million. Commercial indirect buyers doing business in those states will file compensation claims and receive shares of a pool of $198 million. Because it is infeasible for households to file individual claims, they will be compensated indirectly by appropriate state programs. For example,

[14] The present author advised the attorneys general on the size of the overcharge and other economic matters.

New York State announced that it would use the consumer portion for grants to nonprofit organizations and local governments for programs related to prenatal care, child nutrition, and alleviation of hunger. These settlements were by far the largest ever made under state indirect-purchaser antitrust laws. However, persons doing business in or living in most states received no compensation. Moreover, the $305 million, while an impressive amount, is under the most conservative assumptions of pass-through at most one-third the trebled indirect overcharges.

Effectiveness of Civil Penalties

One of the recurring themes of this book is the great escalation in monetary sanctions faced by price fixers since 1995. Not only have public prosecutors secured ever-larger fines on cartel participants, but civil settlements have also become more costly for companies. The total recovery by U.S. buyers from the three global cartels in lysine, citric acid, and vitamins reached $5 to $6 billion. This total is roughly five times the U.S. government's antitrust fines of $1.11 billion. The combined total of public and private monetary sanctions in the United States accounted for 90% of all monetary sanctions worldwide. Despite the growth of antitrust enforcement outside the United States, American penalties are still by far the harshest in the world, and private actions deserve most of the credit.

Simply as a historical trend, these three cases have taken private price fixing settlements to a new, exalted plane. In their comprehensive study of federal private antitrust cases, Elzinga and Wood (1988) reported on the settlement amounts for a sample of 49 cases in a confidential survey with 285 usable responses. Their sample tended to include a high proportion of middle-sized law suits and spanned all categories of antitrust infractions. The average total settlement in these cases was $1.45 million, including a few awards made to defendants. Prior to the vitamins settlements, only about ten private settlements had breached the $100-million mark Connor (2001: Table 15.1). Previous record holders include *Brand Name Prescription Drugs* (net recovery of $723 million in 1999) and *NASDAQ Market Makers* ($1,123 million in 1999).

The settlements connected to the three global cartels in this book are not only absolutely large, they are large relative to their U.S. affected commerce. To try to compare the recovery rates of various price-fixing conspiracies, the recovery amounts are divided by the sales of the defendants during their respective conspiracies. Such data are difficult to assemble, but a sample of 10 U.S. cases was found that were filed in the years 1976-1994 (Connor 2001: Table 16.2). These data make clear the vital

precedent set by the recoveries in the lysine, citric acid, and vitamins cases. Prior to 1996, recovery rates for federal class-actions were typically quite low, averaging only 3% of sales. By contrast, recovery rates for injured buyers of the lysine, citric acid, and vitamins cartels ranged from 16 to 70%.

However, these settlements are not so impressive when they are measured against the damages caused. Recall that the U.S. overcharges of the 1992-1995 lysine cartels were $80 million; in 1996-1999 the direct purchases were paid at most $92 million or 115% of the overcharges. The buyers of price-fixed citric acid may have done better, receiving about $246 million on overcharges of $160 to $245 million (100 to 154%). The most vaunted case of all was vitamins, in which the huge settlements returned $4.2 to $4.9 billion to direct purchasers. Yet, these settlements amounted to only 175 to 250% of the U.S. overcharges in nominal dollars and were much lower when measured in adjusted dollars. The problem is that prejudgment interest is not awarded to plaintiffs that win private actions. When one takes into account that the vitamins buyers were overcharged in the mid 1990s but had their money returned ten years later, then the settlements are worth only 100% of the money that was stolen. Money not only depreciates over time, it also has an opportunity cost as financial capital (Connor 2006b).

The purpose of single damages is to provide monetary compensation for economic injuries. The purposes of treble damages are also treble: to compensate victims, to give private parties an incentive to search for and ascertain the size of monopoly profits being made by price fixers (thereby leveraging the powers of government antitrust prosecutors), and to deter future violations by inflicting memorable punishment on perpetrators. In practice, the punitive and deterrent functions of private settlements are not being served by class actions.

These findings are important because there are arguments being advanced by thoughtful writers on the subject that treble-damage awards are passé. Rakoff (1992) argues that the entire concept of *corporate criminal* liability is a relatively new American concept in the law that is built on dubious logic. The increasing use of corporate criminal indictments was largely a response to the necessity for punitive fines for large companies, levels that could not be attained with civil charges. Rakoff argues that the U.S. Sentencing Guidelines for organizations made civil treble damages unnecessary or excessive, given the harsh sentences mandated by the Guidelines. It should be noted that Rakoff was writing before there had been any experience with actual implementations of the Guidelines. Since then, the DOJ has habitually sought substantial downward departures from punishments suggested by the sentencing guidelines for the vast majority of price fixing defendants.

It is true that serious price fixing exposes corporations to highly punitive fines if the legal limits are adhered to literally. The government can impose felony fines up to *double* the overcharges on direct buyers; private plaintiffs can ask for *treble* those same overcharges; attorneys general can seek *treble* damages from price fixing for their residents who were indirect buyers in about half the states. In total, cartel defendants theoretically have liability for up to *eight* times their overcharges. This does sound excessive.

But rarely are the prosecutorial planets so aligned. What a literal reading of the law implies and what actually has occurred in practice are quite different things. In the cases studied most closely in this book, most corporate conspirators paid well under single damages in government fines. After discounting, fines never approach double overcharges. Plaintiffs who remained in federal class actions never received monetary recoveries above single damages. Even counting the more generous recoveries extracted later by class opt-outs, civil recoveries properly adjusted for the time value of money typically are below half of the treble damages specified by the Sherman Act. As for consumers and intermediate buyers, *parens patriae* suits have been initiated by the attorneys general of less than half the states, and the few instances of state treble-damages awards to indirect buyers seem to involve mostly small settlements. In sum, because the burden of proof is on prosecutors and plaintiffs and because indirect buyers have no standing to sue in federal courts, most corporate price fixers in practice now face only about double damages, not the eight-times damages theoretically justified by law in felony cases. Only the most obdurate defendant who becomes the last to settle might expect to disgorge treble the illegal profits made from price fixing. Moreover, the courts will see to it that guilty parties will not be inconvenienced by fines or settlements which might cause bankruptcy.

In assessing the appropriateness of the size of private settlements, one has to keep in mind the fact that global cartels typically sell most of their overpriced products outside the United States and Canada. As a rough rule of thumb, the lysine, citric acid, and vitamins cartels did about 25 to 35% of their business in North America. Unless they maintain a buying office in the United States or Canada, offshore buyers of cartelized products seem to have no standing to join private plaintiffs that purchased in the jurisdiction. Therefore, if a corporation is prosecuted for global price fixing and pays, for example, criminal and civil penalties equal to double the monopoly overcharge, these penalties may amount to only one-third of the conspirator's illicit profits. Injured buyers who made purchases outside of North America have no rights to seek compensation in civil legal proceedings in U.S. courts. The vast geographical scope of global cartels severely

undercuts the deterrence power of even harsh monetary sanctions in North American jurisdictions.

Finally, it must be remembered that the probability of being snared by antitrust officials in any jurisdiction is certainly less than 100%. Some antitrust scholars have hazarded that the historical probability of being detected and prosecuted for price fixing is around 10 to 20%. The rebirth of global price fixing in the 1990s may have been influenced by the even smaller chances of being prosecuted outside North America. Global cartel managers often made a point of meeting as much as possible outside the United States. Not only are antitrust traditions not as well developed in Europe and Asia, the business cultures in those regions mean that buyers are likely to be less sensitive to or more resigned to collusive behavior on the part of their suppliers.

Chapter 16: The Business of Fighting Cartels

A Boon for Law Firms

The proliferation of cartels in the 1990s has generated large fees for law firms with expertise in antitrust law. Large civil settlements mean large legal fees for plaintiffs' law firms. The antitrust revenues of major U.S. law firms reached historic highs (*The National Journal* July 15, 2000). At one leading firm with 120 antitrust lawyers, antitrust revenues were $64 million in 1999, up 13-fold from 1992. Five U.S. law firms employed from 100 to 150 antitrust lawyers each, most of them working in Washington, D.C. or New York City. Most of the work was generated by merger approvals, but price fixing conspiracies probably rank second in antitrust revenues. The global scope of the cartels has stimulated U.S. law firms to expand abroad. Several U.S. firms now derive more than one-quarter of their revenues from work outside the United States.

Formerly derided for drumming up business in a manner akin to that of personal-injury lawyers, antitrust plaintiffs attorneys are now increasingly accorded somewhat greater respect for their skills and methods of operation. Instead of being pejoratively referred to as "ambulance-chasers," class-action law firms are now more often described as entrepreneurial firms assisting social justice. In some cases the legal fees earned in prosecuting large cartels are used to subsidize complex, riskier suits that will compensate victims of war crimes and other injustices.

The elevated stature of antitrust plaintiffs' counsel is illustrated by a lengthy admiring profile of attorney Michael Hausfeld in the *Wall Street Journal* (January 4, 2000). His firm, Cohen Milstein, has been involved in high profile civil lawsuits against handgun manufacturers, German companies that enslaved workers during World War II, Swiss banks that did not return the assets of victims of the Nazi holocaust, and oil companies accused of causing pollution. Hausfeld calls these actions "social reform" class-action suits because they can mitigate injuries not being addressed by legislatures or regulatory agencies. More conservative publications refer to Hausfeld as a "corporate shakedown artist." Hausfeld, together with well

known lawyers David Boies and Kenneth Adams, led the civil treble-damages lawsuit against the vitamins cartel.

Plaintiffs' law firms almost inevitably represent buyers on a contingency basis, which implies that the firms must bare the costs of prosecuting a case for up to ten years with uncertain future rewards. Contingency fees may be negotiated by the clients, but most antitrust plaintiffs join a federal class whose legal fees will be determined by a supervising judge. The traditional system of contingency fees rewards plaintiffs' counsel with a fixed percentage of the settlement amounts won by the plaintiffs. This system encourages attorneys to settle for the highest amount that defendants can be persuaded to pay yet also provides incentives to economize by settling prior to a drawn out court battle.

Connor (2001: Table 18.1) contains a list of civil antitrust price fixing cases for which information is available on attorney fees. In a sample of class-action suits from the 1970s and 1980s, Elzinga and Wood found that legal fees and costs averaged $190,000 per case. While these fees may seem rather modest, so were the average values of the settlements – only $640,000 per case. That is, on average legal fees represented about 30% of the total awards made to private treble-damages recipients, or 42% of the net recovery to the plaintiffs. However, the rest of Table 18.1 shows that the larger the size of a recovery, the smaller the ratio of legal costs to recovery amount. Moreover, the largest settlements tend to have been made in more recent years. Indeed, for the top eight settlements the legal-fees percentages are only one-sixth to one-half the rates found by Elzinga and Wood (1988). Thus, it appears that there are fixed costs in representing a civil treble-damages case, or at least some threshold level under which most law firms choose not to accept this type of legal action.

Many legal writers and federal judges have expressed concerns about excessive legal fees in class action cases. The decline in the percentage of settlement awards paid out as legal fees probably represents in part a reaction against perceived over-generous awards in the past. Some judges have tinkered with various methods of calculating fees and costs in order to develop fairer decision rules. Some years ago judges seem to favor the "loadstar" method, which required plaintiffs' attorneys to submit time-sheets and other cost documentation. However, the loadstar method cannot address the issues of fair hourly rates or reasonable profit rates.

In the lysine case, the supervising judge implemented a novel fixed-fee auction to keep legal costs low, but the perverse incentives introduced by a fixed-fee approach were fairly widely condemned. Overall, the tide seems to be turning back toward approving percentage contingency fees or fee amounts arrived at by negotiation with the parties to the suit. However, in a treble-damages price-fixing case settled in late 2000, customers of two New York City auction houses were represented by class

counsel chosen by an auction operated by the supervising federal judge (*Wall Street Journal* December 6, 2000). Instead of bidding fixed fees, law firms submitted minimum amounts of recovery guaranteed to the plaintiffs; the amounts of the settlement above that minimum were used to generate legal fees at a rate of 25%. This type of auction preserves the incentive of class counsel to bargain for the highest possible recovery for the plaintiffs while simultaneously insuring relatively low percentages are paid to class counsel.[1]

There are free-rider issues in setting legal fees in class action suits generally. When a large number of geographically dispersed suits are consolidated and certified as a federal class, a "lead" firm or small number of firms is designated to represent the entire class. If the class is composed of a large number of small plaintiffs this arrangement works quite well. However, typically there is a wide range of sizes of buyers, and the interests of small and large buyers may diverge. In nearly all the civil cartel cases examined in this book, many large plaintiffs opted out of the class because they wanted a larger recovery and they could afford to pay for high quality legal representation. In the most extreme case, buyers of bulk vitamins that accounted for three-fourths of purchases opted out of the federal class. As a result the opt-outs became free riders on the efforts of lead class counsel because the latter helped establish a floor on settlement rates. The plaintiffs who stayed in the class essentially ended up paying for legal services that the opt-outs benefited from.

The vitamins case illustrates a curious reversal of the usual free-rider phenomenon. In that class action, the federal judge overseeing the case approved legal fees of $122 million for about 60 law firms that represented direct buyers of bulk vitamins. Those fees were a modest percentage of the recovery to be paid out to class plaintiffs. However, most of the larger plaintiffs became convinced that the settlement was far too low (about 18% of affected U.S. sales) compared to treble damages computed by their economist experts (about 100% of sales). In March 2000, some 200 plaintiffs representing 76% of vitamin purchases opted out. Because of an unusual *reverse* most-favored-nation clause in the settlement, the opt-ins will have their recovery increased if the opt-outs negotiate a more generous settlement rate. Should this happen, the small plaintiffs who stayed in the class may become free riders on the legal costs of the opt-outs. Why the judge would approve legal fees no matter how small the rump class is most puzzling. The clause delayed recovery to the opt-outs to 2003-2004.

[1] Boies Schiller, the winner of the judicial auction, guaranteed a minimum of $405 million to plaintiffs if they won at trial or settled out of court. Thus, their fee was zero up to $405 million and 25% for any winnings above the $405 million threshold. The settlement of about $535 million generated $27 million in fees for Boise Schiller, or 5% of the settlement amount.

In examining the available data on legal fees, it must be kept in mind that not all treble-damages filings result in settlements of any kind. In these situations, the law firms obtain no revenue for their time and expenses. In addition, many cases are settled out of court before a class is approved, and on such cases virtually no information is available on legal fees.

Finally, legal costs are incurred by the defendants. By their very nature, defendants tend to be large companies with lots of experience in defending themselves from allegations of many kinds. Most have in-house counsel for routine matters, but when defending themselves on matters involving large liability tend to hire specialized outside counsel. In the cartel cases examined in this book, defendants availed themselves of many of the most prominent and high priced U.S. antitrust law firms. Moreover, unless they were granted amnesty, defendants had to defend themselves in a legal war that had three fronts: prosecution by government antitrust agencies in as many as ten jurisdictions, civil suits by direct buyers in several nations, and civil suits by indirect buyers.

Consequently, defendants' legal costs were often higher than the legal fees awarded plaintiffs' counsel. ADM, for example, had to retain multiple law firms to defend itself in the government's criminal cases (lysine and citric acid), two parallel federal civil cases, state-level indirect buyers' suits, and derivative shareholders' suits; ADM's executives were provided with separate counsel, as was its board of directors. ADM's total legal expenses for antitrust amounted to at least $50 million. If other defendants in the lysine, citric acid, and vitamins cases paid proportional amounts, scores of defendant's law firms benefited to the tune of about $180 million. Law firms representing private plaintiffs probably received 15 to 20% of the settlements in the same three global cartel cases, or $350 to $450 million. Therefore, not counting the modest costs of DOJ prosecution, these three cartel cases conservatively generated a total of $530 to $630 million in gross revenues for the U.S. law firms representing plaintiffs and defendants.

Doubtless many will regard such enormous sums as sad evidence of a hyper litigious society. They *are* wasteful expenditures in the sense that many were incurred simply to cancel the effects of expenditures by parties on the other side of the dispute. However, in the end most of the legal expenses were simply a necessary outgrowth of constitutionally guaranteed rights to due legal process. And as high as they were, these legal transactions costs may be low when compared to the economic costs of the alternatives: monopolistic distortions in affected markets or regulatory approach that requires regulatory commissions for price controls.

Can the Antitrust Agencies Cope?

The Antitrust Division of the U.S. Department of Justice is a small agency as federal agencies go. The Division's real resources were cut mercilessly during the 1980s but recovered slowly during the 1990s. The Bush I, Clinton, and Bush II administrations proposed modest but real increases for antitrust enforcement, and the oversight committees of the U.S. Congress have typically endorsed the administrations' budget proposals. In federal fiscal year 1998 when the DOJ's campaign against international cartels was beginning, the Division had 831 positions authorized to be filled (51 fewer than in fiscal 1980) and a budget of $93 million. Growth in the Division's budget has averaged about 6% per year since then.

The Antitrust Division's workload reports for the federal fiscal years since 1990 demonstrate an increasing number of heavy tasks. In matters relating to cartel enforcement, the Division initiated 20 to 50 new criminal investigations each year. Because the grand juries often remained active for a few years, the DOJ was managing from about 80 to 125 of them to investigate pending criminal investigations. By 2005, the number of grand jury probes of *international* cartels had risen to 50 (Hammond 2005d). On average in the late 1990s and early 2000s, these grand jury deliberations resulted in about 40 criminal cases being filed annually against corporations or individuals. More than 90% of all criminal cases filed by the Division are price fixing cases, and slightly less than 90% of all price fixing cases are filed as criminal rather than civil matters. While most price fixing cases are settled by plea agreements rather than formal bench trials, the negotiations leading to pleas are often lengthy and arduous.

The DOJ is the major bulwark against naked price fixing conspiracies, particularly the more intricate and challenging global conspiracies. The Federal Trade Commission prosecuted only one major price fixing case in the 1990s, but the outcome of the case could have significant implications for the FTC's ability to seek single damages. *FTC v. Mylan Laboratories Inc.*, filed in December 1998, charged Mylan with monopolization and restraint of trade in the market for two popular anti-anxiety medications. Normally, the agency seeks only injunctive relief (cease-and-desist orders) in antitrust cases, leaving restitution of monetary damages to the outcome of civil suits. However, in this case the FTC sought disgorgement of illicit profits of $120 million, an action nearly unprecedented in rule-of-reason price fixing prosecutions.

In the late 1990s, the DOJ faced what experienced legal experts were calling an "explosion of international criminal antitrust enforcement" (Adler and Laing 1997). During 1987-1990 *no* antitrust defendants were foreign companies or persons. In the late 1990s and early 2000s about 50% of the corporate defendants in criminal cartel cases were foreign. By all

accounts, global price fixing cases are the most challenging type faced by the DOJ. Their offshore locations make their activities harder to detect and investigate than purely domestic cartels. In addition, once charges are brought, the typically large overcharges make defendants more tenacious in defending themselves.

On the other hand, three developments have made prosecution of international cartels somewhat easier for the DOJ. First, the 1993 revisions to its Corporate Leniency Program have borne fruit (ICPAC 2000). The fact that amnesty for antitrust violators is automatic under certain conditions increased the number of applications for and grants of amnesty and thereby reduced the resources necessary to obtain convictions. The "Amnesty Plus" and "Penalty Plus" features added in the late 1990s further enhanced the leniency program's effectiveness. Since 1998 more than 20 amnesty applications have been received annually by the DOJ.

A second important concession that the DOJ can offer to targets of global cartel activity is to recommend to the Immigration and Naturalization Service that an executive convicted for price fixing be allowed continued freedom to cross U.S. borders; the DOJ will delay the individual's guilty plea until he receives positive assurances about his visa status. ICPAC (2000) notes that such concessions were

> ". . . instrumental in every international antitrust matter . . . [because] freedom to travel into and out of the United States [is] important to every foreign individual's decision to cooperate with the U.S. government . . ." (Chapter 4, p.12).

Besides the INS, the Antitrust Division has improved coordination with many other federal agencies in cartel investigations.

Third, the U.S. government has made substantial progress in signing protocols, cooperation agreements, and formal treaties that can facilitate international cooperation in antitrust matters between the DOJ and its sister organizations abroad. These new instruments supplement traditional international law mechanisms such as diplomatic channels. In addition to the Canadian and EU authorities, the Japan Fair Trade Commission (JFTC) and Korean Fair Trade Commission (KFTC) have joined the DOJ in coordinated global raids to obtain evidence of price fixing. This multinational coordination is made possible through the signing of about 50 Mutual Legal Assistance Treaties (MLATs) that can be used for antitrust purposes. In addition, bilateral antitrust cooperation protocols have been signed by the DOJ with sister agencies in Canada, Brazil, Japan, Israel, Germany, the EU, and several other countries that permit limited forms of enforcement cooperation.

Nevertheless, barriers to prosecuting international cartels remain. One limitation to international antitrust cooperation has been in sharing confidential business information, particularly when such information has been obtained through compulsory legal processes. A 1994 U.S. law does give the DOJ limited rights to share confidential information, but only where the offer can be reciprocated. Another problem is extradition of individuals indicted for antitrust crimes. If a fugitive resides in a country like Switzerland where price fixing is not a crime, then extradition is virtually impossible. But even countries like Japan, which does have a criminal antitrust law and a Japan-U.S. extradition treaty is in force, harbor several fugitives indicted by the DOJ for price fixing.

On balance, these new instruments have helped DOJ investigations of global cartels in precious few instances, and they rarely prove crucial to the outcome (ICPAC 2000). However, there is a positive interaction between the Division's Leniency Program and obtaining relevant overseas evidence. When a target of a global cartel investigation *voluntarily* agrees to cooperate, then the legal barriers to obtaining relevant information abroad appear to melt away. Officials in foreign jurisdictions can and do cooperate without any offense to their sovereign rights. In sum, it is mostly the unilateral efforts of U.S. antitrust authorities that are succeeding in overcoming traditional barriers to international antitrust-law enforcement.

Although the leniency program and enhanced international cooperation has resulted in less effort in the investigatory phase of U.S. anticartel enforcement, these innovations are only a partial answer to serious under-funding of the Antitrust Division. With record numbers of mergers being processed and big cases like that against Microsoft demanding attention, the Division's employees are in danger of being overworked or potential antitrust violations going uninvestigated. In 1999, the American public was treated to the unprecedented spectacle of the Department of Justice's own lawyers suing the Department because they were overworked and underpaid. Department managers seemed not to be wholly unsympathetic to their employees' plight.

If the two federal antitrust agencies in the United States seem starved for resources, the situation in the European Union is many times worse. In 2000, the European Commission's DG-COMP had about 500 employees (80 were "experts") employed in Brussels. When the EU was expanded to 25 members, DG-COMP was not expanded. The EU covers an economic space that is just about the size of North America, and the Directorate must respond to almost as many merger proposals as do the two U.S. antitrust agencies. Moreover, the DG-COMP is hobbled by rules that severely limit its powers to conduct investigations. Search warrants sometimes must be coordinated with the national courts and raids carried out with the national police. The EC's 2001 cartel amnesty program has been so

successful, it is a curse. In 2006 DG-COMP's 60 cartel staff members had a backlog of 180 amnesty applications to process. One of the few changes that will assist DG-COMP in relaxing its severe resource constraints is the creation of the European Competition Network in the early 2000s. The ECN creates a device for sharing the workload in Brussels to the antitrust authorities of the Member States; it also formalizes the coordination of cartel investigations between Member States that began around 2000 (Connor 2004a).

The fines paid by antitrust violators do not, of course, become revenues for the DOJ nor any other agency of the federal government. Rather, together with the criminal fines paid by all corporate and personal felons, the $1.6 billion in price fixing fines were paid into a specially earmarked Crime Victims Fund administered by the U.S. Treasury Department. Since 1994, these federal criminal fines have been dispersed to the states annually on the basis of the state's population. The states in turn award compensation to victims of violent crimes, such as those injured or killed in the infamous Oklahoma City bombing of its federal office building. Since 1996, the major source of funds has been the perpetrators of global price fixing, and by far the lion's share has come from companies registered and headquartered outside the United States. This detail on the disposition of criminal antitrust fines is important because some conservative political writers have railed against the DOJ's newfound assertiveness as simply one more federal government scheme to raise taxes on corporations. In the EU and Canada, fines are transferred to the treasury; they are in effect a reduction in taxes for households and businesses.

Another criticism of antitrust authorities is that they are overly generous in granting fine discounts. This criticism does not apply to the first or second firms to agree to cooperate, but rather to the later firms. It is not possible to know all of the factors that went into the decisions to reduce the fines of guilty late-settling firms below the maximum allowed. Prosecutorial resources are limited and the evidence available for successful litigation is rarely iron-clad. However, in their zeal to cut deals with price fixers, DOJ prosecutors may in hindsight have given away too much. For example, in the vitamins cartels the 21 corporate cartelists received an average fine discount of 81% (Connor 2006c: Appendix Table14). After all, the twin purposes of the criminal fines are to punish and to deter. As prosecutors fully recognized, it is difficult to inflict much fiscal pain on a company like ADM that had cash reserves of more than $1 billion. Moreover, deterrence is absent if companies expect their profits from price fixing to exceed the costs of being caught. A certain hubris has developed at the Antitrust Division concerning the large fines imposed on cartel participants. In 1999, the Division's web site initiated a page that kept a running

account of the so-called Ten-Million Dollar Club, that is, all the companies that had been required to pay $10 million or more in fines. Perhaps such public gloating is understandable and may even build agency morale, but officials must know that $100 million was the equivalent of a mosquito bite to an elephant like ADM. Indeed, on the day that fine was announced, the stock market breathed a collective sigh of relief and rewarded ADM with a run-up in its stock price of more than 4%.

Not only did many politically savvy commentators judge ADM's fine a "bargain," but they correctly recognized that the grants of immunity and other concessions were too generous. An irate Robert Sherill writing in *The Nation* was aghast that chairman Dwayne Andreas was not even interviewed by investigators of the lysine/citric acid scandal (April 7, 1997). "Andreas once again proved himself to be a masterful escape artist . . ." Other tapes, and possibly some of the six placed under seal by the courts, suggest wider involvement of other ADM officers besides the three who were convicted (Eichenwald 1997, Mihm 1999). Sherill's parting thoughts on the inadequacy of the lysine punishments were:

> "The trouble is . . . most of the federal agencies with jurisdiction over the business world are woefully out manned by the huge array of corporate lawyers. It isn't a David-and-Goliath situation – it's more like Shirley Temple versus King Kong."

Other defendants received generous deals. Hans Hartmann, by all accounts the prime mover behind the big citric acid cartel, by USSG standards should have gotten 24 to 30 months in prison and paid a fine of $350,000. Instead, because of his last-minute offer of cooperation (his employer, Bayer Corp., was one of the last to settle) Hartmann was granted enormous "downward adjustments" at the behest of the DOJ: no prison time and a fine of $150,000.

One of the problems with antitrust fines is that prosecutors may have excessive discretion to grant downward departures from the guidelines. Instead of being exceptions to the rule as envisioned by Congress, downward departures are sought by prosecutors for nearly all defendants, even the last to fold and the most culpable. One of the simplest ways to improve the deterrence value of the antitrust statutes would be for Congress to tighten the conditions under which downward departures can be granted by the judiciary, to eliminate the tension between the two sentencing guidelines (USSG § 2R1.1 and 18 USC § 3571(d)), or to specify which sales concept ought to be used to calculate damages.

Were the Fines High Enough?

Opinions vary as to whether present-day monetary sanctions are adequate to contain international price fixing to a tolerable level. Pronouncements by officials of the world's major antitrust authorities tend to be upbeat: "…there is relatively little recidivism among corporate antitrust offenders… (Hammond 2005d: 6). Statistics of higher fines and longer prison sentences abound. Speeches by leading defense counsel harp on the themes of cartels ineffectiveness in raising prices and monetary fines in excess of what is optimal (Smith 2005). On the other hand, empirical research shows cartel price effects that make a mockery of the 10%-overcharge assumption underlying U.S. fines (Connor and Lande 2005), and DOJ officials now seem to agree that the 10% assumption " may be too low" (Hammond 2005d:9).

This section examines global sanctions for the "poster child" of harshly punished cartels – the vitamins cartels (details in Connor 2006b). If the vitamins case doesn't demonstrate deterrence, none will.

Sanctions Summary

Global sanctions levied on the corporate participants in the vast vitamins cartels of the 1990s are shown in Table 16.1. Their total outlays in the six years following their discovery in 1999 by U.S. prosecutors were in nominal terms in the range of $6.2 to $7.6 billion, but Table 16.1 shows the penalties are lower when expressed in 2005 dollars (adjusted for inflation) and the absence of prejudgment interest. Government fines imposed by five jurisdictions accounted for 38% of the total. Estimated settlements by direct buyers in the North America comprised the biggest category of penalties, about 50 to 60%. The remaining were from indirect purchaser suits in North America (8%).

Not shown are the individual criminal convictions of high ranking executives of these companies. In the United States, 16 men were sentenced to pay fines that averaged about $200,000. When evaluating the force of expected sanctions on cartel deterrence, it is difficult to know how to weight the impact of expected individual prison sentences as compared to corporate penalties.

Table 16.1 Vitamins Cartel: Real Corporate Penalties, 1999-2005

Type of Sanction	Known	Estimated	Total
	Millions of 2005 U.S. dollars [a]		
Government fines:			
United States	677	0	677
European Union	482	0	482
Canada	60	0	60
Australia	16.1	0	16
Korea	3.9	0	4
Other countries [b]	0	0	0
Subtotal fines	1347	0	1347
Direct buyers:			
U.S., major vitamins [c]	167	1400-1731	1567-1908
U.S., E. Merck	23.4	0	23
U.S., niacin & biotin group	72-74	0	73
U.S., choline chloride group [d]	34.1	0	34
Canada, all products	70	0	70
Australia	31	0	31
Subtotal Direct Purchasers	397	1400-1731	1803-2144
Indirect buyers:			
Nat'l. Assn. of Attorney's Gen.	140	0	140
California	44	0	44
Massachusetts	9.0	0	9
Other United States	0	34-46	40
Canada	15.4	0	15
Subtotal Indirect Purchasers	208.4	34-46	242-248
Total	1952	1749-1816	3391-3738

Sources: Connor (2006c: Table 18A) and producer price indexes and prime rates of interest.

[a] Fines and settlements outside the United States are translated into U.S. dollars on the date of announcement. Includes legal fees where known.

[b] Investigations are reportedly still underway in 2005 by Brazil. Mexico's fines unknown.

[c] Follows from a November 1999 agreement between about 4,000 plaintiffs in a federal class action and the seven largest defendants. Some of the settlements are secret and are estimated, others were publicly reported.

[d] Includes $21.5 million in civil settlements by BASF, Akzo Nobel, and UCB Chemicals

[e] Estimated

[f] Canada combines direct and indirect (18% of the settlement) purchasers into unified legal actions; includes fees.

How heavy were the vitamins fines and settlements? To answer that, the monetary sanctions are compared first to the value of affected commerce and second to the overcharges.

Penalties Relative to Affected Sales

Figure 16.1 illustrates the ratios of penalties to the jurisdiction's affected commerce in nominal dollars. Such ratios are referred to as intensities. The most intense fines were levied by Canada (15% of sales) with the United States slightly smaller (12%) and the EU the smallest of the three (8%). As a percentage of affected commerce in the rest of the world, fines by Australia and Korea are negligible. By far the most intense sanctions are those extracted by private treble damages suits in the United States. When combined with U.S. fines, the vitamins defendants paid penalties equal to 55% of their U.S. revenues during the cartel periods. Canada's combined sanctions are not far behind with a ratio of 37% of affected sales. Relative to affected commerce in their jurisdictions, North American monetary sanctions are six times higher than the EU's. Therefore, the United States lives up to its reputation as the most fearsome antitrust jurisdiction. The absence of significant fines outside Europe and North America bring down the *global* intensity of penalties to 20%.

The ratios shown in Figure 16.1 are frequently discussed in the antitrust law literature, but such calculations are flawed indicators of antitrust effectiveness. Government fines are imposed many years after the cartel revenues were made; the average lag between the middle of a conspiracy and DOJ fines is about five years; and for civil cases and fines in the EU the lag averages about eight years. Because courts do not award prejudgment interest, the numerator is overstated compared to the sales dominator. When both the penalties and affected commerce are expressed in more appropriate real 2005 dollars, the harshness of the penalties is moderated considerably (Connor 2006b: Table 19A). On average the real ratios are 40% lower than the unadjusted ratios. For the slower legal processes such as EU fines and U.S. private suits, the properly calculated penalty/sales ratios are half the size of the conventional ratios.

Penalties Relative to Injury

A superior way of assessing the harshness of monetary sanctions is to divide them by the overcharges imposed by the cartels (Figure 16.2). From

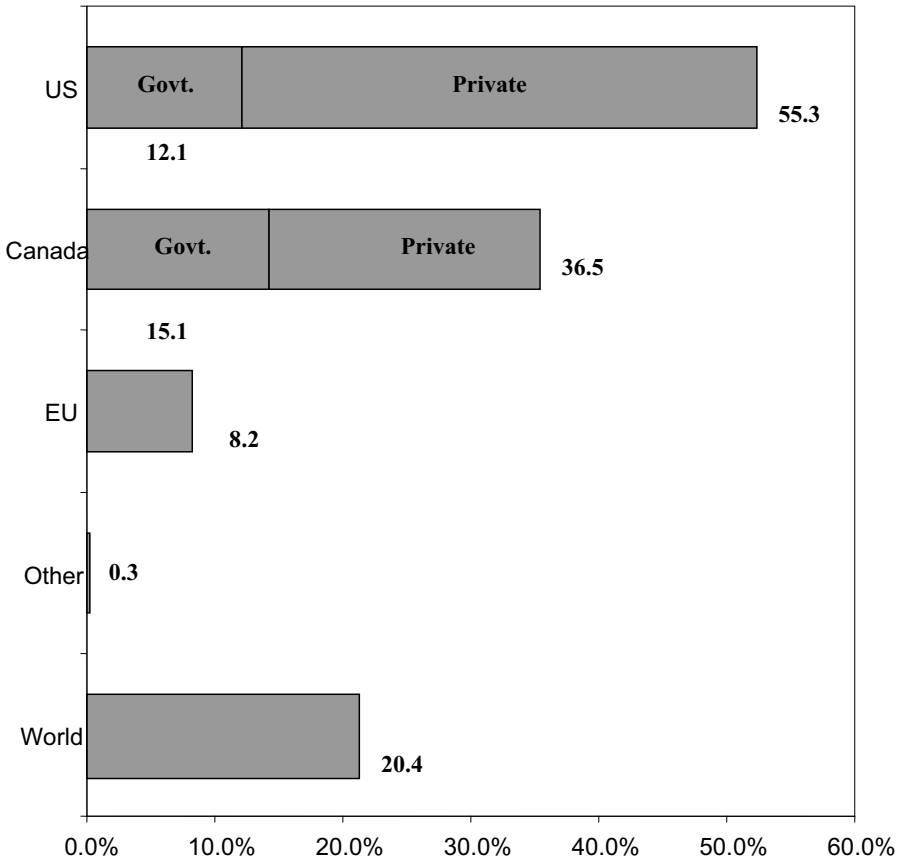

Figure 16.1. Sanctions/Sales Ratios (Nominal U.S. dollars).

Source: Connor (2006c: Table 21)

the point of view of deterrence, these ratios are far more meaningful than the more common sanctions/sales ratios. As the overcharges are close to the amount of illegal profits garnered by the members of the cartels, the sanctions/overcharge ratios are indicative of the degree to which antitrust sanctions were successful in disgorging those profits. A ratio of 100% or higher means that most or all of a cartel's monopoly profits were trans-

ferred from the defendants to taxpayers or purchasers. Ratios higher than 100% imply that sanctions contained a punitive element. Low ratios indicate that members of a cartel as a group retained a significant portion of their collusive profits after paying their penalties.

Global monetary sanctions from government and private legal actions amounted to about two-thirds of the vitamins cartels' worldwide economic injuries. Canadian government fines were the highest (about 50%), whereas U.S. and EU fines amounted to 40% and 30% of damages in those jurisdictions, respectively. Note that the U.S. fines are far from the 200% allowed by law, primarily because of the granting of generous leniency discounts. Private damages suits in the United States imposed the harshest antitrust remedy on the vitamins cartels. Private litigants received full compensation for most of their overpriced vitamins and about one-third more. When combined with the U.S. Government's fines, total U.S. sanctions were 94% higher than the injuries on direct buyers. Taking into consideration the probability of detection, total sanctions were woefully short of optimally deterring defendants like those in the vitamins cartels.

The absence of private antitrust litigation in Europe is a major factor explaining the very low sanctions/overcharge ratios in Europe. Total public and private cartel penalties were *four times* higher in Canada than in the EU; U.S. penalties were more than *six times* heavier than those in Europe. But in the rest of the world, the near absence of penalties of any kind brings the sanctions/overcharge ratios to clearly sub optimal levels for deterrence purposes. The vitamins defendants paid out at most 72% of their illegal gains to governments or victims

Because the penalties and overcharges flowed during different time periods, it is appropriate to calculate the fines and overcharges in real dollars. These real and discounted figures are shown in Figure 16.3. On average the real-dollar ratios are about 85% *lower* than the nominal-dollar ratios. In Canada and the United States, where fines are imposed quickly after a cartel is discovered, the adjusted ratios are about 80% lower than the unadjusted ratios. Private suits and EU fines take from three five years after discovery to resolve; their real penalty/injury ratios are about 88% lower than the nominal penalties/damages ratios. Overall, only one-eighth of the real overcharges were taken away from the vitamins defendants.

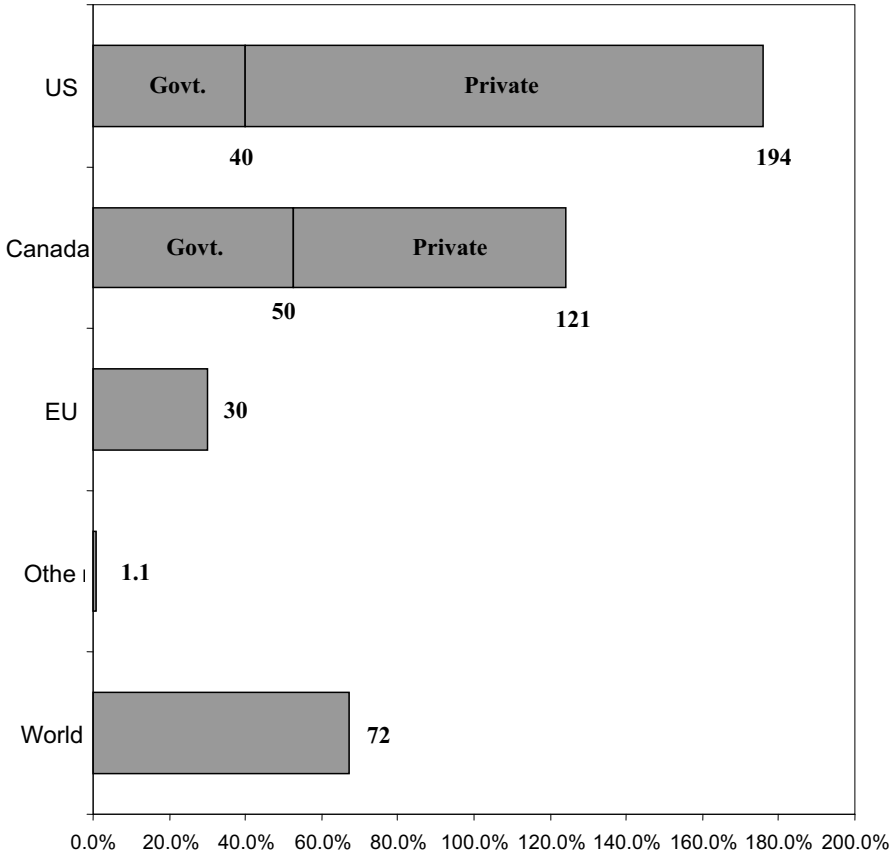

Figure 16.2 Sanctions/Damages Ratios (Nominal U.S. dollars).

Source: Connor (2006c: Table 22)

Intensity of Penalties Summarized

Measured in current dollars, the vitamins defendants disgorged about 20% of their cartel-period sales to citizens, taxpayers, and buyers of vitamins. However, measured in more appropriate real dollars, penalties were 12% of cartel revenues. The main reason that the sanctions/sales ratio is lower in real dollars is that prejudgment interest is not paid by antitrust violators; additionally, violators reap illegal profits throughout the collusive period,

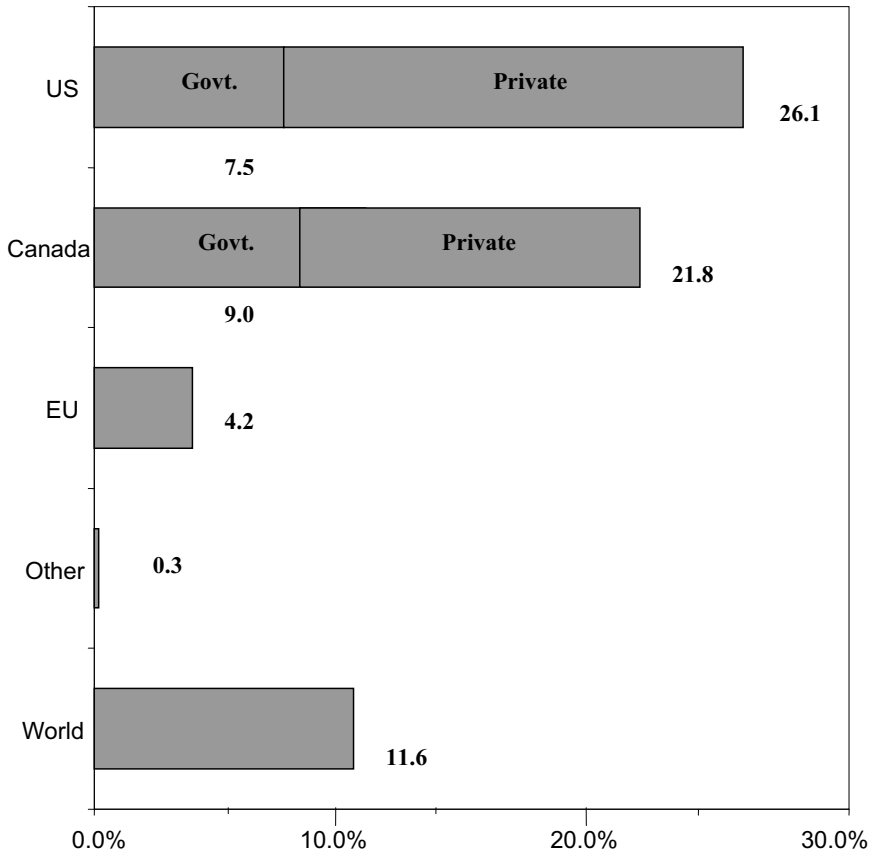

Figure 16.3 Real Sanctions/Real Damages Ratios (2005 U.S. dollars).

Source: Connor (2006c: Table 22A)

yet even quickly levied sanctions are paid in depreciated currencies. Private suits in North America principally compensate direct buyers and indirect commercial buyers for their cartel-generated losses and pay plaintiffs' law firms for their costs and entrepreneurial risk. Citizens and customer-victims of North America are being better served by their anticartel laws than are residents of the rest of the world.

Do these penalties yield punitive damages?

In terms of government fines, Canada, the United States, and the EU are the jurisdictions with the harshest sanctions, ranging from roughly 30% to 50% of the overcharges in their regions. However, because the rest of the world levies miniscule fines on international cartels, total global fines recoup only 72% of the illegal vitamins profits. There are no government fines that are punitive.

Private treble-damages suits in the United States were remarkably effective in transferring vitamins damages back to the victims. Although slightly exaggerated because nominal dollars are the basis of these calculations, private U.S. actions for direct and indirect buyers amounted to about 150% of U.S. overcharges. The lion's share (85%) of settlements goes to direct buyers. While not as high as the 300% specified by the Sherman Act, they do at least have a significant punitive component. In Canada, the 71% ratio is not a bad outcome for a relatively untested single-damages law. As in the United States, direct buyers were compensated to a far greater extent than indirect purchasers. Because economic theory implies that distributors and consumers pay the majority of cartel overcharges, this result suggests that the legal systems of North America are under-serving indirect buyers.

When the numerators and denominators are adjusted for the time value of money and for inflation, the ratios are markedly lower. Because of delays in enforcement and the duration of the vitamins cartels, government fines recoup less than one-eighth of the real illegal profits. The delays in private suits in North America are even longer. Combined with the absence of prejudgment interest, the real-dollar vitamins settlements provide no punitive damages.

Conclusions about the Vitamins Case

This analysis of sanctions is a summary of Connor (2006c), which is a comprehensive examination of the global bulk vitamins cartels of the 1980s and 1990s. In terms of its precision and breadth of coverage, the quantitative information now available on vitamins surpasses that of almost any other modern cartel.

The size of these cartels is extraordinary. Evidence is presented that these 16 interrelated cartels were collectively the largest discovered international price-fixing schemes of the late 20th century. The formation of the cartels by and large occurred in markets that were in terms of their structures and historical modes of behavior ideally suited for overt collusion. Although organizationally similar in many respects, the cartels also displayed a wondrous variety of collusive conducts.

On the other hand, vitamins cartels were typical in several ways. The vitamins cartels endured on average about as long as the average international cartel. Only six of the cartels died natural deaths. Had it not been for public and private investigations in the United States two-thirds of them might be operating clandestinely today. The percentage increases in bulk vitamin prices wrought by the cartels averaged about 44%, which is about average for successful international cartels since 1990. Also, the vitamins cartels were typical in their geographic spread: affected sales and overcharges were distributed roughly equally in three regions, North America, Western Europe, and the rest of the world.

Antitrust scholars and enforcement officials frequently cite these cartels as the most effectively punished international price-fixing conspiracies in history. Indeed, some legal writers are of the opinion that the vitamins sanctions are egregiously supra-deterrent (Waller 2003: 221-225).[2] Others, even those critical of the high settlements in U.S. private litigation, believe the sanctions in the vitamins cases were justified by the deterrence aim of antitrust (Baker 2004).

There is little question that the convicted members of the vitamins cartels were in absolute monetary terms the most heavily sanctioned defendants in the history of antitrust law. From 1999 to 2005, the defendants paid about $5 billion in fines and settlement payouts, of which more than 80% resulted from U.S. government and private legal actions. Moreover, 20 heavy individual criminal sentences were imposed on the managers of the cartels.

Yet, it is equally non-controvertible that the impressive corporate monetary sanctions imposed worldwide were inadequate to deter recidivism. In nominal monetary terms global public and private penalties

2 "Based solely on harm to the US market Hoffmann[-La Roche] will have paid in excess of six times the harm it caused…" (Waller 2003:234). Waller provides no details on his data sources.

amounted to only 20% of the cartels' affected commerce and 72% of their world-wide damages. *Measured in real 2005 dollars, the global vitamins sanctions represent merely 12% of worldwide damages, and no jurisdiction achieved punitive damages.* With sanctions well below 100% of profits, no matter the probability of being caught, it is simply rational for international cartels to be formed.

Are New Laws Needed?

The Sherman Act passed its 115th year in 2005. Section 1 of the Act that governs cartel violations has remained virtually unchanged since 1890. Only the wording that refers to penalties has been adjusted over time. The U.S. penalties currently available for antitrust enforcement, particularly for criminal felony cases, are the harshest in the world even though they are rarely applied to the fullest extent possible. In addition, civil penalties can be applied in treble damages cases that on paper are also the toughest in the world, though the settlements never seem to approach even half the levels authorized by the law. The DOJ can rightly point to a long string of successful prosecutions with quantitatively impressive sanctions.

Joel I. Klein (1998), head of the Antitrust Division, proposed in testimony before the U.S. Senate Subcommittee on Antitrust that the *statutory* limit on corporate fines be raised from $10 million to $100 million. His proposal was made law in 2004. Raising the corporate fine limits to $100 million gives the DOJ greater leverage in plea negotiations. The statutory fine limit for individuals was raised to $1 million in 2004, but it is very likely that the new 10-year prison sentence will have the greater deterrent effect.

There is a need for Congress or the courts to clarify when the alternative sentencing provisions (§3571(d)) must override the statutory provisions and what level of proof is necessary in sentencing based on double damages. One purpose of the 1987 U.S. Sentencing Guidelines was to increase the penalties for antitrust violations to levels higher than those available under traditional sentencing when the size of the crime warranted it, but the Guidelines cannot be used to impose fines that exceed the Sherman Act's fine maximums. Prior to 2004, the DOJ needed to appeal to the double-the-harm provision whenever a negotiated guilty plea involved a corporate fine above $10 million and since 2004 above $100 million. The Supreme Court's *Booker* decision in early 2005 is problematic because criminal sentencing now requires that all the facts used to set sentences must be proven "beyond a reasonable doubt." The questions are: under what conditions can an economist testify that an overcharge estimate is

beyond a reasonable doubt and do cartel defendants have the right to be sentenced by juries?

In the first year after the *Booker* decision, the DOJ took the positions that juries are not necessary for negotiated fines based on double damages, which cartel defendants are liable for the entire cartel's U.S. damages, and that indictments can proceed with alleged injury calculations (Hammond 2005b). Since the beginning of 2005 DOJ sentencing memorandums have in several cases cited specific dollar damages of cartels, something never seen before 2005. It is not clear whether these damages are the DOJ's best estimates or are lower figures acceptable to the defendants. There is great uncertainty whether the DOJ's post-*Booker* sentencing procedures will hold up if litigated. In particular, given the probabilistic nature of economists' methods of estimating damages, what constitutes a high degree of confidence must be determined.

A third improvement in anticartel enforcement involves the role of information. The DOJ tends to move more quickly than most other competition-law agencies around the world. The contrast with the lumbering investigative and decision-making process of the European Commission's competition directorate is particularly stark. Yet, compared to the detail offered by the Canadian Ministry of Justice, the DOJ is perhaps unnecessarily tight-lipped. The plea agreements, briefs, indictments, press releases, and other sources of information from the DOJ seem to be tailored to offer the absolute minimum of facts about the defendants or convicted parties in a global cartel. Briefs are often heavily redacted. Press meetings and interviews of prosecutors yield a similar dearth of details to the public, and penetrating questions are often evaded or unanswered completely in the name of on-going investigations. In many instances concerns about premature release of information that could jeopardize investigations or clandestine negotiations are well justified. Moreover, DOJ officials are bound by agreements not to release certain commercial trade secrets for firms that are targets of an investigation or defendants in antitrust cases. As a result of this official reticence, parties unrelated to a global price fixing matter learn only about the bare bones of the living, breathing organism that was a cartel: names, titles, and residence of defendants; a list of generic illegal behaviors that hardly varies from one conspiracy to another; the identity of the product; and the minimal time spread of the conspiracy.

The EC publishes most of its cartel decisions in a slightly redacted form about five years after an investigation begins. The reports are often loaded with fascinating details about the conduct of cartels that are unavailable elsewhere. As useful as many of them are to understanding the operational details of cartels, their principal aim is to justify the Commission's fines so as to avoid being overturned by the European courts on appeal (Geradin and Henry 2005). Thus, there is great attention paid to the

arithmetic of setting fines, but few decisions contain economic data that would permit an inference about the economic injuries spawned by the cartels. The decisions pay scant attention to deterrence, the avowed aim of EU competition law.

The Canadian model is a compromise. When a conviction has been secured, the Ministry of Justice issues a Statement of Facts about the case. In addition to the type of information released routinely by the U.S. DOJ, Canada's reports provide details about a defendant's sales, total Canadian sales, a description of the special role played by various participants, and more concrete descriptions of the illegal conduct. Unlike in the United States, unindicted co-conspirators are named. There is sometimes a justification provided about the size of fines extracted. All in all, these statements are more satisfying as public accounts of the Ministry's actions than those of the DOJ because they give citizens enough facts to make their own evaluations of the justness of the punishments. However, the released Canadian documents too contain little by way of detail about a cartel's price effects, and this places plaintiffs seeking compensation at an informational disadvantage.

Revealing more hard information about cartels would be a form of sanction in itself. It would imply that convicted persons lose some of their rights to privacy. Issuing brief cartel case studies with economic details after a case is closed would seem to be entirely legal and serve to educate the public on the benefits of cartel enforcement.

The U.S. practice of keeping secret the names of unindicted co-conspirators in cartels is particularly self-defeating because unindicted co-conspirators become named defendants in tag-along civil actions within a few months anyway. Plaintiff's attorneys must hire experts or investigators to find out the identities of unnamed conspirators and may at times wrongly do so. This observation raises the more general question of whether the DOJ has an obligation to assist private parties in their suits against cartel participants seeking compensatory and punitive damages. Injured parties suits under the Clayton Act treble damages clause are by Congressional design magnifying the deterrent effect of government prosecutions. Guilty plea agreements and guilty decisions by trial are by that law *prima facie* evidence in civil suits. Yet, the DOJ's habitual restraint in providing details in court documents hobbles the ability of private parties to obtain quick and full relief; it may also contribute to the dissent that emerges within federal classes. The DOJ does this by not revealing some participants names, company market shares, precise market sales during the affected period, minimizing the length of the collusive period, and the details of concessions given in guilty-plea deals. In the lysine case details about concessions given to ADM were not released by the DOJ. While the concessions to ADM may have been justified to avoid a

lengthy court case, DOJ secrecy about the terms only added to the public perception that ADM's deal was unnecessarily sweet.

Information about the size of private settlements is also incomplete. Private parties seeking damages under the Clayton Act typically reveal nothing about the terms of settlements reached before a federal class is certified. Moreover, normally nothing is revealed about settlement terms after a member of the class opts out of a proposed agreement. Only when a class action settlement is approved is information available on the payouts to members of the class. The vitamins case illustrates the problems of inadequate judicial oversight of class-action settlements. The low recovery proposed by the vitamins defendants led to the withdrawal of plaintiffs representing about 75% of the value of purchases. The confidential nature of settlements of opt outs means that the settlement rates must be estimated from indirect information. In some cases late-settling plaintiffs may fail to benefit from knowledge of earlier settlements. Secrecy about settlements greatly reduces the power of general deterrence. Because Congress intended the punitive component of private damages payments to deter, this would seem to justify an extended period of supervision of opt-out settlements in open court.

A final procedural improvement concerns the standing of certain injured parties in treble-damages suits. At present, most federal courts permit only those buyers that took title to the cartelize product on U.S. territory to be qualified to sue price fixers. Thus, foreign companies that have their own buying offices in the United States can import cartelize products and get legal standing, but companies that buy abroad or that find hiring U.S. export agents more efficient become indirect buyers without federal antitrust standing. Roundly criticized U.S. court decisions in 2005 seem to have closed off the possibility that purchasers of cartelized goods abroad can seek damages in U.S. courts (Fox 2005). These decisions appear to have been motivated by unjustified concerns about comity and judicial burden rather than by the logic of specific deterrence.

From the standpoint of deterrence, the standing of foreign buyers is a critically important issue (Bush *et al.* 2004). Because sanctions are so weak outside North America, global cartels are under-deterred. In the lysine, citric acid, and vitamins cases, only about one-third of the sales of these cartels was in the form of direct purchases on U.S. territory. Even with historically high U.S, Canadian, and EU fines and private North American settlements above single damages, the deterrence effect is *zero* because two-thirds of the monopoly profits accrue in jurisdictions where private suits are not permitted.

Standing for foreign buyers in U.S. courts for *global* cartel cases could remedy this imbalance. Standing need not be extended to victims of all international cartels, but only to those that colluded on tradable goods

and that fixed prices in two or more currency zones. It is in such cases that global cartels must follow pricing decisions to prevent outsides from engaging in international geographic arbitrage. That is, the Sherman Act can be applied because harm caused to buyers in the United States *directly and necessarily depends* on the harm caused to foreign buyers. This is a feasible proposal because the tests of international tradability and multiple currency zones are the sort of "bright lines" that are favored by the judiciary (Fisher 2006). Judicial resources would be conserved because fewer than ten cases per year would qualify.

Conclusions

The severity and absolute size of both government fines and private-treble damages awards have increased throughout the 1990s to unprecedented levels. U.S. fines imposed on cartel participants steadily increased as a proportion of the economic injuries generated by cartel activities. From a maximum on a single company fine of only $2 million at the beginning of the 1990s record U.S. fine by 1999 had reached $500 million. Canadian and European antitrust authorities also levied record fines on international price fixers. Huge fines and private settlements have certainly created enormous publicity that can only add to the deterrence effect of antitrust enforcement. The mostly tag-along investigations and actions against international cartels by competition-law agencies in Canada, the European Union, Mexico, Brazil, Australia, New Zealand, and others cannot be discounted as a source of great discomfort to corporate price fixers. While the monetary sanctions outside the United States range from significant to negligible, these legal battles must be at least a great distraction to management.

Yet, these monetary sanctions so far have fallen well short of the levels needed to provide punitive penalties for global cartels. Large discounts on maximum fines are often granted for both legitimate reasons (leniency programs) and for minimal cooperation. Payments of fines and settlements are often made many years after the cartel's monopoly profits were earned, which robs recipients of prejudgment interest. Moreover, by charging smaller subsidiaries of parent multinationals and by offering multi-year installment payments, antitrust authorities are reluctant to impose fines that might require a defendant to sell some of its assets. Other than concerns about increasing industry concentration, there is little legal or economic support for bankruptcy-avoidance as a criterion for fines.

The Antitrust Division has since 1996 relied almost exclusively on large fines as the sole corporate sanctions in criminal price fixing cases. There is no doubt that fines are among the most concrete sanctions that can

be applied; also, once having been paid, they require no further government oversight. Yet, this book has recounted several cases of corporate recidivism in price fixing, which suggests that the earlier fines were too small. There is a wide panoply of additional corporate sanctions that governments have the power to request from the courts. Specific managers could be required to be fired or banned from the industry. Boards of directors could be restructured to include more independent members on key committees. Tougher antitrust compliance programs could be required for convicted firms. In lieu of fines, assets can be seized. "Structural relief," i.e., the divestiture of selected corporate units, can be mandated in many jurisdictions.

The U.S. Government has been increasing the severity of the fines and prison sentences for executives directly involved in global price fixing, but the DOJ is nearly alone in the world in doing so. There is now more scope for increasing the fines and prison sentences for convicted felons, and there will doubtless be higher amounts seen in the future. Progress is being made on extradition of guilty individuals from countries with criminal antitrust statutes, but the vast majority of nations still have only civil penalties available for violators. Criminalization of antitrust in Europe and Asia would help. It is probably prison sentences that will ultimately make more of an impression on the individuals themselves and future potential violators.

In the United States and Canada private parties can add considerably to the deterrence of cartels. Combined with the double-the-harm fines, private treble damages raise the potential legal liability to a theoretical level of *five times U.S. overcharges*. Indirect purchaser suits raise the potential monetary liability for corporate price fixers to nearly *six* times overcharges. Historically, no cartel has been assessed fines or private payments as high as three times the harm, but the potential is there. Rather, most private antitrust actions have resulted in settlements similar in size to the criminal fines. Only a few patient and relatively large opt-out firms have achieved recoveries above single damages.

This is not what the U.S. Congress of 1914 had in mind when it passed the Clayton Act, but private plaintiffs are typically at significant informational disadvantages compared to the defendants and to the DOJ itself. Quickly negotiated class actions result in low settlement rates. Even extensive discovery will not usually give plaintiffs all they need to compute an accurate overcharge estimate. Plant cost and capacity data are particularly hard to extract from defendants. Moreover, as we have seen in numerous cases in this book, the DOJ provides little information in its possession that could assist private plaintiffs.

One of the most encouraging signs for improving deterrence of international price fixing is the openness now being expressed in Europe for increased access of victims to private suits. The UK courts may be taking

the lead in this trend. If the EU develops a viable system for private damages suits, other jurisdictions are likely to follow its lead.

Modern cartel enforcement is a paradox. The stated goal of antitrust laws of most nations is deterrence, and optimal deterrence requires that cartel penalties be based on multiples of economic injuries. Yet antitrust authorities are typically reluctant to calculate fines on the basis of damages because of perceived analytical challenges (ICN 2005). However, reasonable estimates can be quickly prepared using several methods when appropriate economic data are available (Connor 2006d). More often than not, alternative estimates of cartel overcharges tend to be mutually supportive. Econometric modeling is more time-and-skill intensive but does not necessarily yield a superior estimate (Connor and Bolotova 2006). The reluctance of antitrust authorities to base fines on overcharges seems to be based on a super abundance of caution.

Chapter 17: Global Price Fixing: Summing Up

Awareness of antitrust enforcement matters has entered the U.S. public's consciousness to a degree that could hardly be imagined just a decade ago. The nation's leading newspapers and magazines have many times devoted prominent space to news about price-fixing fines, trials, and related enforcement activities. Antitrust has not been as fashionable for decades, if ever.

The ground swell of popular interest is partly a response to the scandalous behavior of the conspirators, whom Joel Klein skewered as "well dressed thieves." Their intrigues and deceptions are the stuff of racy mystery novels.[1] Yet, the story of the global cartels goes beyond mere fascination with aberrant behavior. It is also high drama pregnant with ethical lessons about contemporary business and politics.

This chapter reviews the facilitating factors that give rise to these conspiracies and the major impacts that the management and prosecution of these global cartels had on the conspirators, on stockholders and customers, on the antitrust agencies, and on the politics of antitrust. The sizes of the corporate and personal penalties for price fixing are reviewed with four questions in mind. Will the corporate penalties deter future conspiracies? Is there evidence of reform of corporate governance structures that will be less hospitable to collusion? What were the ultimate impacts on companies and industries? How much did global price fixing cost society?

Market Structure Matters

The market environments for the lysine, citric acid, and vitamins cartels fostered collusive price-fixing behavior by the leading firms in the industry. Two industry features tower above all the others in importance. They approach being necessary conditions for cartels to be formed and flourish:

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[1] *Business Week* (July 27, 1998) compared the global cartel stories to the plot of a "cheap paperback thriller-mystery" full of secret meetings, code names, and treaty negotiations. Eichenwald's (2000) account of the FBI's lysine probe borrows his style from this genre. Indeed, he suggests that some of FBI super-mole Mark Whitacre's more bizarre behavior was inspired by his reading of Grisham's novel *The Firm*. Life imitates art.

high seller market sales concentration and product homogeneity. High barriers to market entry are icing on the cake: with them cartels will be durable, without them new sellers will enter the industry and in time make cooperation in pricing a thing of the past. Finally, the remaining structural features of markets shown in Table 17.1 may be called "plus factors." The plus factors are not necessary conditions for the formation of cartels, but they do facilitate the establishment of price agreements and increase the probability of serious price effects.

Concentration

There is no doubt that industry concentration – the share of sales or production capacity controlled by the leading suppliers – was high in every global-cartel case. The share of global production accounted for by the four largest manufacturers of lysine, citric acid, and vitamin A was in excess of 80% in the early 1990s. There is evidence that Western Europe, North America, South America, and Asia were viewed by the cartel members as geographically distinct markets. With few exceptions sales concentrations within the continents were even higher than global concentration. Prices were set quarterly for each region, yet never so far apart as to allow non-cartel firms to make profits through geographic arbitrage activities.

Exactly what threshold may be considered high enough to generate a measurable degree of market power is a matter of some debate in economics. Moreover, the degree of industry concentration required for *monopoly* pricing behavior – the form of pricing to which cartels aspire – is likely to be higher than that needed to achieve significant market power. Finally, the critical concentration level for monopoly pricing may vary according to the type of industry and whether concentration had been historically rising or falling. Despite these uncertainties, empirical studies tend to identify the critical level of four-firm sales concentration at between 40 and 65%.[2] Seller concentration in the cartelized industries covered in this book exceeded the upper end of this range by a comfortable amount. In addition, in the few cases covered in this volume where entry caused industry concentration to dip below about 65%, cartel activity generally ceased.

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2 The threshold employed by the DOJ for merger analysis (a monopoly power concept) is a Herfindahl index of 1800, which corresponds to a 60 to 70% four-firm concentration ratio.

Table 17.1 Economic Conditions Facilitating Global Price Fixing: Lysine, Citric Acid, and Vitamin A, Early 1990s.

Market Conditions	Lysine	Citric Acid	Synthetic Vitamin A
High seller concentration:			
Global market	CR4 > 95%	CR4 > 80%	CR4 > 95%
U.S. market	CR4 > 97%	CR4 = 90%	CR4 = 100%
Few cartel participants	4 or 5	4 or 5	3
High cartel supply control	95-99%	65-70%[b]	95-100%
Low buyer concentration	CR4 < 30%	CR4 < 40%	CR4 < 20%
Homogeneous product[a]	Perfect	High	High
High barriers to market entry:			
Large plant scales	$150 mil.+	$150 mil.	Probably
Sunk investment costs	Yes	Yes	Yes
Technology secret	Yes	Yes	Yes
Building new plants slow	3 years+	3 years+	3 years+
Transparency of market prices	None	Some	Little
Long history of strategic interaction	Yes	Yes	Yes[c]
Annual market growth	10%, steady	8%, steady	2-3%, steady
Cultural propinquity of cartel members	Low	Moderate	High

Sources: Chapters 4, 7, and 10.
CR4 = Sum of the market shares of the top four suppliers or buyers.
[a] Within well recognized industry grades when prices were at cartel-enhanced levels. There were no substitutes when prices were within a normal range.
[b] Control by formal members of the cartel. Cargill, a major supplier with up to 20% of U.S. capacity, provided passive support for the cartel's pricing decisions.
[c] The vitamin A conspirators were long time rivals from Western Europe, but in most of the other vitamin cartels Japanese or Northern American companies had to be recruited to the cartels.

Conceptually separate from the issue of overall industry concentration is the degree of control by the cartel itself. In every case except for citric acid the top four or five producers were all members of the cartel, so in practical terms industry control and cartel control of supply were one and the same. In the citric acid case the one missing leading firm – Cargill – appears to have followed the cartel's pricing decisions while refraining from active collusion. Another dimension of concentration is the fewness

of company numbers. In every case examined in this book, the global cartel operated with three or four corporate conspirators; at times a fifth firm joined the lysine and citric acid cartels. The fewness of firms made formation and monitoring of a price agreement eminently feasible.

Finally, consistent with cartel theory, the degree of buyer concentration was low. In every instance, the top four direct purchasers accounted for less than 20 to 40% of the market, whether calculated at the global or regional level. Low buyer concentration makes it more difficult for purchasers to share credible information about transactions prices and prevents buyers from countervailing against the market power of sellers. Moreover, these industrial ingredients were but small elements in the mix of materials being purchased by the buyers; consequently they had little business incentive to invest in procurement experts who might have detected collusion more readily.

Homogeneity

Cartels can more easily agree on one price than on many and can more easily agree on a measurable market indicator like price rather than a fuzzier notion like superior product quality. Moreover, homogeneous products tend to be made with standardized technologies. Thus, homogeneity often signals equal costs across firms, and equal costs facilitate cartels.

Lysine, citric acid, and each of the vitamins are pure organic chemicals with unique chemical signatures. Within a recognized grade or type, each of the cartelized products was perfectly homogeneous. The presence of conventional grades in the market did not present the cartels with an insuperable challenge. In some cases, such as liquid lysine or natural human-grade lysine, the cartel simply agreed to ignore these relatively insignificant market niches. In some other cases, such as citric acid, the liquid product forms were simply priced off the 100% pure dry form, employing traditional industry rules of thumb for discounts. In some cases, such as vitamin A in oil and vitamin A in dry powder form, the two types flowed into such distinct marketing channels that two prices had to be agreed upon.

With few exceptions, the cartels sold a somewhat more purified form to food processors or pharmaceutical firms and a less purified form to animal-feed manufacturers. As a rule the food/pharma version was sold at the highest price while the feed version sold at recognized conventional discounts. New entrants typically began selling the cheapest version first because the manufacturing standards were not as rigorous. Differences in technical standards prevented substitution of the lower priced grades for

the high priced ones, thereby protecting the established sellers in the food and pharma versions from direct price competition.

In every case, when a cartel became successful in raising prices, participants had to take care not to raise them too high lest substitutes become price competitive. That is, product uniqueness and homogeneity is found only over a certain range of prices. For lysine, soybean or fish meal became an economical substitute in animal feeds if the price of lysine made by the conspirators from dextrose rose above $2.00 per pound. Similarly, citric acid and vitamins can be extracted from natural vegetable matter, but only if the prices of the synthetic versions rose to well above the prices set by the cartel. The availability of substitutes at very high prices limited the ability of some cartels to charge the full monopoly price.

Barriers to Entry

Lysine, citric acid, and several vitamins are manufactured with fairly new fermentation technologies, many of which are still undergoing movements. Most processes are protected by patents or industrial secrecy. The finishing plants are usually dedicated to production of a unique product; while economies of scale for the finishing units are modest, there appear to be substantial economies from physical vertical integration with dextrose or other carbohydrate feedstocks. Even if an efficient technology is widely available, market entry is slow. The finishing plants require two or three years to be built and generally require a year or two more of learning-by-doing to reach optimal productivity levels. Thus, technological barriers of several kinds protect biotech industries making amino acids, food acids, and other organic chemicals.

Several of the vitamins are made with traditional synthetic chemistry. While patents are unimportant, the synthesis is described as difficult to master and key intermediate chemicals are often made by only a couple of suppliers. In general, the cartels that were most protected by technological barriers had low rates of entry and the most durable agreements.

Other Plus Factors

There are five other facilitating factors that are present to varying degrees in the cartel case studies presented above. First, collusion is difficult to maintain when frequent, accurate, public price reporting is available. For all these products nearly the only price data available are irregular announced list or spot prices from trade magazines. While these sources occasionally announce transaction prices, the relationship between the two types of prices tends to narrow considerably at the start of a price-fixing

conspiracy. Thus, list price series would tend to underreport price changes due to collusion. Moreover, list prices typically do not drop when collusion ends, even though transaction prices plummet. International trade data can sometimes provide monthly implicit prices of imported product by country, but lags in sales and transportation costs interfere with developing reliable transaction prices. Only citric acid had a publicly available price series, a monthly survey of prices reportedly paid by purchasing managers.

Second, a long history of aggressive rivalrous interaction among potential members of a cartel may tend to discourage overt price fixing. Predictability in the strategic behavior of one's rivals makes various forms of tacit, less risky cooperation more feasible for a firm. On the other hand, an industry with a history of collusion is more likely to repeat that behavior again. In all the cartels examined in this book, the cartels formed in the 1990s almost always were preceded by overt price fixing in the 1980s or before. Also, in lysine and citric acid there were two new firms that had entered production only a year or two before the conspiracy was formed. The new firms would not have had enough time in the industry to learn how to cooperate tacitly. Tacit cooperation would have been difficult to achieve. Overt price fixing was a faster route to supranormal pricing.

Third, rates of volume growth were quite robust for lysine and citric acid, but vitamin growth had decelerated greatly since the 1970s and 1980s. In each case, growth rates were reasonably predictable. However, in examining the financial records of the major participants in the cartels examined, in the late 1980s nearly all of them showed signs of shrinking profitability in major lines of business. Rather than seeking explanations for collusion in market growth patterns, were it measurable the anxiety of a looming corporate slowdown in growth or profitability may provide a predictor of a willingness to collude.

Fourth, cultural or geographic closeness among conspirators has often been cited as a positive factor encouraging collusive schemes. These forms of propinquity are most often interpreted as proxies for lower conspiratorial transactions costs or the likelihood of developing group trust of a type likely to lower the tendency to cheat. While cultural similarities may have facilitated the cartels formed in Europe and Japan prior to the 1990s, one of the striking features of the global cartels of the 1990s is the cultural plurality of their membership. At times the South Korean firms seemed to be endangering the harmony of the lysine cartel, but in general the broad mix of national and business cultures observed in the case studies seems not to have inhibited cartel formation or longevity. Cartels composed of companies drawn from the more industrialized regions of the "triad" (East Asia, Western Europe, and North America) now seem eminently feasible.

Collusive Behavior

When two or more legally independent companies overtly agree to engage in coordinated actions with the intent of raising prices, a cartel is formed, and their actions are called restraints of trade. There are many specific conducts encompassed by the idea of restrictive business practices. The behaviors of the three global cartels featured in this book illustrate nearly all the 24 specific restraints of trade associated with cartels (Table 17.2). Among the few tactics that were not tried are restricting plant investments, trigger-price mechanisms, or pooled sales through a common agency.

Escalating Antitrust Sanctions and Deterrence

In the European Union, Canada, and several other countries, the successful prosecutions of global cartels by the United States seem to have encouraged a significant stiffening of antitrust penalties. U.S. fines, prison sentences, and private settlements for price fixing escalated impressively from the mid 1990s as a result of changes in U.S. laws and enforcement policies, the growth of cartel injuries, and newfound vigor among both public and private prosecutors. In this section, the issue of the adequacy of the new penalty structures is addressed. Are they sufficient, too low, or too high? Specifically, are the harsher penalties imposed on global price fixers since the mid 1990s likely to deter further future violations?

The sufficiency of cartel penalties is assessed through optimal deterrence theory. The two main purposes of monetary penalties for economic crimes are to *compensate* injured victims of the crime and to *punish* the perpetrators so as to prevent them from repeating the same crime in the future. In addition, penalties can serve to compensate professionals to detect, to investigate, or to provide legal advice concerning antitrust violations. The treble-damages provision for private plaintiffs in Sherman Act cases in the United States was designed specifically for all three purposes. Optimality is affected by the probability of detection of the crime. If, for example, only 20% of all conspiracies are uncovered, then penalties equal to five times the damages are needed to deter repetitive crimes to a socially

Table 17.2 Restraints of Trade in the Lysine, Citric Acid, and Vitamins Cartels.

Types of Collusive Behavior	Lysine	Citric Acid	Vitamins[c]
Setting Common Prices:			
1. List price agreement	X	X	X
2. Transaction price agreement			
3. Agreement on customer discounts		X	
4. Agreement on price-protection clauses	X		
5. Rigging bids	X		X
Setting Company Market Shares:			
6. Global sales shares		X	X
7. Global quantity shares	X		X
8. Regional or national shares	X		X
9. Allocating specific customers			X
Setting Production Limits:			
10. Global output reductions[a]	X		
11. On exports to specific destinations	X	X	X
12. On arbitrage by buyers	X		X
13. On production capacities			
Monitoring the Illegal Agreements:			
14. Reporting company production data[b]	X	X	X
15. Sales certification by third parties		X	
16. Inspection of plant records or inventories on site		X	?
Cartel Enforcement Methods:			
17. Trigger price mechanism			
18. Dominant firm threatened excess production	X	X	
19. Periodic compensation for under-share members	X	X	X
20. Marketing agency for pooling of sales			
21. Pooling and division of profits			X
Cover-up Efforts:			
22. Create or exploit an industry trade association	X	X	X
23. Hide evidence of travel, meetings, or communications	X	X	X
24. Employ code words or code names	X	X	

Source: Chapters 5, 8, and 11.
X = Behavior observed or highly probable in cartel above.
? = Some unconfirmed reports of such behavior.
[a] Production limits are set below historical rates of growth in the market.
[b] Frequent, detailed information on prices, production, sales, inventories, or costs of production.
[c] Because there was no trial conducted in this market, there is somewhat less detail available than for the lysine and citric acid cartels.

Table 17.3 Summary of Corporate Penalties for Global Price Fixing, 1996-2005

Company/ Subsidiary [a]	Lysine	Citric Acid	Vitamins	HFCS[b]	Total
	Million nominal dollars				
Archer Daniels Midland Co.	176.3	133.8	0	460.0	770.1
Ajinomoto/Heartland Lysine	60.4	0	0	0	60.4
Kyowa Hakko/Biokyowa	42.6	0	0	0	42.6
Sewon Group	19.0	0	0	0	19.0
Cheil Jedang, Ltd.	14.6	0	0	0	14.6
Bayer AG/Haarmann & Reimer	0	192.3	0	0	192.3
Hoffmann - La Roche	0	73.0	2595.0	0	2039.0
Jungbunzlauer International	0	73.0	0	0	73.0
Eridania/Cerestar Products	0	1.5	0	0	1.5
Cargill	0	0	0	23.0	23.0
CPC International	0	0	0	7.0	7.0
Tate and Lyle/ A.E. Staley	0	0	0	115.0	115.0
American Maize	0	0	0	5.0	5.0
Roquette Freres/ Hubinger	0	0	0	5.0	5.0
BASF AG	0	0	1034.0	0	1034.0
Alusuisse/ Lonza	0	0	68.8	0	68.8
Aventis/ Rhone-Poulenc	0	0	317.0	0	317.0
Aventis/ Hoechst	0	0	1.2	0	1.2
Takeda Chemical Industries	0	0	527.0	0	527.0
Eisai Co.	0	0	156.0	0	156.0
Daiichi Pharmaceutical	0	0	117.0	0	117.0
DuCoa, Inc.	0	0	0.9	0	0.9
Chinook Group, Ltd.	0	0	13.1	0	13.1
Nepera	0	0	7.6	0	7.6
Reilly/ Vitachem	0	0	6.2	0	6.2
Degussa/ Vitachem	0	0	23.0	0	23.0
Mitsui/ Bioproducts	0	0	53.8	0	53.8
E. Merck KGaA	0	0	73.5	0	73.5
Solvay Pharmaceuticals	0	0	8.1	0	8.1
Sumitomo Seiyaku	0	0	17.5	0	17.5
Tanabe Seiyaku	0	0	45.0	0	45.0
Kongo Chemical	0	0	0	0	0
Total	256.9	473.6	5065.7	610.0	6407.2

Sources: Connor (2001: Table19.3), Connor 2006b (Table 16).
[a] Aventis became the new parent firm in 1999 of two independent conspirators.
[b] High fructose corn syrup (civil suit in the United States).

optimal level. In the United States, the legal maximum penalties (fines equal to double damages plus trebled private damages) would be optimal.

The reality is that U.S. cartel fines and settlements never approach the legal maximums. Moreover, outside the United States many jurisdictions impose no fines, and only a few countries permit buyers to sue for civil damages. Where they exist, such laws permit plaintiffs to seek only single damages. The toughening of the fine structure for cartel violations in the European Union in the late 1990s was partially a response to the lack of civil suits in national courts and to the absence of personal penalties for price fixing in most European jurisdictions. Finally, the inability of courts and commissions to award prejudgment interest has a significant negative impact on the effectiveness of penalties.

Table 17.3 attempts to collect together all of the information on the monetary penalties imposed on the corporate participants in high fructose corn syrup and three global cartels: lysine, citric acid, and vitamins. The data shown include both government-imposed fines and court-approved civil settlements, but they do not include the cost of legal services incurred by the companies for their defense. The total antitrust penalties amount to $6.4 billion for the 32 companies listed. Four-fifths of the penalties arose from the vitamins cartels. Two firms, Roche and ADM, had penalties in two or more of the cartels.

Several penalties represent historic record amounts. The total U.S. criminal fines imposed on corporate lysine conspirators in 1996 were $91 million. In 1996-1997 the citric acid cartel members paid $105 million, and by 2000 fines paid by the participants in the vitamins cartels had climbed to $911 million. Each of these was a historic U.S. record. Canadian, Australian, and EU fines in vitamins were also records. The U.S. and Canadian civil settlements were the largest recorded. These penalties are undeniable, concrete indicators of increased prosecutorial toughness in the price-fixing arena.

Competition-law prosecutors are quite proud of their enhanced fine levels. U.S. and Canadian prosecutors assert that in general their fines force price fixers to disgorge more than their illicit profits. Class counsel often echoes that sentiment. Yet, legal commentators are divided on whether the penalties serve deterrence. For example, when announcing the plea bargains for the major vitamin manufacturers, the head of the DOJ noted that the $14 million fine paid by Hoffmann-La Roche in 1997 was insufficient to keep the company for continuing to fix prices in vitamins for another year. There are scores of companies that are recidivists.

Criticism that antitrust penalties are too low is easy to find, but the reasons given often do not pass muster. The presumed inability of antitrust

authorities to drive hard bargains seems to be based on suggestions that defendants' counsel must be better because they are higher paid, that governments are reluctant to hobble national business champions, or that political interference plays a role in limiting fines. The positive reactions of the stock market to the announcements of price-fixing fines are cited as evidence of weak fines.

More trenchant are assertions that monetary sanctions extracted from cartel participants in the 1990s were lower than the monopoly profits earned (Barboza 1999). Deterrence can work only if the *probable* costs of prosecution exceed the *expected* monopoly profits. According to some critics, the crime of price fixing pays, and one of the main reasons it pays is that antitrust agencies only calculate harm to buyers within their jurisdiction when deciding on appropriate fines (Adams and Bell 1999). In the era of global cartels that make large shares of their monopoly profits outside a given jurisdiction the chances that price fixing pays are quite large. Added to that is the fact that the secretiveness of cartels makes them difficult to discover.

Taking the opposite tack are Kelly and Sayyed (2000). The authors judge that the DOJ's double-the-harm fines, when combined with treble damages "border on overkill." The *vitamins* cases, they say, illustrate the "unfortunate . . . scale and scope" of recent cartel litigation. They warn that high cartel penalties may not be tolerated by the Supreme Court because the Court is opposed to "duplicate damages" that the treble-damages provision creates incentives for firms to harass rivals with frivolous suits, plays into the hands of greedy plaintiff's attorneys, and will drive some defendants into bankruptcy. Kelly and Sayyed are long on passion but short on supportive facts for their arguments.

Assessing Antitrust Sanctions

As impressive as the total dollar penalties imposed on global cartels may appear, assessment of the effectiveness hinges on the examination of other quantitative indicators. Three objective standards of severity suggest themselves: the actual penalties compared to the maximum legal liability, compared to the economic harm caused to customers, and compared to the monopoly profits generated by the cartel.

Discounts from the Maximum Penalties

In criminal systems of cartel enforcement, almost all fine are the result of bargaining between the government and defendants. Because of the precision of the DOJ's sentencing guidelines, it is the only jurisdiction for

which it is possible to calculate a price fixer's maximum fine. Connor (2006b: Appendix Table 14) gathers information on the DOJ's discounting decisions with regard to price-fixing fines in the vitamins cases.

The first vitamin conspirator to agree to plead guilty was Mitsui's U.S. subsidiary Bio-Products, Inc. In 1998, it received full amnesty, i.e., a 100% discount, as the first to inform the DOJ about the choline chloride cartel (Barnett et al. 2005). Lonza was the second firm to begin cooperating with the DOJ, but could not qualify for amnesty because it was the leader in the vitamin B3 cartel; in line with standard DOJ policy Lonza received a 72% discount from the maximum possible fine. The DOJ evidently regarded the Roche cartels as legally separate events from the vitamins B3 and B4 conspiracies, because it conferred full amnesty on Rhone-Poulenc in February 1999. So far the downward departures seem understandable and consistent with stated policy.

However, Roche and BASF, designated as tied "second" firms to plea (actually fourth), received inexplicably generous discounts of 81 and 72%, respectively. These discounts seem excessive because Roche and BASF were allowed tied positions contrary to the Corporate Leniency Program's rules, because they were the co-ringleaders of 14 cartels, and because three companies had already agreed to cooperate. The three largest Japanese firms stuck together, refusing to plead guilty until four months after Roche and BASF. For this defiant stance Takeda, Eisai, and Daiichi were awarded discounts of 75, 25, and 44%, respectively. The 10th and 11th firms to come forward, E. Merck, and Degussa, procrastinated for more than a year, yet got 44 and 29% discounts from double the U.S. damages. None of their managers were indicted. Nepera and Reilly enjoyed 80% discounts. The remaining 8 corporate conspirators received fines of 99 to 100%. In three cases ability to pay was an issue, and in two more cases the statute of limitations could have intervened. But by far the most common explanation for no fines was that the size of the affected sales in four cartelized markets fell below a certain threshold.

In summary, every one of the 21 vitamins defendants were bestowed downward departures from the maximum legal U.S. fines. Instead of paying up to $4.8 billion in fines, they paid a bit over $900 million – an aggregate 81% discount. If one ignores the justified discounts (amnesty, second to apply, and ability to pay), the DOJ still gave away at least 75% of the liabilities as discretionary inducements to plead guilty. This unwritten policy contributes to sub-optimal deterrence.

Penalties Relative to Affected Commerce

Chapter 16 contains a detailed analysis of penalties applied worldwide to the vitamins cartels. Antitrust scholars, antitrust skeptics, and enforcement

officials frequently cite these cartels as the most severely punished international price-fixing conspiracies in history. Therefore, they are an excellent test case to examine the deterrence power of corporate monetary sanctions.[3]

Measured in nominal dollars, total monetary sanctions averaged about 20% of global affected sales (Figure 16.1). The most intense fines were levied by Canada (15% of sales) with the United States slightly smaller (12%) and the EU the smallest of the three (8%). As a percentage of affected commerce in the rest of the world, fines by Australia and Korea are negligible. By far the most intense sanctions were those extracted by private treble damages suits in the United States. When combined with U.S. fines, the vitamins defendants paid penalties equal to 55% of their U.S. revenues during the cartel periods. Canada's sanctions are not far behind with a combined ratio of 37% of affected sales. Relative to affected commerce in their jurisdictions, the North American monetary sanctions were five or six times higher than the EU's. Therefore, the United States lives up to its reputation as the most fearsome antitrust jurisdiction.

There is an interesting connection between U.S. fines and the intensity of private settlements. Most private antitrust suits are follow-on actions. But because the DOJ chose not to prosecute some of the cartels for reasons of administrative convenience, private litigants seem to have had a more difficult time extracting substantial settlements in the markets for vitamin B12 and other carotenoids. Absent government prosecution, U.S. buyers did not sue the vitamin D3 makers. On the other hand, private plaintiffs obtained relatively large settlements in the markets for vitamins B1, B4, B6, folic acid, and biotin – all markets with no or spotty U.S. prosecutions. Companies that were not fined anywhere in the world (Sumitomo, Tanabe, Kongo, etc.) paid significant civil penalties in the United States and Canada.

The ratios just cited are frequently discussed in the antitrust law literature, but such calculations are flawed. Government fines are imposed many years later than the cartel revenues were made; the average lag between the middle of a conspiracy and DOJ fines was about five years; and for civil cases and fines in the EU the lag averaged about eight years. Because courts do not award prejudgment interest, the numerator is overstated compared to the sales dominator. When the penalties are

[3] There were 17 men sentenced, 16 in the United States, four in Canada, and three in both countries. The United States imposed average fines of $110,000 and prison sentences of 8 months.

adjusted for the time value of money the sales intensity penalties is moderated considerably. On average the real ratios are 50% lower than the unadjusted ratios.

Penalties Relative to Damages

A superior way of assessing the harshness of monetary sanctions is to divide them by the overcharges imposed by the cartels (Figure 16.2). From the point of view of deterrence, these ratios are far more meaningful than the more common sanctions/sales ratios. As the overcharges are close to the amount of illegal profits garnered by the members of the cartels, the sanctions/overcharge ratios are indicative of the degree to which antitrust sanctions were successful in disgorging those profits. A ratio of 100% higher means that a cartel's monopoly profits were transferred from the defendants to taxpayers or purchasers.

Global monetary sanctions from government and private legal actions amounted to about two-thirds of the vitamins cartels' economic injuries. Canadian government fines were the highest (about 50%), and U.S. and EU fines fell well below the global mean at 40% and 30%, respectively. Again, the private damages suits in the United States were the harshest antitrust remedy. Private litigants received full compensation for most of their overpriced vitamins. Taking into consideration the probability of detection, total sanctions were woefully short of optimally deterring defendants like those in the vitamins cartels.

The absence of private antitrust litigation in Europe is a major factor explaining the very low sanctions/overcharge ratios in Europe. Total public and private cartel penalties were four times higher in Canada than in the EU and U.S. penalties six times heavier. But in the rest of the world, the near absence of penalties of any kind brings the sanctions/overcharge ratios to clearly sub optimal levels for deterrence purposes. The vitamins defendants paid out at most 72% of their illegal gains to governments or victims worldwide.

Because the penalties and overcharges are from different time periods, it is appropriate to calculate the fines and overcharges in present values. On average the real-dollar ratios are about 50% lower than the values (Figure 16.3). On average the real-dollar ratios are one-sixth of the nominal-dollar ratios. With sanctions well below 100% of profits, it is simply rational to join an international cartel.

Financial Impacts of Antitrust Sanctions

Companies will be deterred from repeating otherwise profitable price-fixing behavior if the expected financial costs incurred from antitrust sanctions are high enough. The financial costs of being sanctioned also show up on the income and balance statements of the corporate conspirators. In addition, the major companies involved in global price fixing have suffered reputational losses that may have persisted for years after their confessions of guilt. The reputational injuries show up as skepticism about the quality of a company's management, the sources of positive financial performance during the conspiracy period, and doubts about the management's ability to repair the company's profit-making potential in the years following a cartel's exposure and prosecution.

The most dramatic and tangible evidence of loss of investor confidence are plunges in the stock prices of listed companies when antitrust investigations become known and the prospects of significant sanctions increase. In many cases, these share prices fail to recover for years after these events even though managers are replaced, capital expenditures continue, and sales or profits in the company's other lines of business show healthy growth. Perhaps in the long run the most important effect is not whether the conspirators themselves are specifically deterred from repeating their crimes but whether their difficulties become a negative example to other firms in conspiracy-prone industries.

Among the companies involved in global price fixing in the 1990s, the best-documented example of financial and reputational losses is the Archer Daniels Midland Company (ADM). During the fiscal years ending June 30, 1992 to June 30, 1996, ADM's pre-tax profits were between 6.5 and 9.3% of sales. However, beginning in fiscal 1996, the year ADM's lysine problems began, ADM's profit rate plunged each year as it incurred antitrust costs. During 1997-2000, pre-tax profits averaged only 3.5% of sales, or less than half the 1992-1996 period. After-tax profits fell even more precipitously because companies are not permitted to offset part of the costs of fines and civil settlements by income-tax reductions. While other factors such as the 1997-1998 East Asian financial crisis and falling agricultural commodity prices contributed to ADM's poor profit performance, direct antitrust costs accounted for 55 to 63% of ADM's profit declines in 1995-96 and 1996-97. Falling sales revenues from lysine and citric acid attributable to the breakup of the two cartels further added to ADM's poor financial performance in 1996 and 1997, even though the two products accounted for less than 5% of the company's sales.

Abundant information on ADM's illegal profits from the lysine and citric acid cartels, together with fairly reliable information on the financial costs incurred for these infractions, permits one to develop an

answer to the age-old question about crime: Does it pay? Table 17.4 attempts to gather evidence on this question from earlier chapters in this book, looking separately at ADM's U.S. business and its global lysine revenues.

The bottom line is that ADM clearly bore more *U.S.* financial costs from antitrust legal actions against it than it earned in the form of monopoly profits from the lysine cartel. U.S. antitrust costs exceeded the extra profits from collusion by about $70 million. However, ADM earned

Table 17.4 Does Crime Pay? ADM and the Lysine Cartel, 1992-1995.

Income Statement	Actual Liability	Maximum Legal Liability
	Million dollars[c]	
United States:		
Revenues (Monopoly Profits)	80	80
Costs:		
U.S. government criminal fines	70	160
Federal civil settlements	45	240
Suits by attorneys general	0	120
State-level indirect buyers units[a]	15	30
Legal services	20	20
Total U.S. financial costs	150	530
Net U.S. revenues from price fixing	-70	-490
Rest of the World:		
Revenues[b]	100	100
Costs:		
European Union fines	45	1,200
Canadian government fines	8	10
Canadian civil suit	10E	25E
Other national agencies	10E	25E
Total non-U.S. financial costs	73	1,260
Net non-U.S. revenues from price fixing	27	-1,120
Global net revenues	-43	-1,610

Sources: Chapters 5, 6, 8, 9, 13, and 14.
E = Estimated.
[a] Assumed half of U.S. sales in states that permit such suits and a 75% pass-through rate.
[b] Non-U.S. affected sales by ADM were $250 million. Assumed same overcharge rate as in U.S.
[c] ADM's global sales were about $12 billion in 1992. Affected annual U.S. lysine sales were $200 million and global lysine sales about $450 million.

small positive returns from lysine price fixing on a *non-U.S.* accounting basis. In other words, because government fines were smaller and civil suits uncommon outside the United States, ADM has so far profited from its lysine price fixing outside the United States. On a global basis, ADM did not make its crime pay, but the loss in net revenues was relatively small, about $43 million.

Another important lesson from this analysis is that the full force of the law could have vastly increased ADM's antitrust liabilities. Had the maximum legal sanctions been imposed, ADM's net losses from its participation in the lysine cartel could have reached $490 million in the United States or $1.6 billion worldwide. Note that this analysis of the costs and returns to price fixing does not include ADM's role in the citric acid and fructose cartels.

An intangible effect of antitrust conviction is its impact on the company's reputation. In some cases, a long held reputation for honesty and reliability may be lost. In other cases, an existing image for unethical behavior will be reinforced. With ADM it appears to be the latter case. Prior to its conviction for price fixing, ADM was already perceived in the industry as an agile agribusiness giant that had cleverly exploited its political ties for profitable, government-sanctioned deals. For buyers and suppliers, ADM was known to be a tough negotiator willing to throw its weight around. To the broader public ADM's advertising featured sugar-coated themes of patriotism, ecology, and the relief of global famine that were barely indistinguishable from public service announcements; in fact, the spots were generally subtle appeals supporting public policies like ethanol subsidies that benefited ADM. After its conviction perceptions about ADM's strengths took on a more sinister cast. The company's strategic success was attributed to "muscling into market position" thanks to "years of unashamed influence-peddling in Washington" (Carlson 1996). When ADM paid a record $100-million antitrust fine, many journalists hinted that it was a sweetheart deal, payback for years of extraordinary political contributions by ADM and the Andreas family.

Even years after ADM pleaded guilty to price fixing, the company was still being cited as one of the most egregious examples of poor management, corporate crime, and corporate welfare. In July 1997, the head of the U.S. Council of Institutional Investors said, "ADM is as good as a corporate villain as you can get." When three of its top officers were found guilty of price fixing in a jury trial in 1998, ADM's image slipped even lower. In 1999, the *Chicago Tribune* called ADM "corporate America's black sheep" because of its habit of "flouting the law when it served its interests."

Industry Restructuring

All industries become restructured from time to time. That is, significant changes in the population of leading suppliers and their market positions may occur. Such restructuring may spur or obstruct collusive market conduct. In some cases merger control may be the first line of defense against cartels.

In the vitamins industries, restructuring preceded, accompanied, and followed the global cartels of the 1990s (Connor 2006c). In the decades of the 1960s and 1970s, Hoffmann-La Roche's hegemony eroded in most product lines as many new European and Japanese firms built new manufacturing facilities. Doubtless some cartels were formed in a few markets during these decades, but in many product lines net increases in the number of sellers discouraged explicit collusion. In the 1980s vitamins market structures stabilized; there were relatively few examples of large-scale entry into most vitamins industries. On the other hand, industry consolidation was facilitated by a number of industrial exits. Indeed, Roche engineered significant restructuring by acquiring the Danish vitamin maker Grinsted, which had important shares in the vitamin C, B1, B2, and B6 industries. In retrospect, the EU should have opposed this merger.

In the years immediately following the end of the vitamins cartels, several changes in ownership occurred as a result of altered business conditions. While precise data are lacking, the global vitamins industries seem to have become more concentrated in 2006 than they were in 1990.

Hoffmann-La Roche, for 70 years the proud global leader in the vitamins industry, decided to withdraw from vitamins manufacturing altogether. Four years of legal battles with angry customers, stubborn regulators, and mounting financial costs seem to have sapped the company's commitment. In 2003, Roche decided to sell its entire Vitamins and Fine Chemicals Division to a mid-sized Dutch chemicals maker, DSM NV. Even though Roche agreed to absorb all liabilities for still-lingering vitamins antitrust suits, DSM got the division and its 7,500 employees in 2004 for a song (only $2.1 billion).

In late 2001 Aventis announced the sale of its Rhone-Poulenc animal nutrition division to a UK venture-capital firm for merely $267 million. Besides its considerable assets in vitamins, the division included the amino acid methionine and feed enzymes. This division achieved 2004 sales of about $600 million from plants in France, Spain, and the United States. In 2005 the assets were sold again to Blue Star Group, a unit of ChemChina and one of China's largest companies.

In late 2000 Takeda Chemical Industries, the largest Japanese defendant, also withdrew from the vitamins industry. Takeda's substantial physical and technological non-Japanese assets in this market were sold for less than $225 million to the world's number two producer, BASF. In a

detailed analysis of the acquisition, the UK Competition Commission related BASF's stated motives for the purchase (UKCC 2001:7). Broadly summarized, BASF desires to imitate Roche's formula for success.

During the 1990s the major example of restructuring was the impressive growth of Chinese manufacturing. High prices spurred large investments in production capacity in the vitamins C, E, B1, B3, B5, B6, B9, and B12 industries. When prices collapsed after 1999 Chinese sales in most vitamin industries contracted but remained substantial.

One of the more sanguine themes of this book is the role played by Chinese vitamins manufacturers in destroying global price fixing in a few markets. Now, like a horror story in which a monster believed to be dead springs to life to wreck havoc one last time, the former spoilers in the world markets for vitamins have transmogrified from friends of consumers to fiends. With the assistance of a parastatal industry association, Chinese makers of vitamin C have been credibly accused of fixing the price of exports to the U.S. market, where they control 85% of imports (Wilke and Chen 2006). After a meeting in November 2001 of the newly formed Vitamin C Chapter of the China Chamber of Commerce of Medicines, spot prices rose by 200% within a month. Minutes of the meeting (posted on a public web site) clearly show the Chapter's intention to raise prices. A civil damages suit has been launched in the United States.

Corporate Governance Structures

As the previous section emphasized, firms can be deterred from violating the antitrust laws by judicially imposed sanctions. Up to some optimal level, the greater the likelihood and severity of antitrust fines or civil settlements, the greater the deterrence effect. However, private-sector solutions to enhanced deterrence are also possible. That is, corporations and their trade associations may on their own institute structural reforms or compliance programs aimed at reducing the liability faced by corporations when their employees opt to violate the antitrust laws.

There are three types of policies available to corporations. First, companies can develop personnel guidelines that would increase the degree of personal responsibility of executives guilty of contravening the antitrust laws. Second, firms can establish internal antitrust compliance programs and more aggressive financial accounting controls to detect violations at an earlier stage. Externally, corporations can press for antitrust safeguards for the trade associations in which they hold memberships. Third, corporate governance can be restructured in ways that make price fixing more difficult to hide.

Personnel Policies

Price-fixing schemes require managers to run them. One of the striking lessons of the global cartels examined in this book was how high ranking the chief conspirators were. At ADM the principal perpetrators of the lysine and citric acid conspiracies were the Vice Chairman and two presidents of the company's divisions. At Ajinomoto, the group's president blessed the lysine cartel and one other member of the company's management committee directed the conspiracy. At Hoffmann-La Roche, two of the eight members of the company's management committee were deeply involved in fixing the prices of vitamins and citric acid. In five or six other companies, the Chief Executive Officers were the principal perpetrators of their company's price fixing agreement.

As far as can be determined only *one* corporate officer of the more than twenty five companies that pleaded guilty to lysine, citric acid, or vitamin price fixing voluntarily resigned in protest of their employer's illegal activities. In a few cases, executives about to plead guilty for criminal price fixing were forced to resign their positions as officers. By resigning rather than being fired for cause, these executives for the most part retained their pensions, their vested rights to stock options, and their eligibility to seek employment at other companies. Out of about 300 or so known cartel managers, at most six corporate officers guilty of price fixing were dismissed outright because of their antitrust violations. The most common sanctions imposed by companies on the top officers caught price fixing were mild reprimands and reassignments to positions that were lateral moves or slight demotions.

Some companies were extraordinarily supportive of the executives who devised and managed the cartels. ADM, for example, never fired any of the five or six officers who were actively engaged in price fixing. It did, however, fire one officer when he refused to partake in the citric acid scheme. ADM permitted Michael Andreas to go on an extended paid leave when he was indicted in December 1996, 17 months after the FBI raid on ADM's headquarters. Moreover, Andreas was given a raise and immediately hired as a consultant to ADM up until at least the end of his trial in September 1998, and possibly for a year more. Terrance Wilson resigned in late 1996.

The actions taken by the three largest Japanese vitamin manufacturers after their guilty pleas were a bit different. After somewhat ritualized apologies featuring deep bows in public places, these companies took somewhat more tangible steps to symbolize shame and admit responsibility. The presidents of the three companies resigned their honorific positions as chairmen of industry trade associations. Many officers and members of the boards of directors voluntarily imposed on themselves

significant, temporary reductions in their salaries or fees. No similar demonstrations of shame were seen outside of Japan.

When employees are being investigated for alleged antitrust violations and even after being indicted, companies must walk a fine line between the presumption of innocence and protecting the company's reputation for ethical behavior. An overly quick condemnation will redound badly on employees' morale, but doing nothing will signal the company's tolerance for unethical or indeed illegal behavior. It is well to be reminded of one of the principal lessons learned by the DOJ after years of prosecuting global cartels:

> ". . . in our experience, without exception, . . . foreign cartel members are fully aware that they are violating the law in the United States and elsewhere [and] show callous disregard for customer victims" (Spratling 1999: 9).

There are a number of steps that companies can take with regard to contractual conditions of employment for corporate officers that would raise the cost of engaging in price fixing. First, companies should have in place policies that would only protect employees that are innocent of price fixing. Executives should continue to receive adequate legal counsel paid for by the company, but it should be reimbursable to the company should the employee plead guilty or be found guilty at trial. Second, employees should know that after being indicted for serious criminal offenses, being placed on leave is automatic. Third, being found guilty and having exhausted all appeals, it should be a corporate policy that dismissal for cause is automatic. Such dismissals should, by employment contract, require forfeiture of pension rights and stock options.

Antitrust Compliance Programs

Many well-managed companies have antitrust compliance programs, but many do not. ADM, Roche, and BASF specifically announced after pleading guilty that such programs would be started or reinvigorated. These programs may be established or monitored by the company's office of the general counsel or by an outside law firm with antitrust experience. Typically, antitrust compliance programs involve in-service training of officers and salespersons about legal principles and prohibited practices. Memoranda reminding employees of corporate ethics will be issued periodically by a top company executive. The general counsel's office will make known their availability to assess in confidence questionable pricing practices or to accompany officers when they confer with rival firms. ADM

and other companies have set up "hotline" telephone systems so as to encourage employees to report anonymously on suspicious behavior by other employees. Some companies have an officer identified as an "ombudsman," a respected senior employee empowered to investigate allegations of improper behavior and to report findings to the Chairman or Board of Directors.

Compliance programs are complementary to traditional mentoring customs for corporate employees. Of course, if a company has a culture that positively encourages risky behavior that is ethically dubious, then an antitrust compliance program may not be able to overcome the effects of mentoring that teaches opposing standards. Some companies seem to foster a buccaneering spirit that inculcates disdain for laws like antitrust that by their very nature constrain firms from following many potentially profitable opportunities.

The antitrust compliance program of a company's general-counsel office should be supplemented by the checks and balances of a company's accountants. All the global cartels studied in this book were operated by a multi-firm committee that met face-to-face on a regular schedule. Cross-checks of travel expenses and corporate telephone records could provide a company's top management with early warning of suspicious behavior. The controller's office should be authorized to make unannounced audits of suspicious travel and communications patterns.

However, these internal checks and balances are unlikely to catch collusive behavior by employees if a cartel uses a legitimate trade association as a cover for illegal price fixing. Therefore, firms must satisfy themselves that the trade associations they belong to are unlikely to provide cover for collusive activity. Trained antitrust lawyers should be present at meetings to prevent illegal topics from being discussed. Regular meetings should be tightly scheduled so as to discourage side meetings of cartel participants.

Finally, the European Union should re-examine its policy of encouraging official trade associations comprised solely of private corporations. The lysine and citric acid cartels were facilitated by associations loosely affiliated by the European Commission's Agriculture Directorate. The European Union seems to have become aware that trade associations can have their dark side:

> ". . . in recent years, trade federations, an age-old tool for corporate networking, have become implicated in an increasing number of cartel investigations conducted by the [European] Commission's antitrust department" (*Wall Street Journal* August 28, 2000:A23).

Besides the European Citric Acid Manufactures' Association (ECAMA), the EU has investigated the anticompetitive roles industry associations in paperboard, cement, steel tubes, and banking. In some cases, the associations themselves have been fined for competition violations. For example the Product Group Paperboard was fined $117 million in 1994.

Boards of Directors

Boards of directors are ultimately responsible for ensuring the long run best interests of the stockholders of corporations. Directors must walk a fine line between minimal oversight and intrusive meddling in major managerial decisions. Normally, they should be supportive of the many difficult decisions made by top executives, yet at the same time avoid becoming too complacent, just because management is producing good financial results. Excessive passivity might foster an authoritarian management style that research has shown facilitates unethical corporate behavior, including price fixing. Investors value companies with good corporate governance policies. Valued policies include companies that have a majority of its board members independent from management, pay directors mostly in stock or stock options rather than cash, and have formal performance evaluations for directors.

ADM's Board of Directors became an egregious example of failed corporate governance. In November 1996, a *Business Week* survey of management experts rated ADM's board as nearly the worst in the United States. It was poorly structured, ignored danger signs, and acted too slowly once clear evidence of serious criminal price fixing had been presented to it. A major reason for the Board's inaction is that it was mesmerized by Chairman Dwayne Andreas' charisma and lulled by decades of extraordinary financial performance under his leadership. Contributing to the Board's indulgent view of management was the fact that it was too large (17 members), too old (average age over 70), and too close to the Chairman. Prior to 1996, at most three members could possibly be categorized as outsiders, and even these had been recruited for their prior personal ties to Dwayne Andreas. Friendship, loyalty to the company, and blood relationships made it nearly impossible for the Board to act quickly in the interests of reducing ADM's antitrust exposure when doing so meant sacrificing the Chairman's son and successor to the prosecutors. A well-known professor at the University of Chicago's Business School opined that ADM's "family fiefdom" model of management could not continue.

ADM's antitrust problems eventually brought about significant reform of the company's governance structure. Partly in response to a shareholders' suit against it, the board had decided in early 1996 to reduce its

membership to 12 and increase the number of independent or outside directors. By late 1996, after eight resignations from ADM's board, well over half of its members were still insiders by anyone's definition, a state of affairs that infuriated the company's largest institutional investors. In October 1996, a motion opposed by the board that was designed to tighten the definition of what constituted an outside director was narrowly defeated in a stockholders' vote. Some other reforms included reducing directors' compensation from a minimum of $110,000 per year to about half of that level and changing the nominating committee's membership to include more outsiders. While ADM's governance changes may have been fitful and half-hearted, they have for ten years kept a company prone to price fixing out of trouble.[4]

The Fate of Individual Conspirators

The price-fixing convictions had no effects on the professional careers of most of the 300 or so individual conspirators. However, there were a small number of executives who played leading roles in global cartels in the 1990s, for whom U.S. criminal prosecution took a profound toll on their professional and personal lives.

The three principal perpetrators of price fixing at ADM were the most severely punished individuals in the history of the Sherman Act. *Terrance Wilson*, who worked nearly his entire adult life for ADM, resigned in October 1996 about the time ADM pleaded guilty in the lysine case. He stood trial in U.S. District Court in Chicago in the summer of 1998 alongside his former boss, Michael Andreas. After being found guilty and exhausting all appeals up to the U.S. Supreme Court, he was fined $350,000 and sentenced to federal prison for 33 months. *Michael Andreas*, who worked nearly his entire adult life for ADM, is "the most prominent American executive ever convicted for international price fixing" (*Wall Street Journal* September 17, 1998). But for his 1998 conviction at trial he would, in all probability, be the Chairman and CEO of ADM today. Andreas paid a $350,000 fine and was sentenced to 36 months in prison, which bestows on him the infamous distinction of being the first individual to pay the maximum penalties under the Sherman Act. He narrowly escaped being fined under sentencing guidelines that would have imposed a $25-million penalty.

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[4] ADM engaged in at least four naked cartels in the early 1990s. In the late 1990s members of the Board publicly praised the company and Dwayne Andreas to the skies. Directors strained credibility by calling ADM "the cleanest company in America." Among its more controversial decisions was to replace Dwayne Andreas with his nephew G. Allen Andreas.

Mark Whitacre, the FBI's informer in the lysine cartel case, was also found guilty of criminal price fixing at the 1998 Chicago trial. Whitacre's 30-month prison sentence was surprisingly high to many observers because traditionally whistle-blowers have been given suspended sentences (Lieber 2000). In addition, Whitacre was sentenced to nine years for embezzlement of $10 million from ADM. Besides restitution of the stolen money plus interest to ADM, Whitacre was further required to pay $6.3 million to ADM when his former employer won a civil suit for breach of duty and fraud. These judgments bankrupted Whitacre.

For a while after he was fired, Whitacre was a genuine American folk hero (Lieber 2000). Later, his proclivity for self-destruction and tale spinning earned him the unenviable sobriquet "Pinocchio with a Ph.D." Whitacre's fall from grace dragged three of his loyal subalterns down with him.

Andreas' counterpart at Ajinomoto, *Kazutoshi Yamada*, seems to have been forced to resign, but has otherwise escaped punishment. After agreeing to surrender to U.S. authorities, Yamada failed to appear for trial in 1998. It is fairly certain that Yamada's name appears on a "watch list" maintained by the U.S. Immigration and Naturalization Service thus effectively barring him from U.S. territory for the rest of his life.

ADM President *James Randall* and Chairman *Dwayne Andreas* have both retired. Both men escaped indictment for price fixing only because of bargains with the DOJ made at the last hour. In Andreas' case, journalists have speculated that that this was evidence of special treatment for a politically exalted personality. However, by the time of ADM's October 1998 annual meeting, Andreas' stature had eroded greatly, so much so that the *Chicago Tribune* called him "the forgotten man." The conviction of his son and the constant barrage of criticism of his secretive, ruthless, and shoot-from-the-hip management style had taken their toll. Dwayne Andreas retired at the age of 80 in January 1999. Numerous profiles in the nation's leading business publications extolled his visionary business decisions concerning soybeans and fructose, but inevitably ended with references to ADM's legal problems. A *Chicago Tribune* senior business writer called Andreas the last of the "old-style corporate bosses," a "political heavyweight" who made ethically questionable political gifts, and a father "who looked the other way as his son . . . conducted a global price fixing scheme."

The first individual to be sentenced for the citric acid conspiracy was *Hans Hartmann*, head of Bayer's U.S. sales operations. In 1997 Hartmann pleaded guilty and agreed to pay a fine of $150,000. No prison time was requested by the government, even though he was the acknowledged ringleader of the conspiracy and residing in the United States. Two months later Hartmann quietly retired from Bayer after 40 years of service to his

company. Later that month the two chief conspirators in Hoffmann-La Roche (Udo Haas) and Jungbunzlauer International (Rainer Bichlbauer) were handed down the same punishments.

The vitamin-cartel convictions were more far reaching. *Kuno Sommer*, Hoffmann-La Roche's head of global marketing for vitamins and other fine chemicals, was agree to pay a $100,000 fine and go to prison for four months. He became the first European to be imprisoned for a Sherman Act violation in the law's 109-year history. A few months later, the President of Roche's Vitamins and Fine Division, *Roland Brönnimann*, also pleaded guilty to criminal price fixing. He paid a larger fine ($150,000) and served a longer prison sentence (five months). It is noteworthy in the vitamins case is that Roche immediately announced that both Sommer and Brönnimann were summarily fired from their jobs and were denied severance packages. At the second largest company in the vitamins cartel, BASF, similar actions were taken. *Hugo Strotmann*, director of global vitamins marketing, and *Peter Suter*, head of the five chemicals division, were both forced to leave their company. Strotmann, Suter, and Suter's predecessor at BASF, *Reinhardt Steinmetz*, resisted settling with the DOJ for 15 months. All three eventually agreed to significant fines and prison sentences in April 2000. At the same time *Andreas Hauri* agreed to pay the maximum $350,000 statutory fine and spend four months in a U.S. prison. Thus, six European executives of Roche and BASF accepted severe punishments, an unprecedented development in the annals of antitrust enforcement.

The Social Costs of Global Cartels

The previous sections above have attempted to make the case that discovered cartels typically result in profoundly unpleasant consequences for the corporate and individual conspirators. However, it is well to keep in mind that the costs incurred by buyers were also great. Indeed, in many cases the cartel prosecutions were unable to recover the full costs of the conspiracies to buyers. That is, the sellers in some cartels were able to reap rewards from their illegal behavior that exceeded the penalties imposed by antitrust judgments against them.

Customers of effective sellers' cartels are negatively affected in two ways. First, and quantitatively larger, purchasers of cartelized products overpay for the goods they continue to buy during the conspiracy period. This is the customer overcharge that was estimated for the lysine, citric acid, and vitamins cartels above (see chapters 6, 9, and 12). A customer overcharge is a transfer of income from buyers to the sellers. When a cartel's collusive behavior raises prices above competitive levels, the joint

profits of the cartel members rise roughly by the same amount that buyers' expenditures rise.

The second negative impact on buyers is the "dead weight loss" or "social loss." This injury to buyers is an indirect consequence of higher prices. Under normal demand conditions, when a cartel is effective in raising market price, the quantity of sales will fall. The value of these lost sales is the dead-weight loss. Because it represents both lost production as well as lost consumption, all social groups are injured: owners of the productive units, workers, intermediate buyers, and consumers. Consumers either must use the disposable income they would have spent on the overpriced good on some other good they regard as inferior or do without.

Table 17.5 gathers information on the dollar losses to customers (direct buyers, indirect commercial buyers, and consumers) of the three cartels featured in this book. This table estimates customer injuries worldwide. The total losses incurred by buyers of lysine, citric acid, and bulk vitamins amounted to $10.8 billion during the various conspiracy periods.

Table 17.5 Summary of Consumer Losses Due to Global Price Fixing

Affected Market			Losses to Consumers[a]		
Product	Period	Global Sales	Overcharge	Dead-Weight Loss	Total
			Million U.S. dollars		
Lysine	1992-95	1,660	330	51	381
Citric Acid	1991-95	3,950	690	88	778
Bulk Vitamins:	1989-99	26,600	7,577	2,110	9,687
Total	1989-99	32,210	8,597	2,249	10,846

Sources: Chapters 4, 6, 7, 9 and Connor (2006b).

[a] The consumer portion of the dead-weight loss is the reduction in purchases caused by the decrease in the quantity produced by the cartel during the affected period. In the absence of precise information, I assume that the own-price elasticity of demand is –1 when the price was at the monopoly level; for the formula used, see Peterson and Connor (1996).

The sizes of the losses in lysine and citric acid are roughly proportional to the amount of product sales during the affected time periods, but vitamins is higher because the overcharge rate is higher than the other two. Second, the deadweight losses are about one-tenth to one-quarter the size of the customer overcharge.

Antitrust Prosecutors: Methods and Reputations

The worldwide convictions of global cartels seem to have elevated the reputations of prosecutors among nearly all groups of society. The widespread revelations of the cartels' insidious methods and the scope of their damage to global markets have reinforced the educated public's appreciation of the social benefits of the antitrust laws. Except for a minority ideologically opposed to the laws themselves, business leaders and their legal advisors have a renewed conviction about the importance of avoiding price fixing behavior. In the United States especially, markedly tougher investigatory techniques, substantially higher penalties, and a string of courtroom victories have deepened the image of the antitrust agencies as organizations armed with formidable legal powers. At the same time, the legal community has a heightened realization of the expanded powers of the enforcement agencies to dispense valuable concessions for clients under investigation. Finally, rapidly escalating international cooperation among the world's competition-law authorities has convinced multinational businesses and their executives that locations outside North America no longer provide shelter from criminal antitrust charges.

Positive Publicity

Dozens of press conferences and scores of press releases by the Department of Justice about their legal victories have had the effect of raising the public image of antitrust regulators to nearly heroic stature. Popular books like those by Lieber (2000) and Eichenwald (2000) have portrayed FBI agents and Antitrust Division lawyers as incorruptible, dedicated public servants. The accolades showered on DOJ antitrust chief Joel Klein upon his retirement were due in no small part to the Division's aggressive anticartel campaign (*Washington Post* September 20, 2000). Often, the defendants and their lawyers are drawn in contrast as power hungry, privileged, manipulative, shady characters. The crude amorality displayed on the lysine conspiracy tapes, shocking even to seasoned antitrust lawyers, has done much to justify treating price fixers like déclassé mafia types.

The 1998 courtroom victory in Chicago against three ADM executives has had an especially strong impact. The convictions and harsh sentences meted out in *U.S. v. Michael Andreas et al.* had the effect of reversing the DOJ's image of powerlessness in the pursuit of international cartels. Prosecutors in the Chicago trial soon received important promotions. Virtually the whole team was given a prestigious award by the Department of Justice, a sure sign of approbation by Attorney General Janet

Reno and the White House. As the *New York Times* put it, the 1998 verdict ". . . marks a sweeping victory for Federal prosecutors . . ." and shows that Dwayne Andreas could not prevent ". . . the weight of the judicial system from falling on his son and one-time heir apparent . . ." (September 17, 1998). A leading antitrust-law scholar, Professor Eleanor Fox, opined that the global cartel prosecutions marked the major direction of change in U.S. enforcement priorities in the 1990's and a vivid reversal of the lethargic pattern during the Reagan years.

The improved stature of public prosecutors in the United States has redounded on other prosecutors. In Canada, the Competition Bureau and prosecutors working with it in the Ministry of Justice also have received positive press attention. In the European Union, support for anticartel actions by DG-COMP seems to be solid in the Commission and Parliament. In the early 2000s the competition-law commissioner was readily granted significant new investigatory powers. Finally, private law firms representing plaintiffs have also experienced a positive alternation in their professional stature. Class-action counsel, formerly portrayed in the business press as opportunistic vultures, now are more often profiled as risk-takers seeking economic justice for exploited customers of cartels.

Perhaps the major reason for the renewed respect accorded antitrust prosecutors is the huge, newsworthy fines and settlements made since the mid 1990s. The $100-million fine paid by ADM for its role in fixing the prices of lysine and citric acid was probably the seminal event in an unending string of huge sanctions. Canada has similarly extracted record antitrust fines from members of global cartels. EU cartel fines have surpassed €3 billion and are likewise given extensive coverage in the European press. The punishments on individuals for global price fixing by North American courts have been if anything more shocking to multinational businesspersons. Besides the lengthy prison sentences imposed by U.S. courts on dozens of violators, one German CEO paid a fine of $10 million rather than be incarcerated for his role in fixing the global prices of graphite electrodes.

Almost equally important in raising the public's consciousness about the seriousness of antitrust enforcers is the marked transformation in U.S. investigatory tactics. Up to the mid 1980s violations of the Sherman Act were misdemeanors. In common with other less serious white-collar crimes, the FBI employed a limited range of relatively gentle investigatory methods. However, since 1990, FBI probes into global price fixing have used the full range of "blue-collar" tools of the trade, methods long employed against drug dealers and kidnappers: audio and video tapes, tapping telephones, undercover informants, and "flipping" small fish to get the big fish (Eichenwald 2000). To an old-fashioned lawyer like Robert Strauss, long accustomed to white-glove treatment for his corporate clients, the behavior of the FBI and DOJ in investigating the lysine cartel was "almost

obscene and shocking" (*Business Week Online*: *www.businessweek.com*). Another ADM director, Ross Johnson, in a public meeting at a Southern university called the FBI "thugs." The use of large forces of agents to serve search warrants has the practical value of minimizing the destruction of evidence, but its psychological value may be even greater.

The Limits of Power

The prosecutions of global cartels in the late 1990s also revealed some limitations in the powers of cartel prosecutors. First, it is apparent that investigation of the lysine and citric acid cartels involved highest-level government officials: the Assistant Attorney General for Antitrust, members of the President's Office of the General Counsel, and the Director of the FBI (Eichenwald 2000). Participation by so many high officials was indicative of the high priority and extreme sensitivity of these cases, but it also demonstrated how few big cartel cases can be handled at the same time.

Second, the antitrust agencies may have been hampered by other resource constraints. In the late 1990s the DOJ's antitrust resources were smaller than in the late 1970s. A record number of mergers required that large resources be devoted to monitoring corporate acquisitions. Moreover, the Division was pursuing the large Microsoft monopoly case. Complaints by DOJ lawyers about overwork became public in a suit against the Department.

There is some danger that the antitrust triumphs over the cartels and Microsoft might lead to arrogance or hubris within the DOJ. One piece of evidence for this evolving posture is the Antitrust Division's "Ten Million Dollar Club," that is, its list of corporations that have paid $10 million or more in fines. Like stuffed animals in a hunter's trophy room, the list is prominently displayed on the agency's web page. Instead of somber references to such firms, DOJ official typically refer to the Club in gleeful terms.

Possible Antitrust Reforms

The large monetary penalties imposed on corporate cartel members since the mid 1990s has doubtless discouraged the formation of many cartels in the past ten years. Yet, it is possible that the huge fines on corporate price fixers will have little long run effects on the largest multinational corporations. In most cases the fines are small percentages of the guilty company's

liquid assets. One constraint on the size of U.S. fines is the U.S. Sentencing Guidelines, which are based on the outmoded assumption that the typical cartel overcharge is 10% of sales (Connor and Lande 2005). A more rational policy would amend the guidelines so as to permit maximum fines to be double or triple their current limit of 80% of affected sales. In addition, for international cartels there is nothing to prevent the DOJ from using global sales as the basis of the fines instead of U.S. affected commerce.

Many antitrust observers believe that personal fines and prison sentences, when combined with sufficient social opprobrium, have greater long term deterrence effects. The "statutory" maximum fine for individual violators of the Sherman Act was $350,000 from 1990 and $1,000,000 from 2004 – amounts easily within the means of most top executives who were fined for international price fixing in the late 1990s. The median price-fixing fine since 1990 is only $50,000. Application an alternative sentencing statute could result in a fine as high as $25 million, but this alternative is rarely employed because of judicial uncertainty.

However deterring such monetary penalties would be, the prospect of long prison sentences is probably even more daunting. The present upper U.S. limit of ten years is certainly a significant disincentive for would-be price fixers, but during 1995-2005 the average sentence was less than two years. New guidelines are needed to apply higher prison sentences. In the EU and its Member States criminalizing hard-core cartels would add needed deterrence.

The DOJ has been criticized for giving away too much when it negotiated guilty pleas for corporate and individual members of global cartels that were convicted in the late 1990s. In the case of ADM's lysine-citric acid fine, months before negotiations began prosecutors leaked to the press their intention to seek a $400 million fine. Perhaps this was just a bargaining ploy, but as late as one month before ADM's plea bargain was made public, the DOJ wanted a fine of $125 million and the freedom to indict four ADM officers (Eichenwald 2000: 508-511). The final compromise was $100 million and two current officers of ADM indictable. Doubtless most plea bargains involve compromises of this type between prosecutors and defense counsel. As distressing such a pragmatic process is to purists who value highly legal principles, the limited resources of the federal antitrust agencies make avoiding all but a few trials each year virtually necessary. In deciding which penalties to concede to the defense and which to insist upon, a large number of competing factors must be considered. But offering generous discounts to cartelists that are not the first or second to apply for leniency is a practice that needs to be re-examined.

Finally, in the area of private antitrust damage suits, much needs to be done. Implementation of effective systems for compensatory suits outside North America ought to be a high priority for governments in Europe,

Asia, and other regions. An alternative is to permit foreign buyers from global cartels to seek treble damages in U.S. courts. Several foreign countries urged that this idea be rejected. A 2005 ruling by the Appeals Court of the District of Columbia decided that U.S. courts have no subject-matter jurisdiction over wholly foreign buyers by applying a "narrow proximate cause test" (Joshua 2005). That is, the Appeals Court deemed as "plausible" the plaintiffs' theory that prevention of international geographic arbitrage was a necessary feature of the vitamins cartels, but decided that such arbitrage did not "give rise to" a direct causal relationship between fixing prices in the United States and the injury to buyers located abroad. To insure that such suits are confined to those that have proximate price effects on U.S. commerce, jurisdiction ought to be limited to global cartels selling internationally tradable and storable goods. The opposition of the United States, Germany, the UK, and other countries to such a modest, bright-line proposal would inconsistent with their prior commitment to cartel deterrence.

Political Support for the Antitrust Laws

The United States' antitrust laws have generally received bipartisan support from the U.S. Congress. While the support of presidential administrations for antitrust enforcement has ebbed and waned over time, neither political party nor ideological orientation can explain such cycles. This comment is especially true for the Sherman Act prohibition of conspiracies in restraint of trade. The 1990 amendment to the Sherman Act that increased cartel sanctions was initiated in a Congress controlled by the Democratic Party, and the same action in 2004 was through a Republican-dominated Congress.

The revelations about the global cartels in the late 1990s have reinforced political commitment to anticartel enforcement, and the relevant agencies have responded by shifting resources toward investigating and indicting international price fixing conspiracies. At the state level, large monetary settlements involved in the global vitamins case prompted no less than 24 attorneys general to band together in 1999 to successfully recover damages for indirect buyers. In the European Union, the commissioners in charge of the competition laws have sometimes come from political traditions antithetical to the antitrust philosophy of preserving the competitive process in markets, yet they have developed a zeal for their work typical of converts. In the past 20 years each new EU Competition Commissioner has tried to exceed his predecessor's determination to stamp out cartels, and each has received the support of the Commission to do so.

Global cartels were also responsible for accelerating the trend evident since 1945 for countries outside North America to adopt new or more stringent anticartel legislation. Since 1996, countries as diverse as New Zealand, the United Kingdom, South Africa, Sweden, and the Netherlands have revised and strengthened their antitrust laws governing price fixing. The lysine cartel was cited as one reason for raising the maximum fine for cartel behavior in New Zealand in 1998. In 1999, South African legislation brought its fine structure in line with EU standards and permitted civil suits to seek private damage awards. Following the adoption of a set of recommendations on hard-core cartels by the Organization of Economic Cooperation and Development in 1999, at least four of its member states – Denmark, Sweden, the Netherlands, and the UK – significantly strengthened their competition laws in the area of price fixing. (*European Report* June 7, 2000). In the early 2000s, Korea became the first antitrust authority in a developing economy to impose harsh fines on global cartels. In late 2005 Australia criminalized its competition law and introduced far higher fine limits for cartel conduct.

A recent set of OECD recommendations urges greater international cooperation in fighting global cartels, but the statement merely blesses a trend that has been strong since 1990. New bilateral agreements are being signed almost every month that make information-sharing and coordinated investigations possible. Cooperation among the U.S., EU, Canadian, and Australian antitrust agencies is already intense. A rather extraordinary example of such partnerships was the simultaneous raids by police agencies in Europe, the U.S., and Japan on the corporate offices of manufacturers of graphite electrodes. Whether enhanced international investigation might evolve into the establishment of a multilateral antitrust agency is uncertain. However, even though a distinguished advisory panel set up by the DOJ's Antitrust Division was split on the idea, public opinion in the United States seems to be shifting toward such an arrangement for limited areas of antitrust enforcement (ICPAC 2000). Smaller countries and the EU seem to favor centralization of antitrust authority in a body like the World Trade Organization.

In sum, there seems to be an endless supply of new international cartels. Yet, global cartels now face coordinated, determined, and powerful opposition in several jurisdictions. The fight is still at an immature stage in most parts of the world, but all the signs are point to more resources being devoted to anti-cartel enforcement.

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