INTERNATIONAL HANDBOOK SERIES ON ENTREPRENEURSHIP

Handbook of Entrepreneurship Research

Disciplinary Perspectives

Edited by
Sharon A. Alvarez
Rajshree Agarwal
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Springer

HANDBOOK OF ENTREPRENEURSHIP RESEARCH

Interdisciplinary Perspectives

International Handbook Series on Entrepreneurship

VOLUME 1

Series Editors
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SERIES FOREWORD

Interest in entrepreneurship has surged in the last decade. Scholars across a broad spectrum of fields and disciplines have responded by generating new research approaches uncovering a wealth of new findings and insights about entrepreneurship. This new research spans not just a diverse set of fields, such as management, finance, psychology, economics, sociology, and geography but also a wide range of countries reflecting the fact that entrepreneurship is a global phenomenon. The exceptionally cross-disciplinary nature of entrepreneurship has made it difficult for scholars in any one particular field to become aware of and understand the leading contributions and insights emerging in other disciplines. The purpose of this series is to compile a series of handbooks, each devoted to a particular issue in the entrepreneurship field. Each handbook will draw upon the leading international scholars from the entire range of disciplines contributing to entrepreneurship to articulate the state of knowledge about a particular topic. The contribution should identify the fundamental questions which are being posed, the methodological approaches, types of data bases used for empirical analysis, the most important empirical regularities to emerge in the literature, major policy conclusions, and the most promising research direction. Thus, each handbook will reflect the interdisciplinary nature of entrepreneurship that has proven to be elusive to discipline-based scholars. A goal of the Handbook Series is not only to provide a state-of-the-art coverage of what has been learned about entrepreneurship, but that when viewed in its entirety, entrepreneurship is emerging as a bona fide academic discipline.

The particular topics in the Series will be drawn from discussions with the leading scholars. Each handbook will be directed and compiled by a Handbook Editor. (S)he will work closely with the Series Editor to ensure that the contents and contributions are appropriate, and that there is consistency with the other volumes in the Series.

The titles published in this series are listed at the end of this volume.

HANDBOOK OF ENTREPRENEURSHIP RESEARCH

Interdisciplinary Perspectives

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Library of Congress Cataloging-in-Publication Data

A C.I.P. Catalogue record for this book is available
from the Library of Congress.

ISBN 0-387-23621-X e-ISBN 0-387-23622-8 Printed on acid-free paper.

Printed in the United States of America.

9 8 7 6 5 4 3 2 1 SPIN 11334415

springeronline.com

Table of Contents

List of Figures

List of Tables

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Acknowledgements

When Zoltan Acs and David Audretsch asked the three of us to edit the second volume of the handbook with an emphasis on disciplinary approaches towards entrepreneurship we were very excited. This was an opportunity for us to bring to mainstream entrepreneurship, work from the disciplines focused on the phenomena of entrepreneurship. The handbook also helped us to shed some understanding of the complexities of entrepreneurship research with top scholars in the disciplines of economics and sociology. The three of us felt like ambassadors, full of desire that this second volume may help to bridge the phenomenon that traditional entrepreneurship scholars know and understand so well with a set of theoretical tools that the scholars in the disciplines have.

No great accomplishment is achieved alone; every successful project requires the cooperation of many people. Several people contributed to this handbook to make it a success. Certainly all of our authors made valuable contributions, some of them despite personal tragedies during the development of this handbook. Moreover, we wish to thank Zoltan and David for believing in us. We also thank our institutions Ohio State University, University of Illinois, and University of California Los Angeles for without the support of our institutions and our colleagues at those institutions none of this would have been possible. We thank The Center of Entrepreneurship at Fisher College of Business for their generous financial support. Finally, we thank Jennifer Riegle, whose hard work and assistance with the administration of this handbook was invaluable to the process.

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1. Introduction

What should the domain of entrepreneurship studies include? Though many scholars of entrepreneurship have cautioned and even argued strongly against limiting the focus of research to the entrepreneur (Gartner, 1988; Low and MacMillan, 1988), the last two decades have nonetheless seen an increased focus on the individual and that individual's recognition of opportunities in the study of entrepreneurship (Venkataraman, 1997). While many of these articles have been fruitful to increasing our understanding of the challenges entrepreneurs face, numerous important topics, particularly those with more relevance to scholarship and theory than to the practice of entrepreneurship, have been left underdeveloped. For example, less research has focused on the importance of the macroeconomic environment to firm founding, on social and kinship ties as sources of entrepreneurial activity, and the interaction between institutions and entrepreneurship.

In the second volume of the handbook, we strive to increase awareness and stimulate research on these topics in the literature on entrepreneurship. We do so by drawing attention to the relevant research in the disciplines of economics and sociology. This volume of the handbook hopes to begin to bridge the gap between the research in entrepreneurship and the core disciplines by introducing three views of entrepreneurship from disciplinary perspectives. In particular, the chapters in this volume focus on entrepreneurship as it is informed by research in the economic theories of the firm, labor economics, and sociology. As such, the second volume of the handbook is intended to complement and build on the first volume by focusing on a select set of issues and examining them in an in-depth manner. Thus, while we continue in the tradition established in the first volume, that of drawing from the rich disciplinary perspectives, we abstract away from topics that have received much attention in the first volume (and in other entrepreneurship related collections (e.g. small business economics, psychological and other traits of entrepreneurs) to avoid redundancy. Instead,

we hope that the chapters in the second volume inform entrepreneurship researchers of new and fruitful avenues to benefit from work that may not have received as much prominent attention as have other areas.

ENTREPRENEURIAL ECONOMICS

The first of the three views in this handbook re-introduces economic theories of the firm back into entrepreneurship in a manner suggested by Casson (2003) in the first edition of the handbook. Much of this work has its origins in the classics that we are familiar with today such as Schumpeter (1934), Knight (1921), Hayek (1937). Casson suggests that economic theories of entrepreneurship are closely related to modern theories of the firm such as transactions cost economics and the resource-based theory of the firm. In this handbook, we refer to this focus as "entrepreneurial economics".

Entrepreneurial economics uses modern theories of the firm to understand entrepreneurship. These modern theories differ from those offered in the past in that they relax many of the old neo-classical assumptions that made it difficult to apply neo-classical economics to the study of entrepreneurship. In particular, these theories typically relax the assumptions of perfect information, autonomy of preferences and costless optimization. Relaxing these assumptions enables economic theory to incorporate the entrepreneur as a decision-maker under conditions of uncertainty. It is these conditions of uncertainty that provide boundary conditions that have not been explored in our modern theories of the firm. Relaxing certain assumptions in neo-classic economic theory gives today's entrepreneurship scholar intellectual access to the classic writings on entrepreneurship by the great writers of the past, such as Schumpeter (1934), Cantillon (1755), Knight (1921), and Hayek (1937).

The first chapter in this section (Chapter 2) reprints a paper by Rumelt, "Theory, Strategy, and Entrepreneurship." Though an early attempt to think about entrepreneurship and the theory of the firm, "Theory, Strategy, and Entrepreneurship" links to the theory of the firm by beginning to use the definition of entrepreneurship as "the creation of new businesses." This piece raises many questions, such as how are uncertainty, entrepreneurial rents, and the creation of new ventures in order to innovate and capture these entrepreneurial rents related? Hence, it represents an early attempt to understand the role of uncertainty, entrepreneurial rents and firm creation, and lays the ground for future fruitful development of these topics.

The second paper in this section (Chapter 3) by Mahoney and Michael, "A Subjectivist Theory of Entrepreneurship" is grounded in the resource-based theory of the firm and positions entrepreneurial decision-making at the center of the entrepreneurial firm. This work harkens back to

early economic thinkers and classic works such as Cantillon (1755), Knight (1921), and Kirzner (1973). The paper opens by explaining how uncertainty and thus entrepreneurship disappeared from microeconomic theory as it became increasingly formalized (and stylized). It then goes on to bring the entrepreneur and entrepreneurial decision-making back into economic theory by focusing on the interrelationships among actors, knowledge, and perceived economic opportunities using a resource-based framework.

The third paper in this section (Chapter 4) is by Foss and Klein, "Entrepreneurship and the Economic Theory of the Firm: Any Gains from Trade?" Foss and Klein strongly link theories of the firm to entrepreneurship, arguing a fundamental and intrinsic connection between the two. They, like Mahoney and Michael, explain how entrepreneurship became less important in economic models as the general equilibrium model became dominant. Foss and Klein ask: Does the entrepreneur need a firm? They focus on the judgment of the entrepreneur and suggest that this judgment is exercised through asset ownership and starting a firm. Foss and Klein further argue that it is through this notion of judgment that heterogeneous assets combine to meet future wants.

All three papers in this section point to the existence of an entrepreneurial economics rooted in the classics of Knight (1921), Schumpeter (1934), Cantillon (1755), Hayek (1937), Kirzner (1973). This entrepreneurial economics is closely related to modern theories of the firm such as transactions cost economics, the resource-based theory of the firm, and incomplete contracts and residual rights. Despite this fact, the entrepreneurial function – whether it is called decision-making or judgment - is not yet well understood within these theories. Certainly, all three papers suggest that there is considerable room for insights to emerge when modern theories of the firm are examined through the lens of entrepreneurship.

LABOR ECONOMICS AND ENTREPRENEURSHIP

The entrepreneurial process, opportunity recognition and exploitation, the emergence of new ventures, and the interaction of entrepreneurial and incumbent organizations as industries and technologies evolve are issues considered core to entrepreneurship (Acs and Audretsch, 2002). Embedded in these issues are thus two units of analysis: the *individual entrepreneur* who undertakes the entrepreneurial act, and the *entrepreneurial firm* that results from such an action. The first section of this handbook highlights how the theories of the firm inform research in entrepreneurship. As such, and in line with most of the work in industrial organization as well, the focus is on the firm as a unit of analysis. This section provides a complement by focusing on

the interplay between individuals and firms, and in particular, addresses how *labor economics* may inform entrepreneurship research.

Traditionally, labor economics has focused on issues related to employment and wage rates, with an emphasis on selection and matching mechanisms used by both individuals and firms as they interact in markets, and the resultant performance implications. In this section of the handbook, the focus is on issues related to labor economics and entrepreneurship, since differences in knowledge among individuals is an important source of opportunity recognition and the genesis of entrepreneurial firms. Further, for entrepreneurial firms, particularly those that are small and knowledge based, issues related to managerial structure, employee characteristics, and incentive mechanisms are even more important than for established firms in terms of performance consequences. The three chapters in this section examine the role that labor and human capital plays in both the creation of the firm, and the subsequent development and performance of the entrepreneurial start-up.

In the industrial organization literature, new knowledge that results from technological breakthroughs or customer insights has long been acknowledged as a fountainhead of new firm entry (Gort & Klepper, 1982; Schumpeter, 1934). At the same time, differences in human capital, and the decision to invest in increasing it has been a long-standing research tradition in labor economics (Becker, 1964). Indeed, since knowledge is potentially appropriable by the individuals that possess it (Arrow, 1962), Audretsch (1995) encouraged the shifting of the unit of analysis from exogenously assumed firms to individual agents with endowments of new economic knowledge. Two important economic agents that may possess knowledge relevant to entrepreneurship are the employee of an existing firm, and university scientists that engage in basic research[1]. When the lens is shifted away from the firm to the individual as the relevant unit of observation, the knowledge is exogenous and embodied in the individual, be it a worker or a scientist. The firm is thus created endogenously through individuals' efforts at value appropriation (Audretsch, 1995).

The first chapter in this section (Chapter 5) by April Franco "Employee Entrepreneurship: Recent Research and Future Directions" focuses on issues related to *spin-outs*, a term used to define entrepreneurial start-ups that are founded by employees of incumbent firms. Before addressing employee entrepreneurship, Franco provides a nice review of the work that explicitly incorporated the individual entrepreneur in the economic models, and discusses the two roles historically attributed to the entrepreneur in economics. She then conducts a thorough and excellent review of the recent work on employee entrepreneurship, both in the economics and the management disciplines. In particular, Franco addresses issues related to why aspiring entrepreneurs choose to work at incumbent firms, the characteristics of the spin-out firms, and parent firm strategies that are related to spin-outs.

Based on the review of the incipient research stream, she provides avenues for future research in the area, and highlights the many unanswered questions deserving of systematic attention for both theory development and empirical testing.

The second chapter in this section (Chapter 6) by David B. Audretsch and Doga Kayalar-Erdem, "Determinants of Scientist Entrepreneurship: An Integrative Research Agenda" investigates issues related to scientist entrepreneurship. The authors build on the basic premise that not much is known about the decision of scientists to undertake the entrepreneurial act, and urge for more research in the area. Audretsch and Kayalar-Erdem provide us with an excellent overview of four literature streams that may help inform such research. These four literature streams examine four different units of analysis when focusing on innovation: the firm, the region, the individual entrepreneur, and the institution/public policy. Each of these four literature streams has developed largely parallel to each other, and the authors provide a blueprint for their integration so that the crucial determinants of the entrepreneurial choice of scientists can be addressed in a holistic manner. Based on their integration of the four literature streams, Audretsch and Kayalar-Erdem suggest exciting ways in which a research agenda can be created for examining scientist entrepreneurship.

While Chapter 6 and 7 focus on the source of entrepreneurial actions and how individual agents may lead to firm genesis, Chapter 8, by Benjamin Campbell "Using Linked Employer-Employee Data to Study Entrepreneurship Issues" highlights the important interplay between individual workers and firms. Regardless of the source of entrepreneurship, start-ups are confronted with labor economics issues that may well be unique to their circumstance. Indeed, it could be argued that their performance can not only be measured in metrics related to employees as important stake holders, but that that usual measures of performance (growth in sales, survival, profitability, etc.) are disproportionately affected by issues related to employee compensation and organizational structure. Campbell discusses the availability of a new government databases that are now available for the systematic investigation of these issues. In particular, Campbell provides a very thorough description of the linked employer-employee data, including issues related to access and limitations. The chapter highlights the exciting opportunity available to researchers to both test theory using large sample methodology, and to develop new theory based on insights from the data. Further, Campbell reports on innovative ways in which the linked databases may be combined with other data to address issues integral to entrepreneurship, and provides a stimulating list of research questions that can be examined with the use of the data. In particular, Campbell's chapter complements the chapter by Franco in addressing issues related to employee entrepreneurship.

Thus, each of the three chapters in this section provide new directions for entrepreneurship research, and how we can benefit from the theoretical insights and methodological approaches in economics, particularly as it relates to the interplay between labor and industrial organization. It is our hope that some of these issues are addressed in the near future.

SOCIOLOGY AND ENTREPRENEURSHIP

Much of the existing research on the problem of entrepreneurship has focused on how entrepreneurs might recognize profitable opportunities available to them. This perspective paints a picture of a world with dollar bills lying all around; the inability of most to profit from these opportunities somehow reflects either their inability to see these dollar bills or their failure to collect them, perhaps as a result of a disbelief that the dollar bills could just be there for the taking (because surely *someone* should have already picked them up). Research and teaching in this tradition thus considers methods for identifying and locating these opportunities (dollar bills).

Sociology pushes us in a different direction. Although sociologists also have much to offer in understanding why some individuals might have better odds of recognizing profitable opportunities in the economy, the more novel feature of this body of work has been its emphasis on the problem of mobilizing resources or building firms to take advantage of these opportunities. Economists and even strategy researchers frequently consider this stage of the process relatively unproblematic; if profit opportunities exist, firms magically appear to exploit them. The empirical record, however, would suggest otherwise. Many attempts to found firms – perhaps even a majority – never result in the production of goods or services (Carroll & Hannan, 2000; Sørensen & Sorenson, 2003; Jovanovic, 2004). And even in those cases where firms do begin operations, the vast majority fail within the first year or two (Carroll, 1983; Dunn, Roberts & Samuelson, 1989) – in all likelihood resulting in losses rather than gains for the investors and participants involved. It would appear then that building an organization to pursue a perceived opportunity presents a real barrier to entrepreneurs, one both important to a theoretical understanding of the process and to practice itself.

The field of sociology has much to offer here.[2] Sociology has a long tradition of highlighting the ways in which social structures – in the form of expectations, norms, interpersonal relations and institutions – constrain the choices available to individuals, thereby shaping their behaviors and outcomes. Though these theoretical traditions have been developed to explain a wide range of economic behaviors, they also speak importantly to those interested in understanding entrepreneurship. The chapters in this section of the handbook review three relevant theoretical lenses: ecological theory

(Chapter 8: Carroll & Khessina), institutional theory (Chapter 9: Hwang & Powell), and social networks (Chapter 10: Stuart & Sorenson).

Each of these perspectives in turn highlights important insights that those interested in entrepreneurship might integrate into their research and teaching. Organizational ecology, for example, brings to the table recognition that other firms, particularly within the same line of business, constitute a major component of the environment in which firm founding takes place. As such, existing firms provide training grounds for potential entrepreneurs (Sorenson & Audia, 2000), while simultaneously constraining entry by consuming the resources that entrepreneurs would need to found new firms (Hannan & Freeman, 1987). Events within these firms influence the rates at which potential entrepreneurs both attempt and succeed at entry (Delacroix, Swaminathan & Solt, 1989). And the characteristics and distribution of existing firms can influence what types of new businesses have the best chances of success (e.g., Carroll, 1985). Ecologists have also been particularly active in studying empirically both the founding rates of new firms as well as their survival chances. Glenn Carroll and Olga Khessina provide a review of this rich body of theoretical and empirical work in their chapter.

Chapter 9 by Hokyu Hwang and Walter Powell introduces readers to the neo-institutional perspective. Whereas ecologists typically focus on the dynamics within an industry (population of firms), institutional theorists have emphasized the broader context within which these dynamics unfold. This broader context includes not just the legal environment and actors outside the industry – such as analysts, critics, regulatory agencies and non-governmental organizations – but also the expectations held by, and norms governing, various actors in society (Meyer & Rowan, 1977). In addition to reviewing how institutional environments shape entrepreneurship, they also provide insight into a broader definition of the entrepreneur, as one who seeks to alter the institutional context for his own gain.

The final chapter in the sociology section reviews work on social networks. Unlike ecological and institutional theory, this perspective represents less of a unified view of the world than a means of drawing together various theory fragments regarding how locations in social structures (in particular, the patterns of social connections between actors) influence individual behaviors and outcomes. The importance of these positions stems partially from the fact that information, influence, and resources flow through these pathways, offering those at the nexus of these connections advantages in identifying opportunities and in mobilizing the resources to pursue them. Beyond their role in shaping the flow of information and resources, actors locations moreover may serve as (potentially inaccurate) signals to others regarding the quality of market participants (Podolny, 1993), providing another avenue through which position might enable some to found firms

while locking others out of these opportunities. Toby Stuart and Olav Sorenson review this literature.

NOTES

[1] Users of the product represent a third source of knowledge. For research in the area of user entrepreneurship, please see Shah (2003) and Shah and Tripsas (2004).

[2] Though she covers similar theoretical ground to the chapters offered in this volume, Thorton (1999) offers a somewhat different framework for thinking about how to integrate sociological theory into research on the entrepreneurial process.

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2. Theory, Strategy, and Entrepreneurship

INTRODUCTION

Where do new businesses come from? The textbooks say that the entrepreneur, like the stork, brings them. But new businesses do not occur with equal likelihood in all societies or all industries. Also, existing firms in advanced societies have finely developed methods for managing diversified portfolios of businesses, so it is unclear why so many risky *new* businesses are formed. Why don't existing firms, with their experience, established reputations, and in-place resources, have compelling advantages in new business formation? This chapter examines the locus of entrepreneurship, both in terms of product-market conditions and organizational context.

Schumpeter (1950) described the entrepreneur as combining resources in new ways. In this vein I define *entrepreneurship* as the creation of new businesses, and by *new* I mean businesses that do nor exactly duplicate existing businesses but have some element of novelty. For example, the entrepreneur may be opening a convenience store in a hitherto untried location, may have developed a new product or a new production technology, may have a new way of promoting a product, may have identified a novel market segment, or may be betting on a novel method of distribution. I do not automatically equate entrepreneurship with the creation of new organizations or ventures, although I will be concerned with the conditions impeding internal entrepreneurship.

If entrepreneurial activity is seen as motivated by the chance for gain, its frequency, locus, and organizational context should be determined by the availability of entrepreneurial insights, by the potential returns to entrepreneurship, and by the entrepreneur's ability to attract the requisite resources. A good working theory of entrepreneurship would begin with these principles and develop connections to observable and predictable phenomena. It would be useful, for example, to be able to characterize the systematic differences in the potential for entrepreneurial gain across product groups,

industries, and societies. In addition, it would be good to have more precise understanding of the types of structural and contractual arrangements that facilitate or impede entrepreneurial activity.

This chapter explores the terrain on which theories of entrepreneurial activity might be built. In the next section I examine the product-market context of entrepreneurial activity, focusing on the availability of *entrepreneurial rent* and the conditions enhancing its availability and inhibiting its appropriation. The following section explores the organizational context of entrepreneurship, analyzing some of the factors favoring and inhibiting internal entrepreneurship. These ideas are then drawn together in a simple framework for predicting entrepreneurial activity.

THE PRODUCT-MARKET CONTEXT OF ENTREPRENEURIAL ACTIVITY

Since John Stuart Mill introduced the idea of the "stationary state," economists have tended to see the real world as a deviation from some ideal stable condition. Indeed, the central result of neoclassical micro-economics is that individual profit (or utility) maximization in a perfectly informed frictionless economy eliminates any resource waste and drives profits, though maximized, everywhere to zero. This model, however, has nothing to say about the source of new businesses, new products, innovations, or new ways of doing things. As Schumpeter emphasized, the competitive ideal not only fails to describe entrepreneurship, it fails to provide a motive for the search for new methods. If competition is swift and frictionless, entrepreneurs can expect only zero profits if projects succeed and worse if they fail!

The Industrial Economics Tradition

Because of the power and acceptance of the competitive model, the economic analysis of innovation and entrepreneurship has been only weakly concerned with the description of real events; instead, its focus has been the critique of the competitive model's descriptive or normative validity. Thus Schumpeter, the originator of the economics of innovation and entrepreneurship, argued that innovation was incompatible with the competitive ideal, since the risk and cost of innovation would not be voluntarily home without the possibility of compensating gains. These gains, he stressed, appeared in the form of the high profits earned by monopolists and tight oligopolies. Eliminate monopoly power and you throttle innovation.

In the same spirit, Galbraith took the position that innovation was the province of large firms. He argued (1952: 91) that "most of the cheap and simple innovations have, to put it bluntly, already been made," so that only large firms earning monopoly profits could afford to undertake the costly search for new products and techniques.

A respectable literature has grown around the discussion and empirical testing of these ideas. Theoretical work has been pressed by Arrow (1962), Demsetz (1969), Nelson and Winter (1982), Kamien and Schwartz (1982), and others. Important empirical studies have been performed by Mansfield (1968, 1971), Scherer (1965, 1967), Comanor (1967), Phillips (1971), and Williamson (1965).[1] The approach to the issue that has evolved, especially in empirical work, has been to equate market structure (read *concentration*) or firm size with monopoly power and to examine the connection between monopoly power and innovation, the latter usually measured by R&D spending or patenting.

This work is interesting and useful, but its very volume should make it obvious that no clear-cut conclusions have emerged. The best that can be said in general is that innovation does not appear to be strictly the province of the large firm or of oligopolists. The problems with this literature, however, extend beyond its lack of plain answers. In the quest to clarify and test Schumpeter's and Galbraith's assertions, researchers have come to accept a number of questionable propositions. In particular, they have tended to (1) identify all rents as monopoly rents, (2) to equate firm size (or concentration) and market power, (3) to restrict the definition of innovation to technological invention, (4) to assume that R&D spending is the source of invention, and (5) to identify patents as the measure of invention.

That entrepreneurial innovation need not he technical should go without saying. The new form of package delivery service created by Federal Express was innovation, as was the CMA Account developed by Merrill Lynch and the development of pay cable TV channels. Drucker (1985: 31) reminds us that

> *Innovation . . . does not have to he technical, does not indeed have to be a "thing" altogether. Few technical innovations can compete in terms of impact with such social innovations as the newspaper or insurance. Installment buying literally transforms economies. Wherever introduced, it chances the economy from supply-driven to demand-driven, regardless almost of the productive level of the economy.*

The equating of the returns to entrepreneurship with monopoly power, and the subsidiary association between size, concentration, and monopoly, is a more fundamental problem with much research on innovation.

First let us examine the term itself. What, exactly, is a *monopoly profit*? If all profits in excess of fully competitive returns are called *monopoly profit*, the term has no special meaning. It should be obvious that investments in risky entrepreneurial projects can be justified only if the losses on failure are balanced by above-normal returns associated with success. If, for example, totally specific capital is committed to a venture with a one-in-two chance of complete failure (loss of the investment), then the profit rate on success must be twice the normal rate (assuming annuities) to justify investment. Are such profits, if achieved, monopoly profits? In the static theory monopoly profits derive from the artificial restriction of competitors' outputs, are a distortion, and imply waste. That is, once the innovation has been accomplished, the excess profits could be appropriated without curtailing the supply of the new product or service. However, such policies would diminish the supply of innovation in the first place. So if we desire a theory wherein innovation is endogenous, it is incorrect to use the term *monopoly* with regard to entrepreneurial returns. The issue is not one of monopoly but the quite traditional problem of the proper allocation of property rights.

The equating of monopoly profit with size and concentration is also a problem in this stream of research. Put directly, the market power framework posits that firms earn surplus profits by colluding behind strategically erected entry barriers. (The entry barriers by themselves are not sufficient for without diminished competition those behind the barriers would erode each others' profits.) Yet innovation and entrepreneurship are really about novelty and differentiation; models of commodity-producing collectives may not be the best approach to their study. An alternative viewpoint, one that emphasizes the uniqueness of firms and identifies profits with resource bundles rather than with collectives, is offered by the strategy field.

The Competitive Strategy Tradition

The systematic study of business strategy, as practiced in schools of business and management, had its beginnings in case studies of several firms within an industry. These investigations revealed that firms in the same industry often differed markedly from one another. Although operating in the same basic competitive environment, the managements of different firms were seen to have adopted different policies regarding product quality, line breadth, distribution channels, financial leverage, and employee relationships, and they were observed to use different organizational structures. In addition, there were usually substantial and sustained differences in performance among the firms within an industry. These differences among close competitors were identified as differences in *strategy*, and the field of study

has concentrated on understanding strategy in both descriptive and normative terms.

The first basic theory that arose from these data was that of *fit*. According to this framework, a high-performing firm had a product-market strategy that was consonant with the opportunities and constraints imposed by its competitive environment and additionally had an organizational structure suited to its strategy. Good management consisted of the alert tracking of competitive conditions and the implementation of concomitant adjustments in strategy and structure.

The trouble with the fit theory is that it failed to adequately explain why all competitors were not fit. If fit leads to success, and firms are similarly motivated toward success, why are there unfit strategies? To adequately answer this question, strategy researchers have turned to concepts that emphasize the special histories and resource bundles of each firm. Caves and Porter (1977) see firms as having initially different "traits" and strategically moving to build competitive positions around these differences. Lippman and Rumelt (1982) model differences among firms as stochastically generated and as difficult to imitate because of causal ambiguity regarding their sources. Wernerfelt (1984) emphasizes the importance of unique resources (resource barriers) to business strategy. Hitt and Ireland (1985) explored the empirical association between firm distinctive competence and performance.

Empirical work also reveals that the dispersion of long-term profit rates within industries is very much larger than the dispersion of industry profit rates across industries. For example, applying a variance components analysis to rates of return on capital displayed by 1,292 U.S. corporations over a twenty-year period I obtained the results shown in Table 1.1.[2] The data show that the variance in long-run profitability *within* industries is three to five times larger than the variance *across* industries. Clearly, the important sources of excess (or subnormal) profitability in this data set were firm specific rather than the results of industry membership. Once the source of high profits is located in the firm's resource bundle rather than in its membership in a collective, the appropriate profit concept is that of *rent*.

TABLE 2-1 *Results of Variance Components Analysis of Return on Capital, 1,292 U.S. Corporations*

	Industry Definition	
	3-digit	4-digit
Variance due to industry effects	3.9	4.7
Variance due to firm effects within industries	19.2	17.6

The Concept of Entrepreneurial Rent

The idea of economic rent was developed in about 1820 by David Ricardo, as part of his argument for the abolition of England's Corn Laws. Ricardo noted that land varied in fertility, so that when demand was sufficient to make it economic to grow corn on less fertile land, high profits were earned by anyone owning very fertile land. These extra profits were called rents because they ultimately accrued to the owners of the land. Some commentators argued (as in today's rent-control battles) that corn was expensive because of the large rents paid to land owners. The heart of Ricardo's (1971) argument was that the price of corn was determined by the supply of fertile land and not the level of rents:

> *Corn is not high because a rent is paid, but a rent is paid because corn is high and it has been justly observed that no reduction would take place in the price of corn, although the landlord should forego the whole of their rent.*

Ricardian Rents. The differences in payments received by factors of the same "type" are Ricardian rents. The factors are, of course, not exactly of the same type else no rents would be paid. The key to the existence of Ricardian rents is the presence of a fixed scarce factor; the scarcity is such that the extra profit (rent) commanded by this factor is insufficient to attract new resources into use. A standard way of presenting this notion is the *increasing cost* industry. In this type of industry, it is possible (at some given price) to rank the producers from least cost to highest cost, with the marginal cost of the least efficient producer equal to the market price. The marginal firm earns zero profit while the more efficient firms earn rents. The surplus profits in this case (assuming atomism) are not socially objectionable because the profitable firms' outputs are constrained by fixed factors rather than restricted as a stratagem to raise the marker price.

The rent concept due to Pareto (and Marshall) is the difference between a resource's payments in its best use and the payments it would receive in its next best use. Thus, the *Pareto rent* is the payment received above and beyond that amount required to call it into use. When resources in use all have the same value in their best alternative use, the Ricardian and Pareto concepts correspond.

Rents, unlike *profits*, persist in static equilibrium. The usual micro-economic treatment of rents is to ascribe them fully to the scarce factor and then to treat that factor as separately owned, so that the firm's costs include the rent. If the scarce factor is then traded, the rents are capitalized and no one (except some original owner) shows any profit. This formulation is traditional

and saves the zero-profit condition of neoclassical theory. It is inadequate, however, in the face of newer insights. In particular, we now understand that resources that can just as well be rented as owned are of a very special type: They are nonspecific and their use can be obtained via market mechanisms with minimal transaction costs. If, however, the fixed rent-yielding factor is specialized to the needs of the firm, or if its use otherwise involves significant transaction costs, the rent on that factor is not logically or operationally separable from the profits of the firm.

Entrepreneurial Rents. The classical concept of rent applies in a static world and compares the productivity of different resources or of a resource in different uses. Entrepreneurship, by contrast, is the discovery of new combinations of resources and uncertainty is the central issue. I therefore define *entrepreneurial rent* as the difference between a venture's *ex post* value[3] (or payment stream) and the *ex ante* cost (or value) of the resources combined to form the venture, If we posit expectational equilibrium (*ex ante* cost equals expected *ex post* value), then expected entrepreneurial rents are zero. The basic thrust of this definition is to identify those elements of profit that are the result of *ex ante* uncertainty.

Although rents are not competed away in normal competition, they can be appropriated because they are payments for a factor above and beyond that required to attract it to its present use.[4] Thus, if a restaurant is yielding $500,000 per year in profit but would have recovered all the costs of planning, capital, and set-up if it earned profits of only $300,000, the difference, $200,000, is rent. The rent is appropriable in that one could reduce the restaurant's profits by $200,000 (keeping prices the same) without seeing it reduce its level of operations. The *ex post* appropriability of entrepreneurial rent means that owners of rent-yielding assets must anticipate the erosion of rents as interested individuals, groups, and governments opportunistically seek to redefine their shares. In addition, entrepreneurial investments are necessarily specialized to a specific (novel) use, or else there would be no risk of loss. Therefore, the entrepreneur also faces the possibility of appropriation of the additional rents accruing to the specialized portion of the original investment.

Interestingly, the rent-earning firm looks much like the classical successful enterprise of the strategy literature:

-It exhibits a high profit rate and substantial discretion in the allocation of its profit stream.
-At its core rest unique specialized resources that cannot be freely expanded or imitated.
-Its management perceives it as vulnerable to the political bargaining and legal maneuverings of unions, governments, consumer groups, and so forth.

Uncertainty and Rent

Given expectational equilibrium, it is uncertainty that produces the possibility of entrepreneurial rents. Absent uncertainty, we would expect the inputs used in the entrepreneurial venture to reflect their value in use or we would expect *ex ante* crowding or rapid imitation to reduce profits to normal levels. This uncertainty is normally viewed as *discovery* or invention. The two basic kinds of entrepreneurial discovery concern the value of resource combinations and the pattern of demand.

The entrepreneurial discovery of resource value includes mineral exploration, real estate development, technological invention, and the creation of new means of producing and delivering products and services. The discovery of demand patterns includes satisfying new consumer needs and wants and identifying new market segments worthy of attention and focus. Where entrepreneurial activities completely resolve the original uncertainty, the results achieved, absent secrecy, could be perfectly imitated. In this case it is best to provide the innovator with property rights that encourage the dissemination of knowledge. If however, the venture leaves considerable residual uncertainty, as is often the case in commercial rather than technical innovation, the entrepreneur faces a moral hazard problem in obtaining payments from others for what has been learned.

In the limiting case of Lippman and Rumelt's (1982) "uncertain imitability," the causal ambiguity is so great that successful entrepreneurs are no more likely to repeat their success than *de novo* entrants. Here information dissemination is valueless and consequently cannot be a source of entrepreneurial return.

Rent Size and Durability

What permits a risky entrepreneurial venture to earn rents if it succeeds? The business must be a sufficient innovation to be an efficient replacement for substitutes, it must resist the appropriation of rents, and it must have some protection against imitative competition.

The first condition is simply that the innovation be socially efficient. That is, it must provide a sufficient increment in value over pre-existing substitute products or technologies to justify the costs of innovation. Where such gains are not possible, entrepreneurial innovation cannot begin to pay for itself.

The primary appropriation challenges entrepreneurs face are those due to powerful buyers or suppliers (including employee groups), the owners

of cospecialized assets, and governments. If the venture uses inputs from a monopolist, or sells its output to a monopolist, it faces a complex bilateral bargaining situation. Even if contracts have been hammered out before the venture is complete, the powerful buyers or suppliers have incentives to opportunistically recontract, raising the costs of the venture or reducing its returns. A special type of supplier problem occurs when the entrepreneur needs the services of a cospecialized asset. For example, an innovator who develops a new household cleanser would face the prospect of choosing between building a new sales and distribution system or bargaining with a giant household products firm to obtain distribution services. Teece (forthcoming) provides a useful discussion of the contracting options open to such an entrepreneur.

Isolating Mechanisms. Given an innovation expected to be socially efficient, and absent appropriation challenges, entrepreneurship will not be justified unless there are impediments to the immediate *ex post* imitative dissipation of entrepreneurial rents. I call such impediments *isolating mechanisms* (Rumelt 1984) in rough analogy to the ecologist's use of the term to describe barriers to species mobility.

Among the most important isolating mechanisms are property rights. In the early days of the oil industry, for example, the Rule of Capture defined oil as a migratory good (like fish or wild game) and assigned possession only to those who extracted it from the ground. This assignment of property rights, together with the fact of multiple leases on each reservoir, led to very rapid exploitation of new oil fields. Overpumping depressed market prices, which, in turn, reduced incentives to search for oil. A better assignment of property rights would have prevented wasteful overdrilling in known reservoirs and underexploration for new ones. Similarly, fewer resources will be devoted to the quest for an invention that is easily imitated than for one of equivalent efficiency but that can qualify for effective patent protection.

Although the law provides the entrepreneur with property rights over discoveries of minerals, patentable inventions, written material, and trademarks, no such protection exists for the vast bulk of business innovation. New packaging concepts, methods of distribution, manufacturing methods and planning techniques, consumer research methods and information, and most new product ideas entail no assignment of property rights. Were imitative competition in these areas immediate and perfectly frictionless, none of these innovations would be sought. Fortunately, there are numerous lags, information asymmetries, and frictions that function as quasi-rights, thereby sustaining entrepreneurial rents.

The isolating mechanisms that protect entrepreneurial rents from imitative competition normally appear as *first-mover* advantages. That is, they

are asymmetries, usually derived from informational inequalities or the costs of creating and enforcing complex multiparty contingent contracts, that, other things equal, make it increasingly costly for followers to duplicate an innovator's position. There is no unambiguous mutually exclusive list of these phenomena, but the most important appear to be as follows:

Information impactedness: When innovators can prevent potential competitors from obtaining the knowledge gained from successful operation of a venture, they can inhibit effective imitation. Secrecy is obviously more difficult where the knowledge is scientific rather than tacit, where more people are privy to the information, and where employee mobility is high. In the limit, where uncertain imitability holds, competitors cannot extract the innovator's secrets because even the innovator does nor know the causes of success.

Response lags: Competitors may be slow in responding to an innovator, providing high entrepreneurial rents in the interim. Such lags may be due to the time it takes for competitors to recognize, evaluate, and formulate a response to the innovation, or may simply be due to waiting times for specialized equipment. Lags also occur because competitors are unwilling to cannibalize existing high-rent businesses or because of legal constraints. For example, on deregulation, AT&T was prevented by law from meeting MCI's prices on long-distance voice communications services for a period of seven years.

Economies of scale: If the minimum efficient scale of a business is comparable to the size of the market, and if the assets required are specialized to this use, a traditional *entry barrier* occurs. Additional entry is deterred by the prospective entrants' recognition that adding another efficiently sized competitor to the business would depress price below full cost.

Producer learning: In certain cases a producer becomes more efficient as experience is gained, measured by the passage of time or by cumulative output. If the knowledge base underlying this efficiency gain is tacit, so that it resists transfer to other producers, competitors with less experience are at a comparative disadvantage. Producer learning appears to be most important in operations where complex assembly operations are performed.

Buyer switching costs: If early buyers of a new product find it subsequently costly to switch to a competitor's offering, the first mover is at an advantage. Buyer switching costs are high when the product is durable and specialized, when there are substantial specialized co-investments that the buyer must make, where search or evaluation costs are high, or

where buyers invest substantial specialized human capital in learning how to use or consume the product. Even though a follower's product is technically superior to the innovator's, buyer switching costs may prevent its adoption. The problem is technically one of contracting costs: If the buyers could costlessly enter into a mutual contract to wait for the follower's better product, they could diminish the innovator's profits and better themselves.

Reputation: Many products cannot be accurately evaluated by buyers until after they have been purchased and used. As Klein and Leffler (1981) show, a producer's ability to sell high-quality versions of such *experience goods* depends on its *reputation*. To the extent that buyers' beliefs about reputation depend on the length of time the producer has operated reputably, first movers can obtain reputational advantages. Of course, other things may not be equal, and the innovator may face imitators who have substantial reputations built up over time in related businesses (for example, Apple versus IBM in personal computers).

Communication good effects: Certain products increase in value as the number of adopters or users increases. Examples are telephone network services, microcomputer software, and audio compact disk players. Connor and Rumelt (1986) term these *communication goods*. The effect arises because the product serves as a means of social coordination (standardization) or because a larger user base calls into being a larger number of complementary goods. When communication goods are also experience goods (such as microcomputer spreadsheet software), there is a market need for both standardization and reputation-bonding. The upshot is the *de facto* standard, where a particular brand or manufacturer's product becomes the means of coordination. These competitive positions are very powerful and offer the promise of large entrepreneurial rents.

Buyer evaluation costs: As buyers face increasing problems in evaluating competing products they seek ways of economizing on evaluation costs. The most common tactic is to free-ride on the presumed analyses of the well informed and to buy the market leader. Such behavior provides advantages to the market leader as long as the follower's product is not significantly better.

Advertising and channel crowding: Early entrants into a market sometimes face less crowded advertising message spaces and distribution channels. When the first compact personal low-cost plain paper copying machines appeared, for example, Canon's advertisements stood out sharply because no other manufacturer offered a comparable product. Several years later, as the fifth manufacturer attempts to enter the market, it is much more difficult to get the buyer's attention. The multiplicity of similar messages

dims the impact of all. This asymmetry allows the early entrant to build customer awareness less expensively than later entrants. A similar effect occurs with distribution channels. Distributors and retailers face fixed set-up costs associated with taking on new lines (billing systems, salesperson training, and so forth) and minimum fixed costs associated with handling a line of products (allocation of shelf space, spare parts supplies management, and so forth). Consequently, there is room in distribution channels for only a limited number of essentially similar product lines. Late entrants into a market must either chase niche segments or buy distribution by paying substantially larger dealer margins.

The Product-Market Locus of Innovation

The amount of society's resources devoted to entrepreneurship will depend on *ex ante* estimates of entrepreneurial rents and the level of uncertainty. As the potential size of entrepreneurial rents increases, the prizes get larger and more entrepreneurial activity can be expected.

Given limited liability and the right to cease operations and break contracts through declarations of bankruptcy, it is very possible that entrepreneurial activity will increase with increases in uncertainty. That is, if the chances of very positive outcomes are increased, and the losses due to negative outcomes are limited, then more uncertainty can lead to a larger expected value of innovation.[5]

The idea that entrepreneurship increases with uncertainty probably explains the common perception that entrepreneurs are risk-takers. For example, in Grayson's (1960) classic study of oil and gas operators' drilling decisions, his assessed utility functions on wealth were convex, implying risk-seeking attitudes. But it is very possible that these operators had difficulty separating their attitudes toward risk *per se* from their perceptions about the values of various ventures, in equilibrium, ventures with higher uncertainty (holding the mean constant) about the amount of oil below ground are worth *more*. It is likely, therefore, that Grayson's data reveal the wildcatters' preference for increases in uncertainty over the size of the find rather than for financial risk.

The factors influencing the size and duration of entrepreneurial rents will also have a marked effect on innovative activity. Obviously, where appropriation is common, through either government action or opportunistic bargaining by powerful parties, entrepreneurship is reduced. In addition, it is clear that projects involving important cospecialized assets will have the largest expected yield to the owners of those assets, placing the probable locus of entrepreneurship within existing organizations in such cases.

Finally, it is useful to note that much of the initial uncertainty attached to a really novel entrepreneurial venture concerns the strength and quality of the isolating mechanisms that will be present. When RCA undertook its venture in videodiscs for home entertainment, there was uncertainty concerning consumer response. There was also great uncertainty as to the size of any first-mover advantages that might accrue and as to the ability of film companies to eventually appropriate the profits. The venture's failure resolved the consumer response question but left the issue of appropriability and isolating mechanisms open.

In another example, early entrepreneurs in the microcomputer software industry expected that publishers would be distributing a wide variety of titles to the public, envisioning thousands of competing titles. They were taken by surprise when early products (such as dBase II and WordStar) became huge bestsellers and proved difficult to displace even by superior products. As the *de facto* standard aspect of the microcomputer software industry became apparent (reputations plus communication effects), a large increase in entrepreneurial effort followed this increase in expected gross entrepreneurial rent. This industry exhibited large rents for the first movers, but their very staying power naturally leads to diminished entrepreneurial effort once it is perceived that the key niches have been filled.

In many industries, after the first wave of innovation, competition is aimed at reductions in the size of isolating mechanisms. Thus, if buyer learning is an important advantage for first movers, easier to learn products may be developed. If producer learning is crucial, more automated process-like methods will be tried by those seeking to undermine the leader's experience. If channel crowding is the source of advantage, followers will seek out new forms of distribution. These competitive moves, themselves innovative activity, all act to carry the industry from its early birth stages to maturity. As the industry matures, early entrants must try to understand whether the industry will become rent-free or whether it will contain protected niches for those who play correctly.

THE ORGANIZATIONAL CONTEXT OF ENTREPRENEURIAL ACTIVITY

Given the product-market conditions for entrepreneurship, which organizations will innovate and when will innovation be carried out within new ventures rather than in existing firms? I will first look at the total organizational incentives to innovate, treating the firm as a single actor, and then I examine the problems of entrepreneurship from the perspective of the individual member of the firm.

The Problem of Cannibalism

It was a commonplace in Detroit during the 1950s that small cars were less profitable than larger cars and that the wise manufacturer did not cannibalize a profitable midsized auto business by promoting less expensive small cars. Similarly, it can be argued that Xerox's incentive to respond to low-price Japanese plain-paper copiers was dulled by the possible cannibalization of its profitable higher volume machines. Jacobson and Hillkirk (1986: 15) note that

> *The low-volume market is a low-margin business. The high-volume market. . . has always been a high-margin business.*
> *Of course, Xerox is afraid that low-volume products—whether Japanese- or Xerox-made—will pull business away from the crucial high-volume, high-margin end of the business.*

Economists studying this issue have formulated the problem in terms of an incumbent monopolist deciding how hard to work on the development of a more efficient but lower-profit substitute.[6] The incumbent would just as soon never see the substitute appear, but others are also working on developing the substitute. Because the incumbent's gain from innovation is reduced by the destruction of the rent stream attached to the old product, the incumbent has less incentive to innovate and therefore spends less, at the margin, on innovative activity. The interesting thing about this insight is that the larger the original rent stream, the lower the incumbent's incentive to innovate.

Unlike the economist's model, the examples just cited identify the businessperson's concern with response to existing rather than potential competition. Were the incumbent's and rival's product perfect substitutes, there would be no reason for hesitancy; if the incumbent does not make and sell the new product, the rival will. But in many situations there are crucial asymmetries in customer response. In particular, customers may have established relationships with a vendor. They may have invested in learning about a vendor's product, they may depend on vendor-specific cospecialized services (such as service, brokers, dealerships), or they may depend on the vendor for tidings about new product events. When such customer relationships exist, it is reasonable to expect these customers to respond more positively to the vendor's introduction of a new substitute product than they would to a similar introduction by a competitor.

It is this differential response that produces the cannibalism problem. In Xerox's case, the company probably expected their traditional lease customers to respond more aggressively to a new line of low-cost Xerox

copiers, with the consequent returns of on-lease midprice machines, than they would to the Japanese vendors' products. AT&T presently faces a similar problem with respect to the millions of telephones it has leased to the public. Rented at rates corresponding to purchase prices of $100 and more, this lease base provides the firm with enormous cash flow and dramatically curtails its incentive to aggressively compete in the new low-cost ($25) telephone business.

The cannibalism effect implies that in many cases the rent-earning incumbent will not be the innovator. Alternatively, it can be seen that the most fruitful approach for an entrepreneur may well be a direct attack on a profitable incumbent—such a firm may be least willing respond to the attack.

Organizational Routine

There is a vast literature on the issue of bureaucracy and the difficulty of obtaining change within large complex organizations. The issue can be framed in terms of bounded rationality, collective choice, or politics. Crozier (1964: 225) put it this way:

> *People on top theoretically have a great deal of power and often much more power than they would have in other, more authoritarian societies. But these powers are not very useful, since people on top can act only in an impersonal way and can in no way interfere with the subordinate strata. They cannot, therefore, provide real leadership on a daily basis. If they want to introduce change, they must go through the long and difficult ordeal of a crisis. Thus, although they are all-powerful because they are at the apex of the whole centralized system, they are made so weak by the pattern of resistance of the different isolated strata that they can use their power only in truly exceptional circumstances.*

There is also a life-cycle view of bureaucratic organization that holds that change becomes less possible as the organization ages. Downs (1967:20) emphasized this aspect of bureaucracy, noting that "all organizations tend to become more conservative as they get older, unless they experience periods of very rapid growth or internal turnover."

Interestingly, there is also a large literature wherein the opposite is argued—that the large firm is the ideal environment for innovation. Shumpeter (1950), for example, claimed that the modern corporation had "routinized innovation," and Galbraith (1952) saw the resources and sustained collective action required for modern large-scale innovation as being most efficiently provided by large profitable firms. The weight of the empirical evidence on technological innovation does not show either economies or

diseconomies of scale; no comparable work appears to have been done with regard to commercial and general nontechnical innovation.

Given the results of the technological innovation studies, there is no reason to suppose that large organizations are any less (or more) innovative than small or new organizations. What may be true is that the type of entrepreneurship differs. The best entrepreneurial opportunities for large organizations may be those based on the redeployment of the firm's resources and the extension of its competitive positions. Those most attractive to individuals and small firms may be based on new opportunity and the creation of new markets. For example, with the coming of airline deregulation, new entrepreneurial firms entered the industry with strategies based on non-union workforces and low-cost no-frills service. The established carriers, by contrast, worked to develop hubs, frequent- flyer plans, and created a whole new pricing technology for more effective price discrimination.

The Problem of Incentives

To many the essence of the entrepreneurial act is the acquisition of resources, but when the wealth at risk is not the entrepreneur's own, there is a potential problem of incentives. Arrow (1962) was the first to clearly define the problem as one of moral hazard. In his view, the separation of risk-bearing from innovation could be accomplished by simply paying the innovator a fee *as long as it is costless to monitor and evaluate the innovator's work.* But such control is not costless. Consequently, the innovator must be forced to bear at least some of the risk to ensure that he is actually delivering the agreed-on effort. Because the innovator may not have a taste for risk-bearing, too little innovation might be supplied in equilibrium.

A theoretical extension of this idea by Leland and PyLe (1977) shows that outsiders' valuation of an entrepreneurial venture depends on the proportion of the entrepreneur's wealth that has been placed at risk in the project. Downs and Heinkel (1982) provide some empirical support for the proposition that the value of investor's shares rises with the entrepreneur's personal commitment to the project.

These analyses are couched in market terms—they envision the entrepreneur as creating a new venture and having the problem of attracting investment funds. Does the problem of entrepreneurship within an existing firm have a similar structure? I will argue that the nature of the employment contract, managerial mobility, and less-than-perfect markets for managerial labor create incentive problems of a different kind. Rather than a reduction in innovation *per se*, there may be institutional myopia, wherein the

organization's implicit discount rate on future income is higher than its cost of capital.

In organizations so large that decisionmaking is a multilevel process, analysis, proposal, and authorization are separate events. A number of researchers have observed that the authorization step is carried out in the face of large information asymmetries. Schon (1967: 110) observed that

> *Entrepreneurs without authority cannot take the necessary leaps; their justifications before the fact always turn out to he inadequate. Both boss and subordinate operate in ignorance—one, in ignorance of the facts, opportunities, and problems of the innovative process; the other, in ignorance of the considerations which will be governing in making decisions.*

In a similar vein, Mintzberg, Raisinghani, and Theoret (1976: 260) noted that

> *In capital budgeting as well as in less formal types of authorization, a major problem is presented by the fact that the choices are made by people who often do not fully comprehend the proposals presented to them. Thus, in authorization the comparative ignorance of the manager is coupled with the inherent bias of the sponsor.*

Given Limited information, how is the authorization decision made? Bower (1967) studied the process in detail and argued that decisions are ultimately made on the basis of the proposing manager's track record. That is, by gradually building a reputation for reliable judgment, the lower-level manager gains credibility with senior management. The top- level managers cannot assess the projects *ex ante* but are somehow able to attribute reputations from assessments of managers' performance after the fact. One obvious problem with this administrative arrangement is that the top managers' ability to form accurate reputational estimates is severely limited by their presumed inability to comprehend the project *ex ante*. Additionally, the distribution of information leading to entrepreneurial projects will not necessarily correspond to the pattern of reputations. There is, by contrast, every reason to expect that younger managers with shorter track records will have fresher ideas and superior first-hand market and technological information.

Next, consider the impact of managerial mobility on decisionmaking in this context. Assuming that lower-level managers rationally attempt to maximize the net present value of their future earnings, how will managers behave? Given mobility, the manager must temper his view of how a project's future influences his reputation or income with the possibility that he will no longer be in the organization.[7] The net effect is that mobile managers will

discount future cash flows more heavily than would be indicated by their personal discount rates on wealth or their employer's cost of capital. Given the fact that top management must choose among the projects that are actually proposed, the corporation as a whole will appear more myopic than are its members.

If managerial mobility is not just exogenous but potentially opportunistic, even more severe myopia can appear. Entrepreneurial managers, in competition with other managers for scarce project approvals, may sometimes find it necessary to misrepresent the future returns to a project. Calculating that they can leave the firm (or division) if it really begins to appear that their glowing promises will not be realized, these managers may select and support projects that show near-term gains but long-term losses. In essence, they hope to gain the reputational or pecuniary advantages associated with project acceptance and early returns and to avoid the penalties connected with future failure.[8] In part, they bet that their closeness to their projects will give them early warning, permitting opportunistic exit before the project's problems are widely appreciated by others.

But the top-management of the firm will not be ignorant of this logic, although they cannot identify which manager or which project is opportunistic. They are forced to distrust and therefore discount all claims about future profits even more sharply, further increasing institutional myopia.

Now consider the dilemma faced by a midlevel manager who actually has a valuable entrepreneurial idea. The organization, rationally responding to the problems of mobility and opportunism, discounts the longer-term aspects of the proposal or presses for greater collective support by higher-level managers. Seeing that either the project will be rejected or future credits for success will be shared with powerful superiors, the entrepreneurial manager has incentives to leave the firm and pursue the project independently, if possible. By leaving the firm and substituting an ownership interest for an employment relationship, the entrepreneur increases his ability to bond his word by placing his own wealth at risk[9] and providing contractual and organizational arrangements that more tightly link future returns with his wealth or reputation.

To close the analysis, it must be noted that the entrepreneur's ability to exit the firm and form his own venture is yet another avenue that increases the myopia within the firm. Given this alternative, the senior management must consider that any proposal they receive is one that would not be acceptable to the external venture capital market!

The above theory accomplishes two things. It provides an explanation for institutional myopia wherein all actors are rational, and it explains exits

and spin-off in terms of incentive failure rather than as intellectual theft. That is, phenomena like Silicon Valley, where a multitude of firms are formed by employees who quit and take ideas to venture capitalists, can be understood as solutions to the problems of incentives within firms.

CONCLUSIONS

Entrepreneurial activity will be encouraged where appropriability is low and isolating mechanisms are high. These areas may not necessarily be those where the social returns to innovation are highest, but they are those where private returns to innovation exist. The connection between entrepreneurial activity and uncertainty cannot be signed in general, but there are reasons to believe that it may be positive in many cases.

Entrepreneurship within organizations is facilitated by the ability of large firms to muster resources and administer large projects; it is inhibited by bureaucratic inertia and by the incentive problems rising out of informational asymmetries.

With regard to the organizational locus of entrepreneurship, the analysis points up the salience of the project's futurity. As more of the expected returns to investment occur in the distant future, the potential entrepreneur's ability to attract investors diminishes. Coupling this notion with the problem of appropriability by cospecialized assets, the diagram shown in Figure 1—1 may be constructed. Where the entrepreneurial venture involves significant cospecialized assets, the expectation is that it will be undertaken by a firm possessing those assets. However, as the project's futurity increases, it becomes more difficult to assess the project within the firm. Without some external bonding mechanism, entrepreneurial failure may ensue. One possible solution is a joint venture, with both the cospecialized asset owner and the entrepreneurial visionary investing in a new separate corporation.

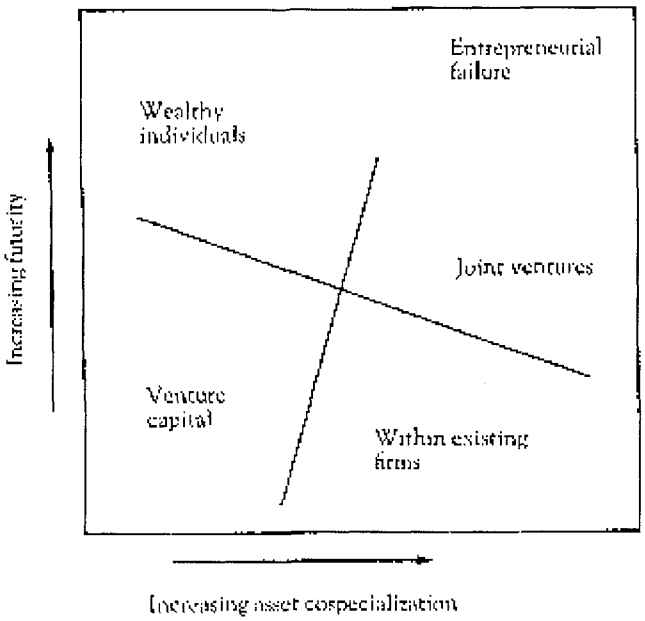

FIGURE 2-1 *Variations in Entrepreneurial Locus with Futurity and Degree of Asset Cospecialization*

Where cospecialized assets are not a problem, we expect to see new ventures formed by individuals, some of whom may be exiting from firms that are unable to provide the appropriate incentive arrangements. Still, when the futurity of these projects grows too large, the problem of obtaining resources can become insurmountable. In this final region, entrepreneurship will be the province of those who have the ideas and are already wealthy enough to indulge them.

NOTES

[1] Griliches's (1984) book provides a fine compendium of recent work in the field.

[2] Taken from Rumelt (1982).

[3] Historically, the term rent applies to continuing nondiminishing payments. Above-normal returns that diminish over time are frequently labeled quasi-rents. However, modem theory is less concerned with long-term equilibria and more concerned with the *ex ante* equilibria of expectations. In this context, in which values are present values rather than annuities, we use the simple term rent to cover both quasi-rents and persistent rents.

[4] It is sometimes useful to distinguish between appropriability with respect to use and general appropriability. If, for example, land earns rents in beet farming and would earn equivalent rents in bean farming, taxes on beet production cannot appropriate the rents because the farmer can simply switch to raising beans. Thus, appropriability with respect to use depends on the specificity of the resource—its relative value in its best use compared with that in its next best use. By contrast, a general tax on land income could appropriate the land's rent regardless of its use.

[5] More precisely, if the entrepreneur faces uncertainty represented by the random variable X with distribution function F and has a convex payoff function $V(x)$, where x is a realization of X, then $EV(x)$ increases with mean-preserving increases in the riskiness of F (in the sense of second-order stochastic dominance). A more familiar application of this result is in option theory, where it is well known that increases in the variance of the underlying security increase the values of existing options.

[6] See Kamien and Schwartz (1982) and Reinganium (1983).

[7] I am assuming that once a manager takes a position in another organization there is a halt to the process of updating his reputation based on results occurring within his previous employer's organization. Mobility is the simplest way in which this type of "forgetfulness" can be invoked. Other mechanisms commonly recognized in practice are promotion, reorganization, moving to a different division, changes in accounting, the bundling or unbundling of projects, and changes in senior management. In each case, the connection between the project that was once "sold" by the manager and updates to the manager's reputation is weakened.

[8] I am implicitly assuming that the market for managerial labor is a lemons market, in the sense of Ackerlof (1970). That is, the market exists because there are nonopportunistic reasons for managerial mobility so that "lemons" can, if their quantity is sufficiently low, mix in with the good-quality managers.

[9] Were the original employer not large and diversified, he could have accomplished this within the firm simply by buying stock.

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3. A Subjectivist Theory of Entrepreneurship

INTRODUCTION

One Sunday morning in 1972, Bill Bowerman's wife went to church. While she was at church, Bowerman's thoughts turned to his perpetual work-related preoccupation: how to help his team's athletic runners gain better foot traction. Bowerman was the head track coach at the University of Oregon, and his coaching career aspiration was to win more track and field events. Bowerman noticed his wife's waffle iron out on top of the kitchen counter, and he noticed the waffle tread design on the griddle. He poured liquid rubber onto the hot waffle iron. From this inspiration, he began to produce soles of athletic shoes with a waffle tread, sewing the soles onto other shoes. He soon discovered that the deeper indentation and the more detailed pattern allowed his runners better foot traction. Eventually, the outcome of his experimentations emerged as Nike's first shoes (Strasser and Becklund, 1993; Yoffie, 1998).

College of Business students who are business administration majors typically have little difficulty relating to this business story concerning entrepreneurship. University students who are economics majors, however, while typically finding this business story intrinsically interesting, are often puzzled. Nothing in their formalized disciplinary economics training guides these students to understand more fully how this entrepreneurial activity occurred. Scanning the table of contents of the typical microeconomics textbook yields multiple references to concepts such as consumer surplus, cost functions, demand functions, economic rents, elasticity, equilibrium, externalities, game theory, oligopoly, production functions, social welfare, supply curves, transaction costs, utility maximization, and so forth. One searches in vain, however, for entrepreneurial topics on entrepreneurial discovery, entrepreneurial vision, experimentation, and "exploratory learning" (see e.g., McGrath, 2001). In short, equilibrium theory neglects market

processes. In fact, in standard neoclassical equilibrium theory there is simply nothing for the entrepreneur to do. Returning to our earlier business example, to maintain, as neoclassical microeconomics theory does, that Bowerman was acting in ways that maximized his own utility function is no doubt true, but such an obviously tautological argument does not take us very far. For one thing, this knowledge claim fails to explain why Bowerman's utility function was not maximized sooner. Why didn't Bowerman search for the waffle iron when he came home from work on Friday night?

In this research paper, we argue that a subjectivist theory of entrepreneurship is required in order to deal constructively with the knowledge creation process. O'Driscoll and Rizzo state that: "On the most general level, subjectivism refers to the presupposition that the contents of the human mind, and hence decision making, are not rigidly determined by external events. Subjectivism makes room for the creativity and autonomy of individual choice" (1985: 1). We seek to ground an economic theory of entrepreneurship in subjectivism, because we argue in the current paper that an entrepreneurial theory that dismisses the very idea of entrepreneurial discovery and creativity misses much of entrepreneurship in action.

The paper proceeds as follows. First we offer a brief criticism of traditional neoclassical microeconomic theory and we note how the entrepreneur and entrepreneurial activity have vanished within this formalized neoclassical framework (Baumol, 1968). Second, we review key elements of a potential subjectivist theory of entrepreneurship that is grounded in economic logic (Vaughn, 1994). Third, we identify a potential source for such new theory building contained in the thought of Edith Penrose (1959), and we analyze the contributions of this resource-based approach in developing a subjectivist theory of entrepreneurship. Conclusions and suggested directions for future research then follow.

TRADITIONAL ECONOMIC THEORY

The entrepreneur and entrepreneurial activity have vanished from traditional neoclassical microeconomic theory. Baumol states that: "The theoretical firm is entrepreneur-less—the Prince of Denmark has been expunged from the discussion of Hamlet" (1968: 66). Formalized, neoclassical economic models simply do not take account of the entrepreneur and entrepreneurial activity. Baumol elaborates further by noting that: "There is no room for enterprise or initiative. The management group becomes a passive calculator that reacts mechanically to changes imposed on it by fortuitous external developments over which it does not exert, and does not even attempt to exert, any influence" (1968: 67). Over thirty-five years later, this fundamental criticism still applies.

In contrast, the concept of the entrepreneur has not been neglected in the history of economic thought. In fact, Richard Cantillion (1755) introduced the very idea of the "entrepreneur" in a work of economic theory twenty-one years before Adam Smith's (1776) publication of the *Wealth of Nations*, which is generally taken to be one of the great books in the history of social science and, more specifically, the beginning of economics as a more formal social science. Moreover, Cantillon (1755) discussed entrepreneurs as bearing risk through trade and organizing production in the face of uncertain future demand and prices, an entrepreneurial function that has not changed for almost 250 years subsequently. So what developments lead to the decline in emphasis on entrepreneurship in economic theory?

Barreto (1989) comprehensively documents the disappearance of the entrepreneur in modern economic theory. According to Barreto's (1989) historical account, the modern and most important research project in the discipline of economics in the 20th century was to determine under what circumstances (if at all) decentralized economic decision-making could duplicate the economic outcome of an omniscient allocator of goods and services. Such an economic problem was more than a theoretical abstraction. The collectivist economies of the Soviet Union argued that planning by a central authority would do better in allocating resources than chaotic decentralized economies. The Great Depression of the 1930's gave political bite to such criticism of decentralized market-based economies. Both for practical and theoretical reasons, questions concerning the efficiency of decentralized economies were placed in the foreground of the economics discipline.

Economic research succeeded in answering such challenging questions in the affirmative: under certain economic circumstances, the actions of decentralized decision-makers could lead to the same (Pareto optimal) outcome that an omniscient planer could achieve. The theoretical models that were provided for the purpose of answering these key economic questions are typically known as the two fundamental welfare theorems derived from general equilibrium theory (Arrow and Hahn, 1971; Debreu, 1959). However, in the process of meeting these intellectual challenges, the assumptions necessary for solution of the general equilibrium problem eliminated the role of the entrepreneur.

A crucial assumption in this general equilibrium model is that of perfect information. In this reconstructed economic world of perfect information, uncertainty does not exist. Therefore, this assumption, by definition, eliminates the entrepreneur as one who bears the burdens of decision-making under uncertainty. Furthermore, the perfect information assumption rules out price differences, and thus eliminates the entrepreneur as engaged in arbitrage, which has historically been of central interest in Austrian economics (Kirzner, 1973). In such a neoclassical economics

framework the firm was represented as a production function and there was no place for a business organizer, the entrepreneur. Finally, with known production functions and perfect information, there was no room for Schumpeterian innovation (Schumpeter, 1934). General equilibrium theory provided a static conceptualization of economic competition, with no room for change and entrepreneurial adaptation. As a result, the entrepreneur has disappeared and the firm of neoclassical microeconomic theory has become a strange and bloodless creature, unchanging and dehumanized.

Admittedly, it is not quite fair to criticize a theoretical framework for failing to answer a research question it did not ask. Nonetheless, the elimination of the entrepreneur has persisted in almost all of modern neoclassical economic theory. Research in theory typically begins with a formal mathematical setup of interaction among one, two, or many agents. Yet these mathematical models often contain assumptions that by their very nature limit or even eliminate a role for entrepreneurship.

Consider, for example, the typical mathematical principal-agent model, where a principal seeks to monitor agent(s)' behavior. Typically, such formal (mathematical) models include a specification of the information structure of the model, in essence who knows what and when. The intellectual merit of such a research approach is clear: such a research framework allows for a solution to a precisely formulated economic problem. But, with respect to entrepreneurship, searching for information is the entrepreneurial activity par excellence. Assuming in advance precisely what people know rules out the exercise of entrepreneurship at the individual level of analysis. In short, the questions of "who knows what and when" are really at the heart of entrepreneurship. In some sense, neoclassical economic theory assumes away the very economic problem that needs to be explained and that students in a business school environment find intrinsically interesting and pragmatically worthwhile exploring. It is to these important questions that we now turn.

ELEMENTS OF A SUBJECTIVIST THEORY OF ENTREPRENEURSHIP

Maintaining a subjectivist theory of entrepreneurship, the future is not merely unknown, but *unknowable*. Indeed, subjectivism and action under genuine (ineradicable) uncertainty (Knight, 1921) are inseparable ideas. Choices in historical (or real) time are rarely made with complete knowledge (either deterministic or stochastic) of their consequences. The recognition of both unbounded possibility sets (O'Driscoll and Rizzo, 1985: 4) and of bounded rationality (Simon, 1947) is the source of rule-following behaviors (e.g., routines and standard operating procedures) (Cyert and March, 1963;

Nelson and Winter, 1982), which serve to produce stable patterns of interaction.

The subjectivist view of entrepreneurship that we maintain in the current paper shares much in common with Nelson and Winter's (1982) classic work on the evolutionary theory of economic change. More specifically, Nelson and Winter (1982) developed a non-deterministic evolutionary theory of the capabilities and behaviors of business firms. In Nelson and Winter's evolutionary economics framework: "firms are modeled as simply having, at any time, certain capabilities and decision rules. Over time these capabilities and rules are modified as a result of both deliberate problem solving efforts and random events. And over time, the economic analogue of natural selection operates as the market determines which firms are profitable and which are unprofitable, and tends to winnow out the latter" (1982: 4). Nelson and Winter's (1982) evolutionary process is not deterministic. Search outcomes, in particular, are partly stochastic. In this sense, Nelson and Winter (1982) provide a neo-Austrian evolutionary theory of economic change. Indeed, Kirzner maintains that: "The notion of discovery, midway between that of the deliberately produced information in standard search theory, and that of sheer windfall gain generated by pure chance, is central to the Austrian approach" (1997: 72).

A subjectivist theory of entrepreneurship would surely involve a broader definition of rationality than is customary in orthodox neoclassical microeconomic theory, moving beyond simple maximization within a given means-end framework towards identifying new means-ends frameworks. Schumpeter (1934) emphasizes that to assume perfect economic rationality acting on well-defined choice sets is a less than useful fiction when studying the phenomena of entrepreneurship. Schumpeter argues that to cling to the assumption of perfect economic rationality "as the traditional theory does, is to hide an essential thing and to ignore a fact which, in contrast with other deviations of our assumptions from reality, is theoretically important and the source of the explanation of phenomena which would not exist without it" (1934: 80).

Such rationality would include creativity, entrepreneurial discovery, surprise, and learning. Indeed, the detection and correction of error (i.e., learning) is an essential element in the market process, and "entrepreneurial discovery" is anticipated (Kirzner, 1973). "Surprise" is thus integral in the business life of the entrepreneur. In the current paper, we emphasize that from a subjectivist perspective not only can there be entrepreneurial discovery of existing opportunities, but also entrepreneurial *creativity*, whereby entrepreneurs through their (inter)actions create their economic profit opportunities.

Entrepreneurial discovery and entrepreneurial creativity serve a coordination role and, as Barnard (1938: 256) observes, coordination is a

creative act. In aggregate, the attempts by entrepreneurs to create new business models lead to interactions (and unintended consequences of action) that constitute the market process. Subjectivist theory suggests that the actions that entrepreneurs need to take to exploit market frictions are not knowable, a priori, and must be determined over time. Interactions that comprise competitive processes effectively discover facts about customers, technologies, and firms, forming a discovery procedure (Hayek, 1978). The market test then determines which of the entrepreneurial interpretive frameworks are workable in the business world of experience. That is, market activity is a kind of trial-and-error process in which the more competent and knowledgeable participants tend to succeed.

A subjectivist theory of entrepreneurship would not just involve individuals and their knowledge. A subjectivist theory of entrepreneurship would also consider how entrepreneurs add to their learning from the actions and activities of market processes. Competition, Hayek (1948: 94) argues "is essentially a process of the formation of opinion ... a process which involves a continuous change in the data and whose significance must therefore be completely missed by any theory which treats these data as constant." And, as Hayek explained thirty years later: "Competition is valuable *only* because, and so far as, its results are unpredictable and on the whole different from those which anyone has, or could have, deliberately arrived at" (1978: 180).

The history of technological entrepreneurship and innovation is full of such business examples. For the typical new product, a dominant design emerges as a set of product features, functionalities, and interfaces become standardized. The dominant design is what the product "should" look like. Dominant designs are determined not only by technical criteria, but also by the dynamic process of competition as a discovery procedure. Competition acquaints users with possibilities (Hayek, 1948; Shane, 2000; Von Hippel, 1988), and users choose among those entrepreneurial suppliers that adapt rapidly and are consequently the ones who succeed.

For example, the first typewriters were introduced in 1875, yet the dominant design (the Underwood Model 5) was not introduced until 1899 (Utterback, 1994). Although there were many desirable attributes of the dominant design, the ability to read one's own typewriting, as one typed, was paramount. Earlier typewriter designs did not allow the typewriting to be viewed until after several line-feeds. Utterback noted that: "The visible writing of the Model 5 allowed the typist to see what he or she had actually typed as the keys struck the page. It was the first to have a tabulator—making columnar presentations much simpler—and it was able to cut stencils and make good copies. These were economically valued features in the marketplace and won Underwood a large share of the commercial office market. And, as more people learned to use the Model 5, it formed their

expectations of what a typewriter should be. From that point on, the essential features of the typewriter were set in the Underwood machine" (1994: 33).

Rumelt, building on the concept of entrepreneurial discovery, notes that: "The two basic kinds of entrepreneurial discovery concern the value of resource combinations and the pattern of demand" (1987: 144.) Rumelt (1987) explores the concept of Schumpeterian (entrepreneurial) economic rents from this Kirznerian perspective. In an important sense, Schumpeter's (1934) theory of entrepreneurship is consistent with the subjectivist perspective of the current paper. Indeed, for Schumpeter entrepreneurial success depends on "intuition, the capacity of seeing things in a way which afterwards proves to be true, even though it cannot be established at the moment and of grasping the essential fact, discarding the unessential, even though one can give no account of the principles by which this is done" (1934: 85). Such creative insight is logically prior to an optimizing calculus of decision.

An increased focus on the knowledge and knowing activities of the entrepreneur is necessary and warranted. Examining different categories and characteristics of knowledge may generate new insights that enable entrepreneurs to adapt effectively and to respond rapidly to changing environmental conditions. For example, during the entrepreneurial process, entrepreneurs acquire non-theoretical "knowledge of the particular circumstances of time and place" (Hayek, 1945: 521). As a second example, some of the knowledge that entrepreneurs apprehend is tacit (Polanyi, 1962).[1] Such tacit knowledge can then be a fundamental source of sustainable competitive advantage for the entrepreneur due to, among other things, uncertain imitability (Rumelt, 1987).

North (1990: 77) maintains that entrepreneurial tasks are to devise and discover markets, and to evaluate accurately product markets and product techniques. North (1990) points out that discovering markets and evaluating product markets and product techniques accurately do not occur in a vacuum. These entrepreneurial capabilities entail the development of tacit knowledge (Polanyi, 1966) to unravel social complexities. Furthermore, North suggests that: "The (political or economic) entrepreneurs may devote their talents or tacit knowledge to ferreting out profitable margins, estimating the likelihood of success, and risking the organization's resources to capture potential gains. Obviously, the efficiency of organizations depends on perceiving and realizing these opportunities" (1990: 87).

It is not only in knowledge itself, but also in the combination of knowledge that leads to entrepreneurial activities. For Schumpeter the entrepreneur carries out *new combinations* of economic value creation activities: "This concept covers the following five cases: (1) The introduction of a new good ... or a new quality of good. (2) The introduction of a new method of production ... (3) The opening of a new market ...(4) The conquest

of a new source of supply of raw materials ... [and] (5) The carrying out of the new organization of any industry ..." (1934: 66). Schumpeter (1934) regarded the creative act of coming up with these new combinations of economic value creating activities as fundamentally different from following standard operating procedures. Schumpeter states that: "Carrying out a new plan and acting according to a customary plan are things as different as making a road and walking along it" (1934: 85). Imagining new combinations of economic value creation activities is often described as entrepreneurial creativity. Resonating with this Schumpeterian perspective on entrepreneurial creativity, the former managing partner of McKinsey and Company, Fredrick Gluck, defined the creative person in the following way: "There are only two things that really distinguish the creative person: the possession of a tremendous store of raw information and the ability to combine, order, or connect this information in a novel and better way" (1989: 38.)

Moreover, as Boulding noted: "We are not simply acquiring knowledge about a static system which stays put, but acquiring knowledge about a whole dynamic process in which the acquisition of knowledge is itself part of the process [of discovery]" (1966: 9). Boulding (1966) here anticipates the Kirznerian theory of entrepreneurial discovery. Indeed, Kirzner emphasizes that: "human action involves a *posture of alertness* toward the discovery of as yet *unperceived* opportunities and their exploitation" (Kirzner, 1979: 109).

In summary, this section maintains that a dynamic knowledge creation process is a foundational building block for advancing any useful theory of entrepreneurship, including a subjectivist theory of entrepreneurship that we champion here. In turning to the next section, we argue that Penrose (1959) can be a major source of inspiration for advancing a dynamic (subjective) resource/knowledge-based theory of entrepreneurship and the knowledge creation process.

PENROSE'S "RESOURCE-BASED" CONTRIBUTION TO A SUBJECTIVIST THEORY OF ENTREPRENEURSHIP

Where, then, to turn to develop a dynamic subjectivist theory of entrepreneurship that is based in economics but valuable to strategic management research? One could turn to Austrian economics as the centerpiece, yet much of contemporary economics views Austrian economics as, at best, an interesting addendum to neoclassical economics (Vaughn, 1994). However, we believe that a more natural starting point can be found in Penrose (1959) and the contributions of this work are covered in nine distinct (albeit inter-related) areas, as listed below. Thus, in the current paper, we

highlight the contributions of Penrose (1959) in moving us closer to a useful subjectivist theory of entrepreneurship. In this section we discuss the following concepts:

- The (entrepreneurial) services of resources
- A definition of the term "entrepreneur"
- Entrepreneurial versatility
- Fund-raising ingenuity
- Entrepreneurial judgment
- Subjective production opportunity set
- Entrepreneurial perception and the direction of growth
- Entrepreneurial expectations about demand
- Resources and entrepreneurship

The (Entrepreneurial) Services of Resources

Penrose notes that: "Strictly speaking, it is never *resources* themselves that are the 'inputs' in the production process, but only the *services* that the resources can render. ...{R]esources consist of a bundle of potential services and can, for the most part, be defined independently of their use, while services cannot be so defined, the very word 'service' implying a function, and activity. ...[I]t is largely in this distinction that we find the source of the uniqueness of each individual firm" (1959: 25). In this conceptual distinction between resources and the services of resources a crucial theoretical point is established. The services of resources cannot be defined without reference to their use.

The linkage between resources and the services of resources is subjective; that is to say, this linkage occurs because of the creative insights of the entrepreneur. In a subjectivist theory of entrepreneurship, knowledge is viewed as subjective. Knowledge needs to be discovered and different people may discover different things or put different interpretations on what they discover. Moreover, different persons may, operating with the same resources, generate entirely different services of these resources. The multiple uses of any given resource plus the potential multiple combination of resources form a set of firm-level possibilities. Penrose states that: "The productive activities of such a firm are governed by what we shall call its 'productive opportunity', which comprises all of the productive possibilities that its 'entrepreneurs' see and can take advantage of" (1959: 31). Such potentially perceived production possibilities are extensive in number and collectively are difficult to enumerate. The difficulty should not obscure the conclusion that, because resources and the services of these resources differ

for each individual in a subjective manner, each individual's productive opportunity differs from others.

Definition of the Term "Entrepreneur"

Penrose maintains that: "The term 'entrepreneur' throughout this study [her 1959 book] is used in a functional sense to refer to individuals or groups within the firm providing entrepreneurial services, whatever their position or occupational classification may be. Entrepreneurial services are those contributions to the operations of a firm which relate to the introduction and acceptance on behalf of the firm of new ideas, particularly with respect to products, location, and significant changes in technology, to the acquisition of new managerial personnel, to fundamental changes in the administrative organization of the firm, to the raising of capital, and to the making of plans for expansion, including the choice of method of expansion" (1959: 31). Penrose (1959), like Schumpeter (1934), contains an exhaustive definition of entrepreneurship, one far broader than the popular press or even much of published entrepreneurial scholarship. The focus in much of the published literature is on novelty, and in particular novel products. But Penrose (1959) points out that entrepreneurship can involve novelty in product or process, organizational design, organizational leadership, financial innovations, and so forth. It is the totality of entrepreneurship, with its effects in product markets, labor markets, and financial markets, which is pragmatically relevant.

We hasten to point out, however, that there are some key conceptual differences between Penrose (1959) and Schumpeter (1934) on the "entrepreneur." In particular, Penrose notes that: "The Schumpeterian 'entrepreneur', though more colourful and identifiable, is too dramatic a person for our purposes. Schumpeter [1934] was interested in economic development and his entrepreneur was an innovator from the point of view of the economy as a whole; we are interested in the growth of firms, and here the entrepreneur is an innovator from the point of view of the firm, not necessarily from the point of view of the economy as a whole" (1959: 36). By defining the appropriate point of reference, Penrose (1959) expands the scope of the concept of entrepreneurship while also capturing its pragmatic utility.

As Hayek (1948) noted, an economy is made up of a myriad of facts in time and in space. Something can only be new to the world once, but it can be new to a distinct firm (or customer, for that matter) and still create utility for one or both parties. Potentially, bringing a chain restaurant such as McDonald's to different geographic locations is --- subjectively speaking --- an entrepreneurial act at each location, and creates utility and economic wealth at each location. Along with Penrose (1959), we judge it to be far too

restrictive to insist that the standard criterion of entrepreneurship be that the innovation must be new to the world. Indeed, that standard of entrepreneurship would result in there being a very small range of entrepreneurial acts, by definition, and such a restrictive standard would be less than useful because we would then miss much of the drama of entrepreneurial discovery (from the subjectivist perspective).

As Foss (1998) argues, Penrose (1959) largely anticipated Kirzner's (1973) theory of entrepreneurship. Penrose notes that: "the decision to search for opportunities is an enterprising decision requiring entrepreneurial intuition and imagination and must precede the 'economic' decision to go ahead with the examination of opportunities for expansion (1959: 34). Again, the conceptual distinction is made between optimization on the one hand, and search procedures, heuristics and business intuitions based on tacit knowledge and experience, on the other hand.

Entrepreneurial Versatility

Penrose notes that: "A versatile type of [entrepreneurial] service is needed if expansion requires major efforts on the part of the firm to develop new markets or entails branching out into new lines of production. Here the imaginative effort, the sense of timing, the instinctive recognition of what will catch on or how to make it catch on become of overwhelming importance. These [entrepreneurial] services are not likely to be equally available to all firms" (1959: 37). The concept of entrepreneurial versatility helps to explain the persistence of firm-level heterogeneity based on unique entrepreneurial services.

Fund-Raising Ingenuity

Penrose argues that: "[M]any small firms without adequate initial financial resources do succeed, do raise capital, do grow into large firms. And they do this, for the most part, by virtue of special entrepreneurial ability. There are many examples testifying to the ingenuity of the superior businessmen in obtaining the funds he needs, and only if the requisite entrepreneurial ability is lacking can one safely say that a firm cannot attract the required capital" (1959: 37-38). There are numerous examples of entrepreneurs finding novel ways to finance businesses that create economic wealth, even in not-so-novel product markets. Franchising offers an excellent example (Michael, 2000). Restaurants and hotels are among the oldest businesses in existence. Most franchisors did not, and do not, offer a significant improvement or novelty in those business areas. But, by allowing

scope for individuals to participate in the chain as franchisees, a novel fundraising mechanism was created that allowed chain restaurants and hotels to be formed.

Entrepreneurial Judgment

The entrepreneur in Penrose's (1959) resource-based approach is far more than a static (and passive) maximizer, an automaton applying a decision calculus to a clearly defined optimization problem. Penrose submits that: "[T]he problem of entrepreneurial judgment involves more than a combination of imagination, 'good sense,' self-confidence, and other personal qualities. It is closely related to the organization of information-gathering and consulting facilities within a firm, and it leads into the whole question of the effects of uncertainty on, and the role of expectations in, the growth of firms" (1959: 41). Again, the role of subjective personal knowledge and experience come to the foreground of the theory.

Subjective Production Opportunity Set

Penrose suggests that: "If we can discover what determines entrepreneurial ideas about what the firm can and cannot do, that is, what determines the nature and the extent of the 'subjective' productive opportunity of the firm, we can at least know where to look if we want to explain or to predict the actions of particular firms" (Penrose, 1959: 42). A primary shaper of the productive opportunity is likely to be driven by the human and social capital of the entrepreneurs. An economic advantage of the entrepreneurial firm is its capability to add or subtract members to the founding team who may provide the ability to change the productive opportunity of the team. Moreover, Foss (1998) argues that Penrose (1959) emphasizes, among other things: flexibility in an uncertain world, organizational learning as an evolutionary discovery process (Hayek, 1948), the vision of the management team, and entrepreneurship.

Entrepreneurial Perception and the Direction of Growth

Once initial opportunity has been identified, the future growth of the fledgling firm follows the same dominant logic. Unused productive services of resources "shape the scope and direction of the search for knowledge" Penrose (1959: 77). As Mahoney and Pandian (1992: 365) note, the services of resources will depend upon the dominant logic of the top management

team, but the development of the dominant logic of the top management team is partly shaped by the resources that the top management team deals with over time. Here in the current research paper, our emphasis is slightly different: the services of resources will depend upon the dominant logic of entrepreneurial vision, but the development of entrepreneurial vision is partly shaped by the resources that these entrepreneurs deal with over time.

The resources that the firm possesses influence the entrepreneur's "image" (Boulding, 1956). This entrepreneurial image gives rise to the subjective opportunity set of the firm and is a further driver of firm heterogeneity and differential absorptive capacity (Cohen and Levinthal, 1990; Kor and Mahoney, 2000, 2004; Wiklund and Shepherd, 2003). Indeed, at all times there exist within every firm a pool of unused productive services of resources, and these, together with the ever-changing vision of entrepreneurs, create unique (subjective) productive opportunities for each firm. A firm's current resources serve as cognitive drivers of future strategy via "resource learning" (Mahoney, 1995).

Entrepreneurial Expectations about Demand

The traditional assumption in orthodox neoclassical microeconomics is that demand is exogenous, completely given from the outside, as a force of nature. By contrast, Penrose observes that: "The really enterprising entrepreneur has not often, as far as we can see, taken demand as 'given' but as something he ought to be able to do something about" (1959: 80). In fact, Penrose submits that: "There is a close relation between the various kinds of resources with which a firm works and the development of the ideas, experience, and knowledge of its managers, and entrepreneurs, and we have seen how changing experience and knowledge affect not only the productive services available from resources, but also 'demand' as seen by the firm" (1959: 85).

As discussed above, the perception of entrepreneurial opportunity is closely linked to the perception of demand. In addition, however, the entrepreneur typically assumes an ability to influence demand through advertising, selling, personal charisma, and so forth. Put differently, entrepreneurs typically believe in the power of persuasion. Nowhere is this key assertion better illustrated than in the career of Richard Sears, the founder of Sears, Roebuck. Historians Boris Emmet and John Jeuck describe Richard Sears' entrepreneurial venture in the early days as follows: "The company's success was due to far more than merely the environment. It may have been true that rural folk needed a system of distribution like Sears's; but making them realize that they need it was something else. ...Sears the man was perfectly equipped for the job. His spellbinding advertisements exerted a

telling effect on farm readers. His compelling messages pulled the reader into his copy and kept that reader's attention to the end. That end was usually the dispatching of an order to Richard Sears for merchandise." (1950: 39).

Resources and Perceptions of Entrepreneurs

Penrose's "resources approach" (1959: 217) focuses on the relationship "not only between the 'inherited' resources of a firm and the ability of the firm to take advantage of the opportunities perceived by its entrepreneurs, but also between these resources and the perceptions of the entrepreneurs" (Penrose, 1959: 216). Entrepreneurs, however, typically go beyond the resources they control in order to create a business (Stevenson and Gumpert, 1985). Frequently these entrepreneurs identify an opportunity and a vision, and then seek resources in order to develop this opportunity. Entrepreneurs appear to take risk only because they sometimes attempt to utilize an opportunity with fewer resources than others (non-entrepreneurs) find adequate. One can view entrepreneurs as those possessing visions and who must assemble resources to make their entrepreneurial visions business reality. In this sense, the entrepreneur perceiving an opportunity who seeks resources to start a firm can be viewed as the "dual" of a firm with resources seeking to identify an opportunity.

A Resource-Based Approach to Entrepreneurship

The resource-based approach has proven to be quite fruitful in examining questions of economic performance differences among established firms. Can a resource-based approach to entrepreneurship offer theoretical insight into economic performance differences among entrepreneurs? The analysis of Penrose (1959) suggests that the answer to this research question is yes. The resources under consideration are, of necessity, different from those associated with established firms. The key elements of such an approach include creativity, information, judgment, and perceived possibilities. As the previous section made clear, the theoretical linkages between resources and the services of these resources require that the resource-based approach to entrepreneurship be a subjective one. Moreover, the informational problems associated with economic activity, change, and rapid adaptation, create economic opportunities for new resources to be discovered and implemented by entrepreneurs.

According to Loasby (2002: 52), one of the more conceptually significant and novel elements in Penrose's (1959) theory is the rejection of the standard concept of a production function in which inputs are assimilated

as factors of production, in favor of an analytical scheme in which resources become a distinct subject of economic analysis and their application is problematic, not only because the economic opportunities to their use have to be perceived (Kirzner, 1973) or imagined (Shackle, 1967), but also because the effectiveness of a resource to a particular business application can never be guaranteed in advance.

Penrose (1959) provides a subjectivist economics where decision-making is not rigidly determined by a given external environment. Penrose (1959) makes conceptual room in her theory for the creativity and autonomy of individual choice. Entrepreneurs do not merely respond to, but also create economic change (O'Driscoll and Rizzo, 1985). Penrose (1959) thus anticipates the concept of entrepreneurial discovery (Kirzner, 1979) and market processes as a kind of discovery procedure where a coherent "spontaneous ordering" (Hayek: 1978: 34) can emerge from the market interactions of various entrepreneurial activities, and in which such an ordering is "the result of human action but not of human design" (Hayek, 1948: 7).

Alvarez and Barney argue that: "Indeed, it may be by examining the intersection between entrepreneurship and the resource-based view (RBV) that clarity may be achieved with regard to the larger impact of entrepreneurship on strategic management" (2002: 89). In order to explain economic performance differences among firms, firms have been modeled as bundles of resources. As resource-based theory has developed, the primary theoretical contributions have been refinements regarding under what conditions resources can yield long-run economic performance advantages. To selectively highlight two contributions, resources yield superior economic performance if resources are valuable and rare, and cannot be completely imitated or replaced (Barney, 1991; Peteraf, 1993). Imitation is made difficult by causal ambiguity and social complexity (Barney, 1991; Dierickx and Cool, 1989). Causal ambiguity occurs when an imitator is uncertain about the cause and effect relationships among resources and economic performance. Social complexity occurs when individuals and their respective talents combine into working relationships, teamwork, organizational routines, corporate culture, and other interactions that in effect create a new resource that can only be fully utilized inside the firm.

In short, the heterogeneity of economic performance among firms has been explained as a result of the heterogeneity of resources of firms. But recent theoretical work by a number of important authors has begun to bring Penrosian themes into dynamic resource-based theory. Most especially, researchers have noticed the need for a theory of heterogeneity of opportunities within the dynamic resource-based theory of the firm. For example, Mosakowski (2002: 106-107) argues that: "Traditional research on the resource-based view of strategy has generally ignored the wide range of

human choices and behaviors involved in identifying, leveraging, and creating resources. Penrose's work (1959) is perhaps most sensitive to the importance of managerial choices and behaviors by suggesting that a firm's resources alone do not matter, but how a firm uses its resources is also important."[2]

Entrepreneurial opportunities often exist (or are created) because different decision-makers have different beliefs about the relative economic value of resources when they are converted from inputs into outputs (Schumpeter, 1934; Kirzner, 1979; Penrose, 1959). Indeed, as Alvarez and Busenitz (2001: 756) observe: "heterogeneity is a common attribute of both resource-based and entrepreneurship theory --- although resource-based logic has tended to focus on heterogeneity of resources while entrepreneurship theory has tended to focus on heterogeneity in beliefs about the value of resources."

CONCLUSIONS AND DIRECTIONS FOR FUTURE RESEARCH

The discipline of economics and entrepreneurship research are not, in recent years, well connected. In the current paper we have attempted to connect these two disjoint research literatures. Our approach has taken two directions. First, we have highlighted the need for a subjectivist theory of entrepreneurship that focuses on the interrelationships among persons, knowledge, and perceived economic opportunities. Second, we have begun to address this need by building on the seminal work of Penrose (1959), who in important ways anticipated a subjectivist theory of entrepreneurship. We hope that students pursuing the evolving science of organization can bring together the relevance of entrepreneurship research with the rigor that can be found in the economics discipline and that strategic management can move forward to develop a dynamic and integrated subjectivist theory of how entrepreneurship functions for individuals, for firms, and for the economy at large.

Contemplating the role of entrepreneurship from a global perspective, entrepreneurship is of keen interest to people, firms, and government agencies worldwide. Entrepreneurship liberalizes the economy, promotes foreign investment, infuses new technology, and increases the standards of living (Zahra, Ireland, Gutierrez and Hitt, 2000). Moreover, profitably operated new business ventures buffer taxpayers from the high operating costs of inefficient government-managed enterprises (Ozkaya and Askari, 1999). And, entrepreneurial small business firms create job. For example, by the year 2000 nearly half of the United States' workforce was employed in small businesses (Hochberg, 2002). Thus, the growing relevance of entrepreneurship worldwide for the economic development of poorer nations and the continued capability to create economic wealth by developed nations

demands an increased effort by scholars to understand more fully this important business phenomenon (North, 1990).

Existing economic research on entrepreneurship has typically adopted two approaches. First, the researcher characterizes entrepreneurship as self-employment, and the study of entrepreneurship has been a search for demographic, financial, or environmental factors that affect the choice of self-employment. Second, the small firm has been assumed to be entrepreneurial, and the market for financial capital for small firms has been examined (venture capital, bank lending, or others). But a subjectivist view of entrepreneurship and entrepreneurs requires renewed focus on the person of the entrepreneur. Without denying the value of research grounded in either labor economics or finance theory, studying the individuals in more depth or in a different way might be expected to yield dividends in the subjectivist approach. Without pretending to be exhaustive, a few directions for future research are proposed.

First, a richer conception of human capital is likely to bear fruit. Traditionally, measures of human capital have been limited to education and work experience. Such a strict dichotomy may not capture the rich subjective nature of entrepreneurship. As one example, one might distinguish between those experiences leading to tacit knowledge versus experiences leading to explicit knowledge, discussed above. A second research direction might usefully employ the concepts of specific versus general knowledge (Hayek, 1945). Specific knowledge is typically knowledge of time and place, which is difficult to communicate to a central decision maker. Information regarding a vacant lot, an underutilized worker, or a source of supply can be more economically valuable than formal job training or education for entrepreneurs. As a third possible research direction, an old maxim of entrepreneurship teaching is that an entrepreneur requires 50,000 chunks of information to succeed with a venture (e.g., Warshaw, 2000). How to represent these chunks, and how to capture them in empirical models, is an intriguing challenge. In short, a richer conception of human capital is necessary.

A fourth possible research direction is to utilize the difference between resources and their services. As noted above, resources are static but their services are dynamic, specific to the task at hand. Matching resources and their services to opportunities is likely to be of particular value. Or resources can be applied in multiple ways; a resource that generates productive services for the product may also provide valuable reputational capital to attract investors. Particularly in smaller firms, one might expect resources to be used in multiple ways. A subjectivist perspective suggests that the economic value of the services of such resources depends upon application, creating much more opportunities for analysis but also creating a higher level of complexity.

Human and social capital of entrepreneurs determines the subjective productive opportunity set. The initial task would be to characterize the subjective opportunity set of a person, and how that combination comes about. The second task would be to advance a theory by which the subjective opportunity set is created by a team. Interdisciplinary research, examining psychological processes by which opportunities are evaluated for their economic potential, or noting that what individuals perceive in their utility function is to some extent determined by social interactions and social forces, would be promising approaches.

Such research may require new or updated methodological techniques. Thoughtful histories are likely to be helpful (Schumpeter, 1991 [1947]. Histories and taxonomies are reasonable beginnings for a new direction of analysis; it is how most sciences begin. Whatever the other merits, however, a historical approach is unlikely to lead to significant progress, where significant means statistical significance. Therefore some technique of aggregation may be appropriate. Without precluding the creativity and entrepreneurship of particular scholars, multi-level methods or meta-analysis may be two such approaches. There are at least five possible levels of influence on the success of a venture: the individual, the team, the opportunity, the fit between the individual and the opportunity, and the industry. Careful coding of thoughtful case analyses may lead to the kind of statistical analysis that leads to greater understanding.

Finally, we do a disservice to ourselves and to the field if we focus on abstract theory at the expense of real business concerns. Our students are interested in the practical question of how to start a successful business, and, as scholars of professional schools, we should respond to that aspiration. Theories that are completely devoid of practical implications, or are so rarefied as to give no guidance to entrepreneurs, should be neither a goal nor a criterion for success. The famous phrase, "Nothing is more practical than a good theory," should provide a criterion for judgment of our endeavors and our research output.

NOTES

[1] Polanyi reconsiders "human knowledge by starting from the fact that *we can know more than we can tell"*(1966: 4). Polanyi (1966: 61) concludes that: "the transmission of knowledge from one generation to the other must be predominately tacit."

[2] Some scholars working within the resource-based view of strategy have highlighted the entrepreneur's role in firm strategy (e.g., Alvarez and Barney, 2000; Mosakowski, 1998). Other scholars interested in entrepreneurial phenomena have drawn from the resource-based view of strategy to understand outcomes associated with new ventures (e.g., McGrath, 1995; Thornhill and Amit, 2001). Finally, we note that Alvarez and Busenitz (2001) build a theory of entrepreneurship that builds on Peteraf's (1993) four cornerstones of competitive advantage:

resource heterogeneity (Barney, 1991), ex post limits to competition due to causal ambiguity (Rumelt, 1984), imperfect factor mobility due to non-tradeable asset stocks (Dierickx and Cool, 1989), and ex ante limits to competition (Rumelt, 1987).

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4. Entrepreneurship and the Economic Theory of the Firm: Any Gains from Trade?

INTRODUCTION

Do entrepreneurs need business firms to carry out their function? Are business firms run by entrepreneurs, or by hired managers? Economists have been thinking and writing about entrepreneurship since at least the 18th century. Within the last few decades, the theory of the firm has become one of the fastest growing areas in applied microeconomics. And yet, surprisingly, the above questions have rarely been asked. The modern economic theory of the firm virtually ignores entrepreneurship, while the literature on entrepreneurship in economics and strategic management has limited use for the economic theory of the firm.[1]

This lack of contact between two fields that seem to overlap so naturally results partly from the development of economic thought. The economic theory of the firm emerged and took shape as the entrepreneur was being banished from microeconomic analysis, first in the 1930s when the firm was subsumed into neoclassical price theory (O'Brien, 1984), and then in the 1980s as the theory of the firm was reformulated in the language of game theory and the economics of information. The gradual "hardening" of the neoclassical approach in economics, including the mainstream approach to the theory of the firm, left, little room for the entrepreneurship; Baumol (1993b: 17) calls it "the specter which haunts economic models." In modern contributions to the theory of the firm (Williamson, 1975, 1985, 1996; Milgrom and Roberts, 1992; Hart, 1995) reference to entrepreneurship is passing at best. These approaches are largely static and "closed," meaning that they focus on solutions to given optimization problems, avoiding questions about the origin of the problem at hand, or indeed of the firm itself. Agency theory, for example, has generated important insights on the effects of incentives on effort and the relationship between incentive pay and risk. In

explaining how a principal gets an agent to do something, however, the theory overlooks the more fundamental question of what the principal should want the agent to do, or indeed, how the principal got to be a principal in the first place (Foss and Foss, 2002).

We argue that the theory of entrepreneurship and the theory of the firm can be usefully integrated. We begin by surveying various approaches to entrepreneurship in the economics literature, asking to what extent the entrepreneur needs a firm (a set of alienable assets he controls) to carry out his function ("Does the Entrepreneur Need a Firm?"). We conclude that only the concept of entrepreneurship as judgment has a direct and natural link to the theory of the firm. Because judgment cannot be purchased on the market, the entrepreneur needs a firm — a set of alienable assets he controls — to carry out his function. Next, we review briefly the main themes in the modern theory of the firm (existence, boundaries, and internal organization) and show how the notion of entrepreneurship as judgment illuminates these issues in novel ways ("Putting Entrepreneurship into the Theory of the Firm: Judgment and Economic Organization"). To develop a judgment-based approach to economic organization, we also draw on ideas from Austrian economics (Mises, 1949; Kirzner, 1973; Salerno, 1993) — the body of economics that is perhaps most intimately connected to ideas on entrepreneurship — and on property rights economics (Hart, 1995; Barzel, 1997), an important part of modern organizational economics. In our approach, resource uses are not data, but are created as entrepreneurs envision new ways of using assets to produce goods. The entrepreneur's decision problem is aggravated by the fact that capital assets are heterogeneous, and it is not immediately obvious how they should be combined. Asset ownership allows the entrepreneur to experiment with novel combinations of heterogeneous assets.

A number of unconventional insights emerge from this approach. First, we argue that the existence of the firm may be understood in terms of limits to the market for judgments about how to combine heterogeneous assets to meet future wants. Second, we argue that the boundaries of the firm, as well as aspects of internal organization, may be understood as responses to entrepreneurial processes of experimentation. In this connection, we introduce a distinction between productive and destructive entrepreneurship and argue that it is useful for understanding the internal organization of the firm.

DOES THE ENTREPRENEUR NEED A FIRM?

The Firm and the Entrepreneur in Economics

Because entrepreneurs in many ways personify market forces, one might expect them to be the central figures in economics. Similarly, because most entrepreneurial ventures somehow involve a firm, entrepreneurship in the context of firm organization would seem to be a central subject in the theory of markets. While some classical economists, particularly Jean-Baptiste Say and Jeremy Bentham, reasoned this way, it is hardly characteristic of modern economics.[2] As the historian of economic thought Paul McNulty (1984: 240) puts it:

> *The perfection of the concept of competition . . . which was at the heart of the development of economics as a science during the nineteenth and early twentieth centuries, led on the one hand to an increasingly rigorous analytical treatment of market processes and on the other hand to an increasingly passive role for the firm.*

The "increasingly rigorous analytical treatment" of markets, notably in the form of general equilibrium theory, not only made firms increasingly "passive," it also made the model of the firm increasingly stylized and anonymous, doing away with those dynamic aspects of markets that are most closely related to entrepreneurship (O'Brien, 1984). In particular, the development of what came to be known as the "production function view" (Williamson, 1985; Langlois and Foss, 1999) — roughly, the firm as it is presented in intermediate microeconomics textbooks with its fully transparent production possibility sets — was a deathblow to the theory of entrepreneurship in the context of firm organization. If any firm can do what any other firm does (Demsetz, 1991), if all firms are always on their production possibility frontiers, and if firms always make optimal choices of input combinations and output levels, then there is no room for entrepreneurship.

As this has been the dominant view of the firm in economics at least since the 1930s, it is not surprising that much of the important work on the economics of entrepreneurship was done prior to this period (e.g., Schumpeter), and that more recent work by economists on entrepreneurship has been done largely outside of the confines of mainstream economics (e.g., Kirzner). However, as we argue later, advances in economics over the last two to three decades have left economics somewhat better equipped to deal with entrepreneurship and to incorporate it into models of firm organization.

Our approach below is to ask if the entrepreneur needs a firm, and if so, what it is that firm organization can do for entrepreneurs. The answers are not obvious. Some approaches to entrepreneurship — Schumpeter's concept

of the entrepreneur as innovator, for instance — treat the entrepreneur as an uncaused cause, a pure genius who operates outside the usual constraints imposed by resource owners and other market participants and is thus unaffected by the firm. Other approaches treat entrepreneurs as skilled managers, exercising their entrepreneurial talents through skillful arrangements of productive factors, thus being an integral part of the firm's operation.[3]

Concepts of Entrepreneurship

Entrepreneurship as management. In the entrepreneurship curriculum of many business schools, the phenomenon under investigation has often been "small-business management." [4] Entrepreneurs are pictured as the managers of small, family-owned businesses or start-up companies. Entrepreneurship consists of routine management tasks, relationships with venture capitalists and other sources of external finance, product development, marketing, and so on. In this sense, entrepreneurship and the theory of the firm — the theory of some firms, at least — are inextricably linked. The theory of entrepreneurship in this approach is the theory of how small business owners organize and manage their assets.

Unfortunately, this notion of entrepreneurship is sufficiently elastic to be practically meaningless. It appears to include virtually all aspects of small or new business management, while excluding the identical tasks when performed within a large or established business. Put differently, if entrepreneurship is simply a set of management activities, or any management activity that takes place with in a particular type of firm, then it is unclear why we should bother to add this label to those activities.

Entrepreneurship as imagination or creativity. It is common, particularly within the management literature, to associate entrepreneurship with boldness, daring, imagination, or creativity (Begley and Boyd, 1987; Chandler and Jansen, 1992; Aldrich and Wiedenmayer, 1993; Hood and Young, 1993; Lumpkin and Dess, 1996). These accounts emphasize the personal, psychological characteristics of the entrepreneur. Entrepreneurship, in this conception, is not a necessary component of all human decision-making, but a specialized activity that some individuals are particularly well equipped to perform.[5]

If these characteristics are the essence of entrepreneurship, then entrepreneurship has no obvious link to the theory of the firm (at least not without further arguments). The relevant personal characteristics can presumably be acquired by contract on the market by purchasing consulting services, project management, and the like. A "non-entrepreneurial" owner or manager, in other words, can manage the day-to-day operations of the firm,

purchasing entrepreneurial services on the market as needed. Moreover, the literature does not explain clearly whether imagination and creativity are necessary, sufficient, or incidental conditions for entrepreneurship. Clearly the founders of many firms are imaginative and creative. If not, are they not entrepreneurs?

Entrepreneurship as innovation. Probably the best-known concept of entrepreneurship in economics is Joseph Schumpeter's idea of the entrepreneur as innovator. Schumpeter's entrepreneur introduces "new combinations"— new products, production methods, markets, sources of supply, or industrial combinations — shaking the economy out of its previous equilibrium through a process Schumpeter termed "creative destruction." The entrepreneur-innovator is introduced in Schumpeter's ground-breaking Theory of Economic Development (1911) and developed further in his two-volume work, Business Cycles (1939). Realizing that the entrepreneur has no place in the general-equilibrium system of Walras, whom Schumpeter greatly admired, Schumpeter gave the entrepreneur a role as the source of economic change.[6] "[I]n capitalist reality as distinguished from its textbook picture, it is not [price] competition which counts but the competition from the new commodity, the new technology, the new source of supply, the new type of organization . . . competition which commands a decisive cost or quality advantage and which strikes not at the margins of profits and the outputs of existing firms but at their foundations and their very lives" (Schumpeter, 1942: 84).

Schumpeter carefully distinguished the entrepreneur from the capitalist (and strongly criticized the neoclassical economists for confusing the two). His entrepreneur need not own capital, or even work within the confines of a business firm at all. While the entrepreneur could be a manager or owner of a firm, he is more likely to be an independent contractor or craftsman. In Schumpeter's conception, "people act as entrepreneurs only when they actually carry out new combinations, and lose the character of entrepreneurs as soon as they have built up their business, after which they settle down to running it as other people run their businesses" (Ekelund and Hébert, 1990: 569).

This suggests a rather tenuous relationship between the entrepreneur and the firm he owns, works for, or contracts with. Entrepreneurship is exercised within the firm when new products, processes, or strategies are introduced, but not otherwise. The day-to-day operations of the firm need not involve entrepreneurship at all. Moreover, because Schumpeterian entrepreneurship is sui generis, independent of its environment, the nature and structure of the firm does not affect the level of entrepreneurship. Corporate R&D budgets, along with organizational structures that encourage managerial commitment to innovation (Hitt and Hoskisson, 1994), have little to do with Schumpeterian entrepreneurship per se.[7]

Entrepreneurship as alertness or discovery. Entrepreneurship can also be conceived as "alertness" to profit opportunities. While present in Cantillon's and J. B. Clark's notions of entrepreneurship, this concept has been elaborated most fully by Israel Kirzner (1973, 1979, 1992). Kirzner follows Hayek (1968) in describing competition as a discovery process: the source of entrepreneurial profit is superior foresight — the discovery of something (new products, cost-saving technology) unknown to other market participants. The simplest case is that of the arbitrageur, who discovers a discrepancy in present prices that can be exploited for financial gain. In a more typical case, the entrepreneur is alert to a new product or a superior production process and steps in to fill this market gap before others. Success, in this view, comes not from following a well-specified maximization problem, but from having some knowledge or insight that no one else has — that is, from something beyond the given optimization framework.[8]

Kirzner's entrepreneurs do not own capital; they need only be alert to profit opportunities. Because they own no assets, they bear no uncertainty. Critics have seized on this as a defect in Kirzner's conception. According to this criticism, mere alertness to a profit opportunity is not sufficient for earning profits. To reap financial gain, the entrepreneur must invest resources to realize the discovered profit opportunity. "Entrepreneurial ideas without money are mere parlor games until the money is obtained and committed to the projects" (Rothbard, 1985: 283). Moreover, excepting the few cases where buying low and selling high are nearly instantaneous (say, electronic trading of currencies or commodity futures), even arbitrage transactions require some time to complete. The selling price may fall before the arbitrageur has made his sale, and thus even the pure arbitrageur faces some probability of loss. In Kirzner's formulation, the worst that can happen to an entrepreneur is the failure to discover an existing profit opportunity. Entrepreneurs either earn profits or break even, but it is unclear how they suffer losses.

For these reasons, the link between Kirznerian entrepreneurship and the theory of the firm is weak. Owners, managers, employees, and independent contractors can all be alert to new profit opportunities; Kirzner's entrepreneur does not need a firm to exercise his function in the economy.

Entrepreneurship as charismatic leadership. Another strand of literature, incorporating insights from economics, psychology, and sociology and leaning heavily on Max Weber, associates entrepreneurship with charismatic leadership. Entrepreneurs, in this view, specialize in communication — the ability to articulate a plan, a set of rules, or a broader vision, and impose it on others. Casson (2000) calls these plans "mental models" of reality. The successful entrepreneur excels at communicating these models to others, who come to share the entrepreneur's vision (and become his followers). Such entrepreneurs are also typically optimistic, self-

confident, and enthusiastic (though it is not clear whether these are necessary conditions).

Witt (1998a, 1998b) describes entrepreneurship as "cognitive leadership." He outlines an entrepreneurial theory of the firm that combines recent literature on cognitive psychology with Kirzner's concept of alertness. Entrepreneurs require complementary factors of production, he argues, which are coordinated within the firm. For the firm to be successful, the entrepreneur must establish a tacit, shared framework of goals, which governs the relationships among members of the entrepreneur's team. As Langlois (1998) points out, it is often easier (less costly) for individuals to commit to a specific individual, the leader, rather than an abstract set of complex rules governing the firm's operations. The appropriate exercise of charismatic authority, then, reduces coordination costs within organizations.

A possible weakness of this approach, in our view, is its emphasis on human assets, rather than the inalienable physical assets the entrepreneur controls. Must the charismatic leader necessarily own physical capital, or can he be an employee or independent contractor? Formulating a business plan, communicating a "corporate culture," and the like are clearly important dimensions of business leadership. But are they attributes of the successful manager or the successful entrepreneur? Even if top-level managerial skill were the same as entrepreneurship, it is unclear why charismatic leadership should be regarded as more "entrepreneurial" than other, comparatively mundane managerial tasks such as structuring incentives, limiting opportunism, administering rewards, and so on.

Entrepreneurship as judgment. An alternative to the foregoing accounts is that entrepreneurship consists of judgmental decision-making under conditions of uncertainty. Judgment refers primarily to business decision-making when the range of possible future outcomes, let alone the likelihood of individual outcomes, is generally unknown (what Knight [1921] terms uncertainty, rather than mere probabilistic risk). This view finds expression in the earliest known discussion of entrepreneurship, that found in Richard Cantillon's Essai sur la nature de commerce en géneral (1755). Cantillon argues that all market participants, with the exception of landowners and the nobility, can be classified as either entrepreneurs or wage earners:

> *Entrepreneurs work for uncertain wages, so to speak, and all others for certain wages until they have them, although their functions and their rank are very disproportionate. The General who has a salary, the Courtier who has a pension, and the Domestic who has wages, are in the latter class. All the others are Entrepreneurs, whether they establish themselves with a capital to carry on their enterprise, or are Entrepreneurs of their own work without any capital, and they may be considered as living subject to uncertainty; even Beggars and Robbers are Entrepreneurs of this class (Cantillon, 1755: 54).*

Bearing risk—that is, making decisions under conditions of uncertainty—is the entrepreneur's raison d'être.

Judgment is distinct from boldness, innovation, alertness, and leadership. Judgment must be exercised in mundane circumstances, for ongoing operations as well as new ventures. While alertness tends to be passive (perhaps even hard to distinguish from luck [Demsetz, 1983]), judgment is active. Entrepreneurs "are those who seek to profit by actively promoting adjustment to change. They are not content to passively adjust their . . . activities to readily foreseeable changes or changes that have already occurred in their circumstances; rather, they regard change itself as an opportunity to meliorate their own conditions and aggressively attempt to anticipate and exploit it" (Salerno, 1993: 123). Those who specialize in judgmental decision-making may be dynamic, charismatic leaders, but they need not possess these traits. Decision making under uncertainty is entrepreneurial, whether it involves imagination, creativity, leadership, and related factors or not.[9]

Entrepreneurial Judgment as a Natural Complement to the Theory of the Firm

While the view of entrepreneurship as judgment appears in many writers, it is most often associated with Knight (1921). For Knight, firm organization, profit, and the entrepreneur are closely related. In his view, these arise as an embodiment, a result, and a cause, respectively, of commercial experimentation (Demsetz, 1988).[10]

Knight introduces the notion of judgment to link profit and the firm to the existence of uncertainty. Judgment primarily refers to the process of businessmen forming estimates of future events in situations in which there is no agreement or idea at all on probabilities of occurrence. Judgment is learned and tends to have a large tacit component. Entrepreneurship represents judgment that cannot be assessed in terms of its marginal product and which cannot, accordingly, be paid a wage.[11] This is particularly because entrepreneurship is judgment about the most uncertain events, such as starting a new firm, defining a new market, and the like.

In other words, there is no market for the judgment that entrepreneurs rely on, so exercising judgment requires the person with judgment to start a firm. Judgment thus implies asset ownership, for judgmental decision-making is ultimately decision-making about the employment of resources. An entrepreneur without capital goods is, in Knight's sense, no entrepreneur.[12] This implies an obvious link with the theory of the firm, particularly those (transaction cost and property rights theories) that define asset ownership as a crucial ingredient of firm organization (Williamson, 1996; Hart, 1995). The

firm, in this sense, is the entrepreneur and the alienable assets he owns, and therefore ultimately controls. The theory of the firm is essentially a theory of how the entrepreneur exercises his judgmental decision-making — what combinations of assets will he seek to acquire, what (proximate) decisions will he delegate to subordinates, how will he provide incentives and employ monitoring to see that his assets are used consistently with his judgments, and so on.

PUTTING ENTREPRENEURSHIP INTO THE THEORY OF THE FIRM: JUDGMENT AND ECONOMIC ORGANIZATION

At least some concepts of entrepreneurship, then, have implications for resource ownership, and thus for the formation and organization of firms. How, though, is entrepreneurship best incorporated into the theory of the firm? What role might the entrepreneur play in various economic approaches to the firm?

Established Theories of the Firm

The neoclassical theory of the firm. As noted earlier, the neoclassical theory of the firm that forms the basis of competitive general equilibrium (and some game-theoretic) models has no place for the entrepreneur. In economics textbooks, the "firm" is a production function or production possibilities set, a "black box" that transforms inputs into outputs. The firm is modeled as a single actor, facing a series of decisions that are portrayed as uncomplicated: what level of output to produce, how much of each factor to hire, and the like. These "decisions," of course, are not really decisions at all; they are trivial mathematical calculations, implicit in the underlying data. In the long run, the firm may choose an optimal size and output mix, but even these are determined by the characteristics of the production function (economies of scale, scope, and sequence). In short: the firm is a set of cost curves, and the "theory of the firm" is a calculus problem. There is nothing for an entrepreneur to do.

While descriptively vacuous, the production-function approach has the appeal of analytical tractability along with its elegant parallel to neoclassical consumer theory (profit maximization is like utility maximization, isoquants are like indifference curves, and so on). Nonetheless, many economists now see it as increasingly unsatisfactory, as unable to account for a variety of real-world business practices: vertical and lateral integration, mergers, geographic and product-line diversification, franchising, long-term commercial contracting, transfer pricing, research joint

ventures, and many others. The inadequacy of the traditional theory of the firm explains much of the recent interest in agency theory, transaction cost economics, the property-rights approach, and other theories spawned by Coase's landmark 1937 article, "The Nature of the Firm."

The Coasian (contractual) framework. Coase (1937) introduced a fundamentally new way to think about the firm. Coase argued that in the world of neoclassical price theory, firms have no reason to exist. Because we observe firms, he reasoned, there must be a "cost to using the price mechanism" (Coase, 1937: 390). Market exchange entails certain costs: discovering the relevant prices, negotiating and enforcing contracts, and so on. Within the firm, the entrepreneur may be able to reduce these "transaction costs" by coordinating these activities himself. However, internal organization brings other kinds of transaction costs, namely problems of information flow, incentives, monitoring, and performance evaluation. The boundary of the firm, then, is determined by the tradeoff, at the margin, between the relative transaction costs of external and internal exchange. In a single brief paper, Coase laid out the basic desiderata of the economic theory of the firm, namely accounting in a comparative-institutional manner for the allocation of transactions across alternative governance structures. Although terminology and specific insights may differ, most modern theories of the firm may be said to be Coasian in the sense that they adhere to this program. But what of the entrepreneur in Coase's thought?

Coase's position is ambiguous.[13] Although he uses the term, his "entrepreneur" seems to be more engaged in the mechanical exercise of comparing the costs of organizing given transactions in given governance structures than in engaging in future-oriented speculative acts (Boudreaux and Holcombe, 1991). On the other hand, Coase stresses certain aspects of economic organization that are best understood in the context of entrepreneurial activities. Notably, his discussion of the employment contract appeals to unpredictability and the need for qualitative coordination in a world of uncertainty (Langlois and Foss, 1999). This provides ample room for the entrepreneur as a speculating and coordinating agent. However, this potential was not fulfilled, neither in Coase's own thought, nor, as we shall see, in later post-Coasian contribution to the economic theory of the firm.

Modern organizational economics. The post-Coasian theory of the firm — or more generally, organizational economics — follows Coase in conceiving the firm as a contractual entity whose existence, boundaries, and internal organization can be explained in terms of economizing on (various types of) transaction costs. This is not to say that any one theory in modern organizational economics has addressed all these three key issues in a unified framework incorporating the same kind of transaction costs. Indeed, a possible perspective on the division of labor that exists within the modern theory of the firm is that while the principal-agent approach (Holmström and

Milgrom, 1991) and team theory (Marschak and Radner, 1972) are mainly relevant for understanding internal organization, the transaction cost (Williamson, 1985) and property rights approaches (Hart, 1995; Hart and Moore, 1990) are designed to explain firm boundaries.

These approaches have stressed different kinds of transaction costs leading in different ways to contractual imperfection and therefore to economic outcomes inferior to the full-information, zero-transaction-cost ideal. For instance, principal-agent theory emphasizes the costs of monitoring contractual relationships in light of potential moral hazard. The property rights approach emphasizes the costs of writing (complete) contracts. The transaction cost approach also emphasizes contracting costs, but particularly the costs of adjusting to unanticipated contingencies.[14]

Of the four approaches, only the transaction costs approach and the property rights approach are conventionally considered theories of the firm in the strict sense. Neither team theory nor principal-agent theory explains the boundaries of the firm, defined in terms of asset ownership (Hart, 1995). Such an explanation must presuppose that contracts are incomplete; otherwise, everything can be stipulated contractually and there is no need for ownership, the "residual right" to make decisions under conditions not specified by contract. Transaction cost economics and property rights theory, by contrast, assume that contracts are incomplete, meaning that some contingencies or outcomes are not specified in the contract.

Following Oliver Williamson (1985, 1996), organizational economics has placed particular emphasis on specific (or highly complementary) assets in explaining the boundaries of the firm.[15] Assets are said to be highly specific when their value in the present (best) use is much greater than their value in the second-best use. Investment in such assets exposes agents to a potential hazard: once investments are made and contracts are signed, unanticipated changes in circumstances can give rise to costly renegotiation. One party can threaten to pull out of the arrangement —reducing the value of the specific assets — unless that party is allocated a greater share of the quasi-rents of joint production. Fear of being "held up" in this way distorts ex ante investment levels, reducing the joint surplus produced by the relationship. Quasi-rents can be safeguarded through vertical integration, where merger eliminates any adversarial interests. Less extreme options include long-term contracts, partial ownership, or agreements for both parties to invest in offsetting relationship-specific investments. Overall, several governance structures may be employed. According to transaction cost theory, parties tend to choose the governance structure that best controls the underinvestment problem, given the particulars of the relationship.

In Hart's (1995) formulation, integration does not eliminate opportunism, but rather changes the incentives to engage in opportunism. By giving property rights to the (non-human) specific assets to the party whose

ex ante investment most effects the joint surplus, the harmful effects of opportunism can be mitigated. The key assumption in this story is that contracts are left incomplete because (for instance) the transaction costs of drafting complete contracts are prohibitive. It is the need to make decisions under circumstances that are not covered by the contract that makes hold-up and its consequences possible.

Putting entrepreneurship into the modern theory of the firm. The analytical apparatus of modern organizational economics offers many opportunities for incorporating concepts of entrepreneurship, particularly the notion of entrepreneurship as judgment. For example, the emphasis on asset ownership as a crucial aspect of firm organization accords well with Knight's (1921) views, as does the emphasis on incomplete contracting. Theories of decision-making under asymmetric information help illustrate what is distinctive about entrepreneurship, compared to other kinds of decision-making. In many ways, however, the modern economics of organization retains the structure of the neoclassical theory of the firm it supplanted. For example, as capabilities theorists (Langlois and Foss, 1999) have pointed out, the modern economics of organization has merely grafted a super-structure of asymmetric information, transaction costs, and the like on top of the neoclassical theory of production. Moreover, the modern economics of organization is almost as deterministic and "closed" as the neoclassical theory of the firm: while notions of uncertainty, ignorance, and surprise are occasionally invoked in the literature, they serve merely as rhetorical devices to justify the assumption that contracts are incomplete (Foss, 2003). Such notions are not themselves explained, nor are they used to incorporate process and entrepreneurship. Still, key insights from organizational economics and the concept of entrepreneurial judgment may be usefully joined into a more complete theory of economic organization.

In the following, we show how the view of entrepreneurship as judgment and can be put into organizational economics. We address the three classical themes of the firm's existence, boundaries, and internal organization. Consistent with the view that entrepreneurship as judgment implies asset ownership, we start with a discussion of capital heterogeneity.[16]

Assets, Attributes, and Entrepreneurship

The entrepreneur's primary function is to choose among the various combinations of inputs suitable for producing particular goods (and to decide whether these goods should be produced at all), based on current prices for the factors and expected future prices of the final goods (Knight, 1921).[17] If capital is a single "good," with one price, then entrepreneurship is reduced to choosing between capital-intensive and labor-intensive production methods

(or among types of labor).[18] Lachmann (1956: 13, 16), by contrast, stresses that real-world entrepreneurship consists primarily of choosing among combinations of heterogeneous capital assets:

> *We are living in a world of unexpected change; hence capital combinations... will be ever changing, will be dissolved and re-formed. In this activity, we find the real function of the entrepreneur.[T]he entrepreneur's function . . . is to specify and make decisions on the concrete form the capital resources shall have. He specifies and modifies the layout of his plant . . . As long as we disregard the heterogeneity of capital, the true function of the entrepreneur must also remain hidden.*

In other words, the entrepreneur's decision problem is complicated by the heterogeneity of capital assets. While it is common to view capital heterogeneity in terms of physical heterogeneity — beer barrels and blast furnaces are different because of their physical differences — an economic approach emphasizes that capital goods are heterogeneous because they have different levels and kinds of valued attributes (in the terminology of Barzel, 1997).

Attributes. Attributes are characteristics, functions, possible uses of assets, etc., as perceived by an entrepreneur. For example, a copying machine has multiple attributes because it can be used at different time, by different people, for different types of copying work; that it can be purchased in different colors and sizes; and so on. Clearly, virtually all assets have multiple attributes. Assets are heterogeneous to the extent that they have different, and different levels of, valued attributes. Attributes may also vary over time, even for a particular asset. In a world of "true" uncertainty, entrepreneurs are unlikely to know all relevant attributes of all assets when production decisions are made. Nor can the future attributes of an asset, as it is used in production, be forecast with certainty.[19] Future attributes must be discovered, over time, as assets are used in production. Or, to formulate the problem slightly differently, future attributes are created as entrepreneurs envision new ways of using assets to produce goods.

Ownership and entrepreneurship. Focusing on attributes not only helps to illustrate the concept of heterogeneous capital, but also illuminates the vast literature on property rights and ownership. Barzel (1997) stresses that property rights are held over attributes, and property rights to known attributes are the relevant units of analysis in his work. In contrast, he dismisses the notion of asset ownership as essentially legal and extra-economic. Similarly, Demsetz argues that the notion of "full private ownership" over assets is "vague," and "must always remain so" because "there is an infinity of potential rights of actions that can be owned . . . It is impossible to describe the complete set of rights that are potentially ownable" (Demsetz 1988: 19).

However, as we noted above, most assets have unspecified, not-yet-created or not-yet-discovered attributes, and an important function of entrepreneurship is to create or discover them. Contrary to Demsetz, it is exactly this feature that creates a distinct role for asset ownership — that is, for acquiring legal title to a bundle of existing attributes as well as to future attributes. Specifically, ownership is a low-cost means of allocating the rights to attributes of assets that are created or discovered by the entrepreneur-owner. For instance, those who create or discover new knowledge have an incentive to use it directly because it is costly to transfer knowledge to others. In a well-functioning legal system, ownership of an asset normally implies that the courts will not interfere when an entrepreneur-owner captures the value of newly created or discovered attributes of an asset he owns. Consequently, the entrepreneur-owner can usually avoid costly negotiation with those who are affected his creation or discovery. This keeps the dissipation of value at bay. Of course, asset ownership itself provides a powerful incentive to create or discover new attributes, as ownership conveys the legally recognized (and at least partly enforced) right to the income of an asset, including the right to income from new attributes.[20] We next apply these ideas to the three classical issues in the theory of the firm: existence, boundaries, and internal organization.

The Existence of the Firm

Incomplete markets for judgment. Agents may realize rents from their human capital through three means: (1) selling labor services on market conditions, (2) entering into employment contracts, or (3) starting a firm. As Barzel (1987) argues, moral hazard implies that options (1) and (2) are often inefficient means of realizing rents. In other words, entrepreneurs know themselves to be good risks but are unable to communicate this to the market. For this reason, firms may emerge because the person whose services are the most difficult to measure (and therefore are most susceptible to moral hazard and adverse selection) becomes an entrepreneur, employing and supervising other agents, and committing capital of his own to the venture, thus contributing a bond.

However, there are other reasons why the market may not be able to evaluate entrepreneurial services. For example, Kirzner (1979: 181) argues that "entrepreneurship reveals to the market what the market did not realize was available, or indeed, needed at all." Casson (1982: 14) takes a more Schumpeterian position, arguing that "[t]he entrepreneur believes he is right, while everyone else is wrong. Thus the essence of entrepreneurship is being different — being different because one has a different perception of the situation" (see also Casson 1997). In this situation, non-contractibility arises

because "[t]he decisive factors . . . are so largely on the inside of the person making the decision that the 'instances' are not amenable to objective description and external control" (Knight 1921: 251) (see also Foss 1993). Hence moral hazard is not the only important factor underlying non-contractibility. An agent may be unable to communicate his "vision" of a commercial experiment — a specific way of combining heterogeneous capital assets to serve future consumer wants — in such a way that other agents can assess its economic implications. In such a case, he cannot be an employee, but will instead start his own firm. The existence of the firm can thus be explained by a specific category of transaction costs, namely, those that close the market for entrepreneurial judgment.

Firms as controlled experiments. The idea of incomplete markets for judgment helps us understand the one-person firm. However, similar ideas may also be useful for understanding the multi-person firm; that is, it may help us understand the emergence of the employment contract.

Consider again the notion of capital (resource) heterogeneity. If capital is homogenous, the coordination of plans is relatively straightforward. In the real world of heterogeneous capital assets, production plans are much more difficult to coordinate. In the "production function view" of the firm, this problem is sidestepped by assuming that the assets controlled by the firm are already in their best uses. More realistically, however, full ex ante knowledge about the optimal sequence of tasks (for example) is not likely to exist.[21] Given that the relationships among assets are generally unknown ex ante, some experimentation is necessary. First, one must isolate the system boundaries, that is, where the relevant relationships among assets are most likely to be. Second, the experimental process must be like a controlled experiment (or a sequence of such experiments) to isolate the system from outside disturbances. Third, there must be some sort of guidance for the experiment. This may take many forms, ranging from centrally provided instructions to negotiated agreements to shared understandings of where to begin experimenting, how to avoid overlapping experiments, how to revise the experiment in light of past results, and so on. The central problem is how this experimental process is best organized. Does the need for experimentation explain the existence of the firm, or can such experimentation be organized efficiently through markets?

In a world of complete knowledge and zero transaction costs, all rights to all uses of all assets could be specified in contracts. By contrast, in a world of heterogeneous assets with attributes that are costly to measure and partly unforeseen, complete contracts cannot be drafted. The resulting set of incomplete contracts may constitute a firm, a process of coordination managed by the entrepreneur's central direction. If relationship-specific assets are involved, the holdup problem described above becomes a serious concern. (Asset specificity may itself be an outcome of an experimental

process.) More specifically, as experimental activity provides information about how to optimize the system, assets will be increasingly specific in terms of time and location. Temporal and site specificity will tend to increase as assets become more efficiently coordinated. This provides one rationale for organizing the experiments inside firms, though not the only one. Firms may also be justified by problems associated with the dispersion of knowledge across agents. Production systems may exhibit multiple equilibria, and it may not be obvious how to coordinate on a particular equilibrium or even which equilibria are preferred.

In principle, an experimenting team could hire an outside consultant who guides the experimental activity, giving advice on the sequence of actions and asset uses, initiating the experiments, drawing the appropriate conclusions from each experiment, determining how these conclusions should influence further experimentation, and so on. However, such an arrangement is likely to run into serious bargaining costs. Under market contracting any team member can veto the advice provided by the consultant, and submitting to authority may be the least costly way to organize the experimental activity. "Authority" here means that the entrepreneur has the right to redefine and reallocate decision rights among team members and to sanction team members who do not use their decision rights efficiently. By possessing these rights, entrepreneur-managers can conduct experiments without continuously having to renegotiate contracts, saving bargaining and drafting costs. Such an arrangement then provides a setting for carrying out "controlled" experiments in which the entrepreneur-manager changes only some aspects of the relevant tasks to trace the effects of specific rearrangements of rights. Establishing these property rights is tantamount to forming a firm.

Changes in Firm Boundaries and Entrepreneurial Experimentation

The theory of firm boundaries is closely related to the theory of entrepreneurship, though it is not usually expressed in this fashion. Mergers, acquisitions, divestitures, and other reorganizations are best viewed as responses to a valuation discrepancy. Acquisition, for example, occurs when the value of an existing firm's assets is greater to an outside party than to its current owners. Put differently, merger can be a response to economies of scope, in that the value of the merging firms' assets combined exceeds their joint values separately.

New combinations of corporate assets can generate efficiencies by replacing poorly performing managers, creating operating synergies, or establishing internal capital markets. Like other business practices that do not conform to textbook models of competition, mergers, acquisitions, and financial restructurings have long been viewed with suspicion by some

commentators and regulatory authorities. However, the academic literature clearly suggests that corporate restructurings do, on average, create value (Jarrell, Brickley, and Netter 1988; Andrade, Mitchell, and Stafford 2001). Given such benefits, why are many mergers later "reversed" in a divestiture, spin-off, or carve-out? Klein and Klein (2001) distinguish between two basic views. The first, which may be termed empire building, holds that entrenched managers make acquisitions primarily to increase their own power, prestige or control, producing negligible efficiency gains, and that acquisitions by manager-controlled firms are likely to be divested ex post. Most important, because the acquiring firm's motives are suspect, such acquisitions are ex ante inefficient; neutral observers can predict, based on pre-merger characteristics, that these mergers are unlikely to be viable over time. (Moreover, by permitting these acquisitions, capital-market participants are also guilty of systematic error.)

A second view, which Klein and Klein (2001) term entrepreneurial market process, acknowledges that unprofitable acquisitions may be "mistakes" ex post, but argues that poor long-term performance does not indicate ex ante inefficiency. In the market-process perspective, a divestiture of previously acquired assets may mean simply that profit-seeking entrepreneurs have updated their forecasts of future conditions or otherwise learned from experience. As Mises (1949: 252) puts it, "the outcome of action is always uncertain. Action is always speculation." Consequently, "the real entrepreneur is a speculator, a man eager to utilize his opinion about the future structure of the market for business operations promising profits. This specific anticipative understanding of the conditions of the uncertain future defies any rules and systematization" (p. 585, emphasis added).

Klein and Klein (2001) discuss empirical evidence that the long-term success or failure of corporate acquisitions cannot, in general, be predicted by measures of manager control or principal-agent problems. However, significantly higher rates of divestiture tend to follow mergers that occur in a cluster of mergers in the same industry. As argued by Mitchell and Mulherin (1996), Andrade, Mitchell, and Stafford (2001), and Andrade and Stafford (2004), mergers frequently occur in industry clusters, suggesting that mergers are driven in part by industry-specific factors, such as regulatory shocks. When an industry is regulated, deregulated, or re-regulated, economic calculation becomes more difficult, and entrepreneurial activity is hampered. It should not be surprising that poor long-term performance is more likely under those conditions.

This notion of entrepreneurial decision-making under uncertainty squares with recent theories of acquisitions as a form of experimentation (Mosakowski 1997; Boot, Milbourn, and Thakor 1999; Matsusaka, 2001). In these models, profit-seeking entrepreneurs can learn their own capabilities only by trying various combinations of activities, which could include

diversifying into new industries. Firms may thus make diversifying acquisitions even if they know these acquisitions are likely to be reversed in a divestiture. This process generates information that is useful for revising entrepreneurial plans, and thus an acquisition strategy may be successful even if individual acquisitions are not. In these cases, the long-term viability of an acquisition may be systematically related to publicly observable, pre-merger characteristics associated with experimentation, but not characteristics associated with managerial discretion.

Internal Organization

Productive and destructive entrepreneurship. In much of the entrepreneurship literature, there is a general, though usually implicit claim that all entrepreneurial activity is socially beneficial (Mises 1949; Kirzner 1973). However, as Baumol (1990) and Holcombe (2002) point out, entrepreneurship may be socially harmful if it takes the form of rent-seeking, attempting to influence governments (or management) to redistribute income but in the process consuming resources and bringing about a social loss. It is therefore necessary to introduce a distinction between productive and destructive entrepreneurship.

When agents expend effort discovering new attributes and taking control over these in such a way that joint surplus (net social benefit) is reduced, we shall speak of "destructive entrepreneurship." Thus, discovering new forms of moral hazard (Holmström 1982), creating hold-ups (Williamson 1996), and inventing new ways of engaging in rent-seeking activities relative to government (Baumol 1990, Holcombe 2002) are examples of destructive entrepreneurship in the sense that these represent the discovery of new attributes that decrease joint surplus. "Productive entrepreneurship" refers to the creation or discovery of new attributes leading to an increase in joint surplus. For example, a franchisee may discover new local tastes that in turn may form the basis for new products for the entire chain; an employee may figure out better uses of production assets and communicate this to the TQM team of which he is a member; a CEO may formulate a new business concept; etc. In the following we sketch how this distinction provides a way of developing an entrepreneurial approach to internal organization. Note that we here use the term "entrepreneurship" more broadly than before, referring not only to decisions made by resource owners (entrepreneurship in the strict sense), but also to decisions made by employees, acting as proxy decision-makers for the resource owners.

Fundamental tradeoffs in internal organization. The first such problem concerns the control of destructive entrepreneurial activities. For example, firms may delimit employees' use of telephone and internet services

by closely specifying their use rights over the relevant assets, instructing them to act in a proper manner towards customers and to exercise care when operating the firm's equipment, and the like. However, firms are unlikely to succeed entirely in their attempt to curb such activities. One reason for this is the costs of monitoring employees. Another reason is that employees may creatively circumvent constraints; for example, they may invent ways of covering their (mis-)use of the internet. Although firms may know that such destructive entrepreneurship takes place, they may prefer not to try to constrain it further. This is because the various constraints that firms impose on employees (or, more generally, that contracting partners impose on each other) to curb destructive entrepreneurship may have the unwanted side effect that productive entrepreneurship is stifled (see Kirzner, 1985).

More generally, imposing (too many) constraints on employees may reduce their propensity to create or discover new attributes of productive assets. At any rate, many firms increasingly appear to operate on the presumption that beneficial effects may be produced by reducing constraints on employees in various dimensions. For example, firms such as 3M allocate time to research employees that they are basically free to use in almost any way they see fit in the hope that this will produce serendipitous discoveries. Many consulting firms do something similar. Of course, industrial firms have long known that employees with many decision rights — researchers, for example — must be must be monitored and constrained in different, and typically much looser, ways than those employees charged only with routine tasks. More broadly, the increasing emphasis on "empowerment" during the last few decades reflects a realization that employees derive a benefit from controlling aspects of their job situation. Moreover, the total quality movement emphasizes that delegating various rights to employees motivates them to find new ways to increase the mean and reduce the variance of quality (Jensen and Wruck, 1994). To the extent that such activities increase joint surplus, they represent productive entrepreneurship.

Stimulating the productive creation and discovery of new attributes by relaxing constraints on employees results in principal-agent relationships that are less completely specified. This is not simply a matter of delegation, or transferring specific decision rights, but rather giving agents opportunities to exercise their own, often far reaching, judgments. However, as we have seen, this also permits potentially destructive entrepreneurship. Managing the tradeoff between productive and destructive entrepreneurship thus becomes a critical management task.

Choosing efficient tradeoffs. In this context, asset ownership is important because it gives entrepreneurs the right to define contractual constraints, that is, to choose their own preferred tradeoffs. Briefly stated, ownership allows the employer-entrepreneur's preferred degree of contractual incompleteness — and therefore a certain combination of productive and

destructive entrepreneurship — to be implemented at low cost. This function of ownership is particularly important in a dynamic market process, the kind stressed by Knight (in the later chapters of Knight, 1921) and the Austrians (Hayek, 1948; Kirzner, 1973; Littlechild 1986). In such a context, an ongoing process of judgmental decision making requires contractual constraints to address the changing tradeoffs between productive and destructive entrepreneurship inside the firm. The power conferred by ownership allows the employer-entrepreneur to do this at low cost (for a fuller analysis, see Foss and Foss, 2002).

CONCLUSION

The theory of entrepreneurship and the economic theory of the firm thus have much to learn from each other. A good theory of entrepreneurship should explain the conditions under which entrepreneurship takes place: Does the entrepreneur need a firm? We have argued that the concept of entrepreneurship as judgment provides the clearest link between entrepreneurship, asset ownership, and economic organization. Similarly, the economic theory of the firm can be improved substantially by taking seriously the essential heterogeneity of capital goods and the subsequent need for entrepreneurial experimentation.

Will these insights be incorporated into the economic theory of the firm? We are optimistic, but guardedly so. Because these concepts lie fundamentally outside the standard constrained optimization framework, they are inherently difficult to model mathematically. Modern economists have difficulty appreciating ideas that are not expressed in this familiar language. Indeed, most recent theoretical advances in the economic theory of the firm have been developed within the more formal framework associated with Grossman, Hart, and Moore, not the more "open" framework associated with Williamson.[22] Relaxing this constraint may lead to considerable advances in economists' understanding of the firm.

NOTES

[1]The terms "entrepreneur" and "entrepreneurship" do not even appear in the indexes of leading texts on the economics of organization and management such as Brickley, Smith, and Zimmerman (2004) or Besanko, Dranove, Shanley, and Schaefer (2004). Two British surveys of economics principles textbooks (Kent, 1989; Kent and Rushing, 1999) confirm a similar absence of the concept.

[2]As Machovec (1995: 109) notes, to the classical economists "specialization and commercial freedom spawned opportunities for alert individuals." Unlike later economists, the classical economists held what is essentially a process view in which competition was seen "as a tapestry of aggressive commercial behaviors which created pure profits by speculating on price

futures, engineering new methods of production, and inspiring new product lines to better serve consumers" (*ibid.*: 136). This is not true of Adam Smith, however; Schumpeter (1949: 65) writes that "the leading or directing activity as a distinctive function played a surprisingly small role in [Smith's] analytic scheme of the economic process."

[3]On the history of the entrepreneurship concept in economic theory, see Elkjaer (1991) and Ibrahim and Vyakarnam (2003).

[4]However, this appears to be slowly changing towards a more generic and theoretically based understanding of entrepreneurship.

[5]As Gartner (1988: 21) argues, however, this literature employs a host of different (and frequently) contradictory notions of entrepreneurship. A "startling number of traits and characteristics have been attributed to the entrepreneur, and a 'psychological profile' of the entrepreneur assembled from these studies would portray someone larger than life, full of contradictions, and, conversely, someone so full of traits that (s)he would have to be a sort of generic 'Everyman.'"

[6]This includes, but is not limited to, the formation of new business ventures.

[7]Other writers influenced by Schumpeter, however, such as Baumol (1993a), do view public and private R&D, the scale and scope of patent protection, and basic science education as important determinants of the level of entrepreneurial activity.

[8]Kirzner's view of superior foresight differs from Stigler's concept of search in which the value of new knowledge is known in advance, available to anyone willing to pay the relevant search costs. "Stigler's searcher decides how much time it is worth spending rummaging through dusty attics and untidy drawers looking for a sketch which (the family recalls) Aunt Enid thought might be by Lautrec. Kirzner's entrepreneur enters a house and glances lazily at the pictures which have been hanging in the same place for years. 'Isn't that a Lautrec on the wall?'" (Ricketts, 1987: 58).

[9]Mises (1949) introduces entrepreneurship to explain profit and loss. In the marginal productivity theory of distribution, laborers earn wages, capitalists earn interest, and owners of specific factors earn rents. Any excess (deficit) of a firm's realized receipts over these factor payments constitutes profit (loss). Profit and loss, therefore, are returns to entrepreneurship. In a hypothetical equilibrium without uncertainty (what Mises calls the "evenly rotating economy"), capitalists would still earn interest, as a reward for lending, but there would be no profit or loss.

[10]Knight explains that "[w]ith uncertainty entirely absent, every individual being in possession of perfect knowledge, there would be no occasion for anything of the nature of responsible management or control of productive activities . . . Its existence in the world is a direct result of the fact of uncertainty" (1921: 267, 271).

[11]"The receipt of profit in a particular case may be argued to be the result of superior judgment. But it is judgment of judgment, especially one's own judgment, and in an individual case there is no way of telling good judgment from good luck and a succession of cases sufficient to evaluate the judgment or determine its probable value transforms the profit into a wage. . . . If . . . capacities were known, the compensation for exercising them can be competitively imputed and is a wage; only, in so far as they are unknown or known only to the possessor himself, do they give rise to a profit" (Knight, 1921: 311).

[12]Carl Menger's (1871) treatment of production gives the entrepreneur a similar role. Production requires an "act of will" and "supervision of the execution of the production plan." These functions "entail property ownership and, therefore, mark the Mengerian entrepreneur as a capitalist–entrepreneur" (Salerno, 1998: 30). Menger describes "command of the services of capital" as a "necessary prerequisite" for economic activity. Even in large firms, although he may employ "several helpers," the entrepreneur himself continues to bear uncertainty, perform economic calculation, and supervise production, even if these functions "are ultimately confined . . . to determining the allocation of portions of wealth to particular productive purposes only by general categories, and to selection and control of persons" (Menger, 1871: 160–61).

[13]Coase dismissed Knight's (1921) explanation. It is arguable that he misunderstood Knight (Foss 1996).

[14]This is a bit of a rational reconstruction on our part: Formal contract theorists, such as principal-agent or property right theorists, are uncomfortable with the notion of "transaction cost."

[15]For expository reasons, we here suppress the differences between Williamson's and Hart's versions of this story.

[16]For an attempt to ground this explicitly in Austrian capital theory, see Foss, Foss, Klein, and Klein (2002).

[17]This formulation makes it clear that financiers — those who determine how much capital is available to each firm and each branch of industry — are also entrepreneurs. In the traditional, production-function theory of the firm, capital markets do little but supply financial capital to managers, who can get as much capital as they wish at the going market price. In a more sophisticated understanding, managers do not decide how much capital they want; capitalists decide where capital should be allocated. In doing so, they provide essential discipline to the manager, who Mises (1949: 304) calls the entrepreneur's "junior partner" (Klein, 1999).

[18]Moreover, in a world of homogenous capital assets (resources), economic organization would be relatively unimportant. All capital assets possess the same attributes, and thus the costs of inspecting, measuring, and monitoring the attributes of productive assets is trivial. Exchange markets for assets would be virtually devoid of transaction costs. A few basic contractual problems — in particular, principal-agent conflicts over the supply of labor services — would remain, though workers would all use identical capital assets. However, it is hard to see what role ownership of capital assets would play in this world. If the costs of measuring and specifying attributes are low, entrepreneurs and factor owners could contract over attributes, and there would be little incentive to acquire ownership of assets themselves. Transactions involving such assets would be governed by complete, contingent contracts. Because contracts would substitute for ownership in a homogenous capital world, the boundaries of firms would be indeterminate (Hart 1995).

[19]This sense of uncertainty links naturally to the notion of contractual incompleteness. We explore the implications of this idea below.

[20]Moreover, ownership simplifies the process of entrepreneurial arbitrage (Kirzner, 1973)—and hence helps to close pockets of ignorance in the market—by allowing entrepreneurs to acquire, in one transaction, a bundle of rights to attributes (i.e., a distinct asset). This means that the parties need not engage in costly bargaining over many rights to single attributes. The dissipation of value is thus minimized.

[21]Strikingly, the problem of defining an optimal sequence of tasks in even relatively simple production systems may require more calculation capacity than is available in a supercomputer (Galloway 1996).

[22]Bajeri and Tadelis (2001) is a prominent exception. See Foss (1994) for the case that Williamson's work represents an ontologically "open" interpretation of Coase, distinguished in this way from other developments of the Coasian tradition.

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5. Employee Entrepreneurship: Recent Research and Future Directions

INTRODUCTION

Entrepreneurship has been a focal issue of interest in Economics from the very beginning (Say, 1880; Marshall, 1890; Schumpeter, 1934). Economists have included entrepreneurs as a main feature of their models, either in order to differentiate entrepreneurs from workers as organizers of resources (Lucas, 1978) or as catalysts of change within the economy (Schultz, 1975). This tradition has been followed to the present, and recent research has focused on obtaining a better understanding of what characteristics influence the decision to undertake entrepreneurship, as well as understanding what characteristics might increase the probability of an entrepreneur's success (Evans and Leighton 1989, Evans and Jovanovic 1989, Buera 2004, Hamilton 2000, and Moskowitz and Vissing-Jorgensen 2002).

In particular, several scholars have begun to examine the phenomena of employee entrepreneurship, whereby an employee of an incumbent firm leaves to found a start-up in the same industry as the parent (Klepper, 2001a, b, 2002; Agarwal, Echambadi, Franco and Sarkar, 2004). There is reason to believe that spin-outs, or firms started by former employees of incumbent firms, are highly successful, since they combine the knowledge inherited from their parent with entrepreneurial flexibility (Agarwal et al. 2004). Further, from the strategic perspective, incumbents may be interested in preventing such entrepreneurship, since spin-outs represent a creation of their own competition.

In this chapter, we begin by providing a historical overview of the economic models that focus on *entrepreneurs*, as opposed to entrepreneurial *firms*. We then discuss the literature that examines some of the causes and effects of undertaking the entrepreneurial act, before focusing on employee entrepreneurship in particular. We examine the literature on why aspiring entrepreneurs choose to work with incumbent firms and what are the characteristics of spin-outs. We follow this with a discussion of what

incumbents may do to prevent creating their own competition. Finally, we suggest avenues for future research in this incipient area.

A HISTORICAL OVERVIEW OF RESEARCH ON ENTREPRENEURS IN ECONOMICS

Entrepreneurship has been a subject of continual interest in economics. While the term was first used in the16th century, well before the recognition of economics as a field of study, to describe an individual who undertakes a business venture, Jean Baptiste Say, the renowned 19th century economist popularized the term by defining an entrepreneur as someone who takes on risk in pursuit of profit, in creating value by shifting resources out of low productivity areas to higher productivity areas. In his Treatise (1880), Say focused on how value arose from the interaction of supply and demand, known as Say's law, and stated that the entrepreneur's occupation was to "estimate, with tolerable accuracy, the importance of a specific product, the probable amount of demand and the means of production." Marshall (1890) furthered this notion by identifying four primary factors of production; land, labor, capital and organization. Organization or the entrepreneur's input to production was the necessary factor to coordinate all other factors.

In the 20th century, Joseph Schumpeter (1934) argued that entrepreneurs created technical and financial innovations in the face of competition and falling profits. By developing new and better goods, entrepreneurs often destroyed the market for older and established goods, thus creating irregular spurts of economic activity which he termed as creative destruction. Schumpeter viewed this as the main reason for business cycles. While other economists also included entrepreneurs in their models, the two important contributions in the area were made by Theodore Schultz and Robert Lucas. Schultz (1975) saw entrepreneurs as individuals who appropriate value by taking advantage of opportunities for creating new products, thus creating disequilibria. The need for these new products is a result of technological progress and resulted in competitive destruction as described by Schumpeter. For Lucas (1978), the firm manager/entrepreneur was as an organizer of inputs, in line with Say's description. This important feature of Lucas, wherein the term manager is used interchangeably with entrepreneur, has been followed by much of the industrial organization literature. Lucas modeled occupational choice for individuals, where entrepreneurship is one of a possible set of occupations. Based on the premise that better managers organize inputs more effectively, Lucas posited that only individuals who are good enough managers would operate firms. This provided one explanation for differences in the firm size; since better managers are able to operate large firms.

Both streams of this literature have been successfully followed. Holmes and Schmitz (1990) were one of the first to formally integrate the Schultzian entrepreneur into mainstream theoretical literature. The authors formalized Schultz's view of entrepreneurship and found that the model had implications for firm entry and exit, and business transfers. Business transfers, in their model, occur when a particular business is developed by one person and then managed by another later on. This allows the developer of the business, i.e. the entrepreneur, to pursue other activities. This idea was followed upon by Prusa and Schmitz (1994). They found that, in the PC software industry, most companies' initial products were the most successful, and they found a declining pattern in the success of subsequent products.

In Jovanovic's (1982) model of firm entry and exit, managers, similar to the ones in Lucas, are uncertain about their abilities to succeed before entering the industry. Only after entry do they receive a noisy signal of their ability. The result is relatively Darwinian: better firms stay in the industry for longer periods. The model produces similar patterns as seen in the data with respect to age and employment: younger firms tend to be smaller, but also have higher variability in size, while older firms tend to be larger with little variance. Takii (2003) found that better entrepreneurs are more capable of predict future demand. Industries differ in terms of demand variability; some industries have higher variance in demand than others. Since better managers are better prepared to deal with demand variability, because they can interpret the industry's key factors and deal with changing economic conditions better, the model predicts that better managers will work in industries with higher demand variability. This is supported by the data, since managers with higher abilities, as measured by GRE scores, work in industries with higher output variance.

WHAT ARE THE DETERMINANTS AND EFFECTS OF UNDERTAKING ENTREPRENUERSHIP?

In addition to the above models that incorporate entrepreneurs, there has been recent interest in determining who becomes an entrepreneur and how successful they will be. In particular, there is significant interest in determining how much liquidity constraints affect individuals' decisions to both to undertake entrepreneurship projects, and how much to invest in these activities. Further, returns to entrepreneurship are argued to be another critical determinant of entrepreneurship. Several researchers have investigated if the pecuniary returns are as high as that of being an employee, while others have worked on modeling cases where the expected returns from entrepreneurial activities are no different from that of employment. Another important question is whether investor protection helps or hinders

entrepreneurial activity. In addition, some of this work has focused on determining how much of a factor entrepreneurs are in determining the wealth and income distribution in an economy. The following provides a brief review of this literature and highlights some stylized facts.

Using the *National Longitudinal Survey of Young Men* (NLS) for 1966-1981 and the *Current Population Surveys* for 1968-1987, Evans and Leighton (1989) examined the selection process into entrepreneurship, using self-employment as a proxy of entrepreneurship. They find that age and total labor force experience have no effect on the entrepreneurship decision. One possible explanation is that new enterprises require capital, which the young may not have access to. This is supported by the fact that individuals with more capital reserves are more likely to choose self-employment. In addition, the probability of departing from self-employment falls with the duration in self-employment. In the first years in self-employment, it is 10%, and by the eleventh year, it falls to 0%. Finally, their findings suggest that the potential wages of the self-employed are not significantly different from the wages of paid employees.

Evans and Jovanovic (1989) determined that liquidity constraints do bind for entrepreneurs using a structurally estimated static framework. They find evidence that entrepreneurial ability is evenly distributed across the population. In particular, wealthier individuals do not necessarily make better entrepreneurs. This suggests that since the wealthy tend to undertake entrepreneurial activities more often than the poor, liquidity constraints must bind. In addition, any entrepreneur must bear a large fraction of the risk associated with his endeavor.

Buera (2004) investigated a dynamic version of the Evans and Jovanovic model. In his model, individuals who are potentially competent entrepreneurs will either choose to save in order to start a business, or if they start below a particular wealth level, will remain employees forever. His found that able individuals who could increase their earnings by 18% by becoming entrepreneurs will remain employees if they start with zero wealth. In other words, even in the dynamic framework, liquidity is an important binding constraint. This suggests that the impact of poverty traps and the welfare costs of borrowing constraints are significant. In addition, the probability of becoming an entrepreneur is non-linear in wealth. It is increasing for low levels of wealth and decreasing for higher levels of wealth.

Using the 1984 panel of the Survey of Income and Program Participation (SIPP), Hamilton (2000) constructed alternative measures of self-employment earnings. In comparing these measures with the wages of paid employees, he found that jobs in paid employments provided both higher starting wages and higher wage growth. In fact, after 10 years in business, median entrepreneurial earnings are 35% less than the alternative wage on a paid job of the same duration. Finally, most workers who choose to be self-

employed receive a substantially lower wage compared to that from their alternative paid employment. This suggests that entrepreneurship offers substantial non-pecuniary benefits.

Another possible reason for why individuals choose to become entrepreneurs is that the return to their capital is higher than when invested in publicly traded equity. Moskowitz and Vissing-Jorgensen (2002) investigated this, since approximately 75% of all private equity is held by households for which at least half of their total net worth is held in that form. They found that the average return to private equity is similar to that of public equity. In addition, they suggest that one reason that individuals become entrepreneurs is not because of the monetary returns, but because of the non-monetary returns to undertaking such an activity, in accord with Hamilton.[1]

Hopenhayn and Vereshchagina (2003) have developed a model to take into account the fact that the empirical evidence shows no sign of a positive premium for entrepreneurs. Their entrepreneurs face borrowing constraints, and endogenous risk choice. In each period, agents decide first whether to work or become an entrepreneur. Self-financed entrepreneurs then choose how much to invest in a project as well as the riskiness of this project, given a set of possibilities. According to their model, entrepreneurs with little savings will tend to invest in more risky projects than those with more savings. The model has implications for the effects of business size and age on survival rates that are consistent with empirical data; their theory predicts larger and older firms tend to be more likely to survive but, conditional on survival, experience smaller rates of returns than younger and smaller firms do.

The issue of risk is a critical problem faced by entrepreneurs when faced with borrowing constraints. A potential way to encourage entrepreneurs to undertake risky projects is through financial intermediation, since this helps to increase the risk sharing across the economy. Castro, Clementi and MacDonald (forthcoming) have recently investigated the commonly held view that investor protection helps foster economic growth. They found that better investor protection has two effects: better risk-sharing and increases in the interest rate. Since entrepreneurs tend to be risk-averse, this improvement in risk-sharing results in an increase in the demand for capital. Since an increase in the interest rate lowers the income of entrepreneurs, it also decreases the current savings. The model predicts that the second effect is outweighed by the first effect in countries with lower capital flow restrictions. In other words, in countries with higher restrictions on capital flows, one would expect to see lower growth than in a country with lower restrictions.

The importance of financial intermediation for undertaking entrepreneurial activities, and its effects on economic growth was seminally investigated by Greenwood and Jovanovic (1990). They presented a model in which financial intermediation and the rate of growth are endogenously

determined. Financial intermediation increases the rate of growth, since capital is more efficient allocation within the economy, leading to higher rates of return. In addition, higher rates of growth allow for the economy to invest in costlier forms to financial structures. Finally, during the transition from a lower rate of growth to one with a higher rate of growth, the wealth distribution between the poor and rich widens. In the same vein, Gentry and Hubbard (1999) determined the relationship between entrepreneurial saving decisions and household wealth accumulation. They found that entrepreneurs own a substantial share of wealth and income and this share is increasing in both the wealth and income distributions after the entrepreneurial act. In addition, entrepreneurs' portfolios tend to be highly undiversified, and a larger share of their assets is in active businesses. Finally, entrepreneurs have higher wealth-income ratios and savings rates, even conditional on age and other demographic variables.

In Cagetti and De Nardi (2003), the effects of borrowing constraints faced by entrepreneurs on aggregate capital accumulation and wealth inequality are considered. They construct a model that matches wealth inequality for both entrepreneurs and non-entrepreneurs, noting that entrepreneurship is an important determinant of capital accumulation and wealth concentration. More restrictive borrowing constraints generate less wealth concentration, but also reduce average firm size, aggregate capital, and the fraction of entrepreneurs. Voluntary bequests play an important role in allowing some high-ability workers to establish or enlarge an entrepreneurial activity. Without voluntary bequests, there would be fewer large firms, fewer entrepreneurs, and less aggregate capital, as well as less wealth concentration.

The above review points to wealth as a constraining factor in undertaking entrepreneurship activities. In addition, most entrepreneurs have portfolios that are highly undiversified, thus increasing their risk-bearing. There also seems to be little evidence that suggests that entrepreneurship has higher returns either through wage earnings or through privately held equity. Since financial intermediation may also play a role in determining entrepreneurship, one would expect to see more entrepreneurship activity in countries with more access to capital markets. Since entrepreneurs have a larger impact on savings rates and the wealth distribution, countries with higher growth and better financial markets may tend to have both higher saving rates and more skewed wealth distributions. If individuals are equally likely to be successful as entrepreneurs, independent of wealth, then why do they choose to take on such risk? One reason may be non-monetary, such as the ability to be one's own boss. As we elaborate below, this may be one reason for the entrance of spin-outs.

EMPLOYEE ENTREPRENEURSHIP AND SPIN-OUT FIRMS

The above literature review indicates that in addition to the study of entrepreneurial firms, economists have also examined the causes and consequences of individuals undertaking the entrepreneurial act. However, none of reviewed literature thus far has addressed the question of where entrepreneurs come from. In this section, we focus on employees who turn into entrepreneurs by leaving their place of employment to start-up a new firm in the same industry as the previous employer. In several industries, new firms are started by former employees of incumbent firms. Spin-outs[2], firms started by former employees of incumbent firms, have been documented in construction and the early automobile industries, as well as among advertising agencies and law firms (Garvin 1983, Phillips 2000). Typically, spin-outs occur at the beginning of the industry's lifecycle, though in some industries, most notably those where technological know-how is often embodied in human capital, they do not occur as disproportionately at the early stages of the industry. Two generic examples of this type of industry are the semiconductor and rigid disk drive industries, where Braun and Macdonald (1982) and Christensen (1993) document the importance of spin-outs. This suggests that entrepreneurs may choose to work for an incumbent in order to learn about the organizational capital used at that firm.

In the last decade, interest in spin-outs has resulted in some incipient research that provides a strong base to study the issue. Klepper (2000a) has provided an excellent review of some of the theoretical and empirical work in this area. In particular, Klepper's review piece provides a well-done break-down of the differences in the models along four dimensions; the nature of spin-outs, characteristics of the parents, the timing of spin-outs, and spin-out performance. We recommend that readers interested in the economic research on employee entrepreneurship begin by reading Klepper's review. The following section builds on Klepper's review by including work that has been published since, and highlighting some other issues that are of interest. In particular, we focus on research that has examined why aspiring entrepreneurs choose to work at incumbent firms, the characteristics of the spin-out firms, and parent firm strategies that are related to spin-outs.

Why do Aspiring Entrepreneurs Work at Incumbent Firms?

To examine whether aspiring entrepreneurs apprentice at incumbent firms, Franco and Filson (2000) incorporated a learning mechanism similar to the one seen in the data into a standard industry dynamics model. Agents can

learn to be more efficient managers by working for a well organized firm as a researcher. Firms, in turn, can improve their own organizational capital by hiring researchers. This paper follows in Lucas' span of control tradition by including occupational choice in a model where agents vary by organizational ability, thus allowing better managers to operate larger firms. Franco and Filson found that more technologically advanced firms produce spin-outs. This is a consequence of the fact that over time, the knowledge within the industry improves. As a result of this improvement, the critical level of know-how required to run a firm will increase as the industry evolves. Employees of firms which are lagging behind the technological frontier may not acquire sufficient know-how to run a firm and therefore laggards do not produce spin-outs. In using data from the hard drive industry, they find strong support for this implication in the data. This is regardless of the size of the firm. An implication of their research is that it is not that larger firms, but more technologically advanced firms that are generating more spin-outs.

In Franco and Filson's paper, the firms are similar in terms of hierarchy and organization, though some are more technologically advanced than others. There are two views of what might lead to the creation of spin-outs: one in which young firms provide employees with the necessary resources in order to become an entrepreneur, and another in which employees become entrepreneurs because of frustration with the lack of interest that their employer has in developing or bringing to market their ideas. In Gompers, Lerner, and Scharfstein (forthcoming), these competing hypotheses are examined using data from employees leaving public companies to start venture capital firms between 1986-1999. While they find evidence that both contribute to the entrance of venture capital firms, most entrants come from smaller entrepreneurial firms. Additionally, more entrants come from firms in Silicon Valley and Massachusetts. This suggests that individuals may choose to work at smaller entrepreneurial firms in order to acquire not only organizational capital for a future entrepreneurial venture, but the necessary networks and attributes.

What are the Characteristics of Spin-outs?

Of course, this begs the question, are spin-outs important? In other words, are spin-outs better prepared to meet the demands of the industry than other entrants? In the rigid disk drive industry, there is significant evidence that shows that while spin-outs are not the only entrants, they compromise the most important source of entrants in that industry. Christensen (1993) focuses on the U.S. disk drive industry during the period covering 1976 to 1989. His detailed examination shows that spin-outs accounted for all but four of the start-ups that were successful at generating revenue; further spin-outs

accounted for 99.4 percent of the total cumulative revenues generated by the start-up group. And while only three out of 28 non-spin-out entrants survived until 1989, 16 of 40 spin-outs survived during the same period. By 1989, almost three quarters of the world OEM/PCM market's ten largest firms were spin-outs.

Using data from the same industry, Agarwal, Echambadi, Franco, and Sarkar (2004) compared spin-outs to other entrants by distinguishing among the other types of entrants. In contrast with other work that makes a more coarse grain distinction between *de novo* and *de alio* entrants, these researchers compare spin-out entrants with other *de novo* entrants that have no apparent ties to the industry, and with *de alio* entrants who are either diversifying entrants or incumbent-backed ventures. In comparing these four groups, in terms of knowledge, they find that spin-outs, along with incumbent-backed entrants, have a higher level of technological know-how than the non spin-out *de novos*. The technological know-how of diversifying entrants is lower than the non spin-out *de novos*. This result is mimicked when using market pioneering knowledge in comparing the spin-outs with the non spin-out *de novos*. The effect of incumbent-backed entrants on market pioneering knowledge is not significant, while that of diversifying entrants is negative and significant. Together, these results indicate that spin-out firms have higher know-how levels than both diversifying entrants and the non spin-out *de novo* entrants. In addition, when comparing the survival probabilities of the different types of entrants, spin-outs are found to have a higher probability of survival relative to all other types of entrants.

Franco and Filson's model also implies that a firm's probability of surviving is increasing in its technological know-how. If the price falls over time, then the critical level of knowledge that a firm owner must have in order to operate a firm successfully will increase over time. Since the probability of improving a firm's knowledge is positively related to the firm's current level of knowledge, firms with lower levels of knowledge will tend to be less successful at improving their knowledge when compared to firms with higher levels of knowledge. This implies that firms with lower than the critical level of knowledge are more likely to failure in the future and hence a positive relationship between survival and knowledge. Finally, because more technological advanced firms are more likely to produce spin-outs, along with the learning mechanism used by entrepreneurs, the model implies that a spin-out's probability of surviving is increasing in its parent's know-how. Their empirical analysis supports their model; they find that better firms, in terms of know-how, are more likely to survive. In addition, spin-out survival is closely related to parental know-how.

Parent Firm Strategies

Parent firm strategies, both before and after the generation of spin-outs, is an important issue to examine when investigating spin-outs, since it has obvious implications for both the creation and the sustenance of the new entrepreneurial venture. Since firms would like to prevent from creating their own competition, an important question is what types of firms are more likely to produce spin-outs? Agarwal et al. (2004) find that parents tend to be those with higher market pioneering knowledge or higher technological knowledge. This highlights the fact that knowledge can be a double edged sword. However, there is some consolation: firms with higher marketing knowledge and higher technological knowledge are less likely to create spin-outs. One possible explanation is that firms that not only create knowledge by improving their technological knowledge, but appropriate it, by increasing their market pioneering knowledge, they are able to keep their employees happy and less interested in spinning out.

Obviously, this is not the only way to prevent employees from leaving. Firms have used a variety of legal tactics as well. The use of trade secrets legislation has been relatively unsuccessful, since by the time that a former employer has used the trade secret in either his own firm or a competitor's, the original firm has lost market power or sales. Another method that is commonly used is by relying on non-compete clauses. However, not all states enforce these and in the states that do, they are only enforced for a specific, well-defined time, geographic area, and industry.

In the legal and sociological research, several authors have suggested that the effects of non-compete clauses are detrimental to growth and the success of the state's economy (See for example, Gilson (1999), and Hyde (2003)). The main example is the difference between the hard drive industry in Massachusetts, where non-compete clauses are enforced, and California, where they are not. However, Franco and Mitchell (2004) show that employee turnover is affected by non-compete clauses only in cases where either the employee's imitative ability is uncertain, or when wages can not be back loaded. Saxenian noted that while Silicon Valley started out much more slowly, it surpassed Massachusetts' Route 128 in 20 years. Franco and Mitchell define the necessary conditions for this outcome to arise, while allowing for uncertainty regarding the employee's imitative ability. These include conditions on the industry's profits over time, as well as the probability of allowing for employees to spin-out, given that firms in California will have to pay worker a higher wage in the following period in order to prevent them from spinning out. Because of this, the value of starting up in California is lower and there are fewer firms there at the beginning of the industry's lifecycle. In Massachusetts, firms can appropriate more of its value, by "charging" its employees to spin-out. This implies that the value of

entering in Massachusetts is higher, leading to more firms there at inception of the industry.

This delineates one clear way to prevent employees from spinning out: paying higher wages. However, imitative ability is typically not considered to be the only characteristic that determines whether an employee can spin-out. In addition to this ability, there is an issue of preferences over risk or what could be thought of as entrepreneurial spirit. In this case, the firm may use a long term wage contract. A firm offers a lower starting wage, with the promise of higher wages in the future, conditional on staying in the firm. Agents with the same managerial ability who are more risk averse will choose to remain at the firm, while those who are risk-takers will leave to spin-out. The firm will recapture much of the value of the employee's as long as the contract can allow for negative wages or if the loss in profits is less than the return from hiring the employee.

AVENUES FOR FUTURE WORK

The study of individual entrepreneurs has been an important topic in economics, and recent research has begun to focus on which type of individuals become entrepreneurs. While there is evidence that former employees are the most likely to become entrepreneurs in several industries, as well as being the most successful entrants, this has not been broadly documented. There is some evidence that this occurs in several industries, but the question of how important this type of entrants across industries remains, to a large extent, unanswered. In what follows, we highlight some avenues for future research in the area.

Industry Characteristics

The models reviewed above indicate some evidence that most spin-outs occur in the beginning of an industry's lifecycle. However, in industries with rapid technological change, this appears to continue up to the middle point of the lifecycle. In recent research, Agarwal, Sarkar and Echambadi (2002) provide evidence that the stages of the industry life cycle condition certain relationships that were previously thought to be universalistic, such as the relationship between survival and firm age and size. In the same vein, future research could focus on whether spin-outs are more likely to enter in certain periods more than others, and the underlying reasons for this relationship. Further, it may be that spin-out performance is also a function of the industry life cycle.

In addition to examining temporal patterns of spin-out generation and performance, we would benefit from additional research on whether there exist cross-sectional differences in industries in their propensity to create and foster entrepreneurial start-ups by employees. In some industries, firms follow the spin-out generating formula, while in others, firms follow the no spin-out generating formula. An example of the former is consulting firms, while an example of the latter is pharmaceutical firms. Are there features of the industry that give rise to the importance of following a particular design? Further, there is some evidence that industries that are rich in tacit knowledge (e.g. consulting, law, high tech industries) are more prone to employee entrepreneurship. Given the empirical context of the above papers, there is a need for a systematic examination of how industry characteristics affect spin-outs. Another one question worth exploring is the extent to which tacit knowledge versus codified knowledge plays a role in determining entrepreneurship.

Firm Characteristics

The incipient research in the area indicates that firms choose not to introduce new products because of the lock-in effect of technology and/or markets. In the hard drive industry, all but one of the new diameters was introduced by an entrant, usually a spin-out, though the technology was developed by an incumbent. This suggests that there are high costs of switching to new products, whether due to cannibalism of older products, the cost of retraining a sales force or the inherent cost of retooling a manufacturing plant. A detailed examination of the characteristics of incumbents vs. spin-out firm will help shed light on the effect of factors other than technological expertise on the probability of entering new market niches, exploiting technological opportunities, and survival. Thus, firm characteristics other than knowledge related ones may explain spin-out generation and performance remains an unexplored area of interest.

In addition to the inter-industry variation in the propensity of spin-out generation discussed above, there is a need for examining intra-industry variations that relate to firm structure. The semi-conductor industry is a prime example, where Fairchild followed the spin-out generating formula, while its own spin-out, Intel, followed the no spin-out generating formula. A potential avenue of research is the comparison of larger, more diversified firms, and smaller more entrepreneurial firms in their propensity of spin-out generation. This leads to the question of what parent firm structures allow for more spin-out generation, and the benefits and costs to both the parent firm, and economic welfare at large, of the different firm structures as it relates to

employee entrepreneurship, as well as what the implications are of firm level heterogeneity on spin-out generation and performance.

While the above questions addressed issues related to firm characteristics, similar questions may also be raised regarding firm strategies, and how they may adapt over time. For instance, what are the competitive dynamics implications (parent-spin-out relationships) *after* the birth of the firm? Extant research has focused on the parent spin-out linkages only prior to the start-up of the spin-out; yet given that both firms operate in the same industry, there is a need to examine the implications of parent/spin-out actions and reactions to each other's strategies. To some degree, these competitive dynamics may be shaped by whether spin-outs compete directly with parents, or occupy positions in nearby product spaces. Future research could examine the implications of such competition for parent/spin-out performance. Christensen (1997) recommended that firms can retard spin-out formation by creating separate business units to target emerging segments. It would be interesting to know the benefits and costs of continued parental involvement for such "spin-offs" or incumbent backed ventures, vis a vis spin-out firms in a manner that extends the work done by Agarwal et al. (2004).

Employee and Founder Team Characteristics

Finally, in addition to industry and firm level characteristics, there is a need for examining employee and founder team characteristics that are related to both spin-out generation and performance. At the broadest level, it would be worthwhile to examine whether the models described in Section 2 above for the general phenomena of undertaking the entrepreneurial act hold more for employee entrepreneurs than other individuals. Intricate and prior knowledge of the industry may loosen some of the liquidity constraints faced by aspiring entrepreneurs, and the work by Gompers et al. (2004) certainly highlights the importance of prior experience in attracting superior venture capital access. In the same vein, more research is needed to tease out whether aspiring entrepreneurs *select* to apprentice, or whether employees develop an entrepreneurial desire only after working with an incumbent firm for a period of time. Thus, while opportunity recognition is critical to the act of entrepreneurship, it may be that employees differ either in their intrinsic characteristics before working with the firm, or develop entrepreneurial motivation only after tenure at the incumbent firm.

Further, the effect of networks and the choice of founding teams in a start-up are important unresolved issues related to spin-outs. How do aspiring entrepreneurial employees search in their locus of networks to choose their founding team partners, or charter employees, and how do these search criteria relate to the functional domains of expertise, prior experience, and

future prospects? These issues are of interest both in the formation of the spin-out firm, and for its continued development and performance. Further, how do founding team dynamics impact the generation and performance of the spin-out firm? Do these dynamics differ among founding teams that have a higher density of prior industry experience, versus founding teams that have fewer members with prior industry experience? We would benefit from a research agenda that systematically examines these issues to the extent that founders enabled or constrained by their experience with the parent firm, particularly in terms of non-technologically related expertise.

CONCLUSION

Entrepreneurs have been an important feature in economics from the beginning. Recent work has shown that entrepreneurs are an important factor in determining savings rates, wealth accumulation, and the distribution of wealth. Savings and access to capital are important in determining entrepreneurial activity. But why do individuals undertake entrepreneurial activity, given the evidence of little monetary benefit? This article focuses on spin-outs and their characteristics for an answer. One proposed reason has been the ability to minimize the frustration faced by some employees when their employer chooses not to develop one of their ideas. Another possible reason is that some individuals have more entrepreneurial interest and choose to work at firms that will help to encourage such behavior. While current research in the area has not categorically resolved the underlying mechanisms, there is evidence that employee entrepreneurs represent an important source of knowledge transfer; spin-outs inherit from their parents and this has implications for their future success. We also highlight issues related to parent firm strategies, and in particular, discuss the literature on what a firm can do to prevent creating its own competition.

The review of the current literature also indicates that there is much need for future research in the area, so that we can better understand, industry, firm and individual related characteristics that impact the generation and performance of spin-out firms. We hope to have excited interest in the area.

NOTES

[1]However, the reader should note that in Campbell's chapter that both Hamilton's and Moskowitz and Vissing-Jorgensen's results are called into question since these studies do not have a strong counterfactual group.

[2] Note that in other articles, the term, spin-offs, is used to describe firms started by employees who left firms within the same industry. However, in the finance literature, spin-offs is typically used to describe a firm that is created when the parent firm sells a division. In order to avoid any confusion, we use the term spin-out.

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6. Determinants of Scientist Entrepreneurship: An Integrative Research Agenda

INTRODUCTION

The purpose of this paper is to synthesize the literature to guide an incipient research focusing on the links between innovation, universities, regions, individual entrepreneurs and public policy to discuss implications for scientist entrepreneurship. This literature review identifies that there has been no single literature dealing with this issue. Rather, distinct literatures have emerged which have provided considerable insights. However, most of the insights have been restricted to the one dimension, or unit of analysis, being analyzed, rather than the nexus of multiple levels of analysis.

As not much is known about the cognitive process leading scientists to pursue entrepreneurial paths, research in this area is sorely needed. In an effort to gain new insights into what shapes the career paths of scientists to become entrepreneurs and commercialize their research, a research agenda probing the formation and evolution of scientist career trajectories is put forward. A central element of this research agenda is to learn about what factors shape the career decisions of scientists which involve the decision to become an entrepreneur.

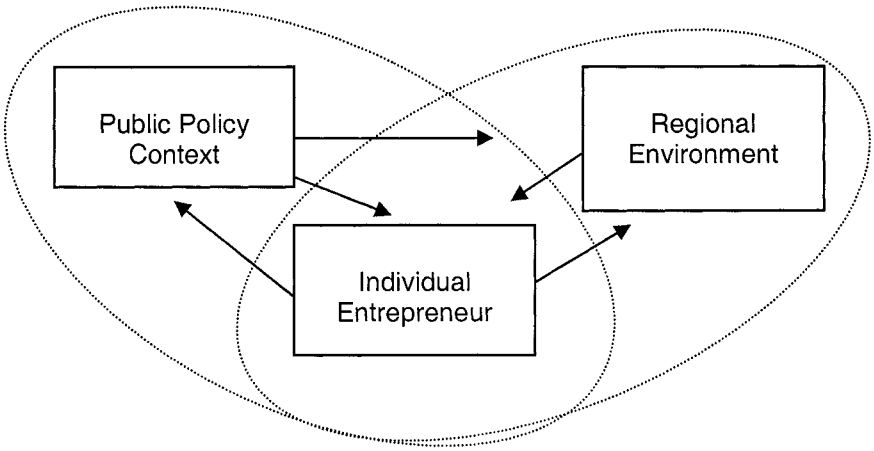
This research can be informed by four literature streams that have developed parallel to each other but need to be integrated so that significant influences on the entrepreneurial choice of university scientists can be addressed in a holistic manner. These four literature streams focus on four distinct units of analysis: the firm, the individual entrepreneur, the region and the public policy context. A research agenda is proposed for examining scientist entrepreneurship based on the integration of these four literature streams while taking into account the four types of entrepreneurship market failures: networks, knowledge, learning and demonstration.

An analytical approach common among most studies examining the impact of universities on entrepreneurship is to analyze the influence of

various university programs, such as incubators or technology transfer offices on firms that already exist. Yet, a different type of impact from the programs may arise by inducing scientists and engineers to become entrepreneurs who otherwise would never have become involved in commercialization. For example, *Nature Magazine* reports, "Jeff Alberts, a psychology professor, was trained as a scientist, not an entrepreneur. But with the help of government funding, he turned his knack for designing animal cages and other experimental apparatus into a successful small business. Alberts made the move in the 1980s after working on part of a Soviet space project that involved developmental biology experiments using rats. The only problem was that Alberts knew little about business, so he turned to the recently established SBIR programme for help in getting his company off the ground."[1]

Such impacts on the career trajectories of scientists could be an important impact of public policy, because recent studies (Audretsch, forthcoming; Audretsch, Keilbach and Lehmann, forthcoming; Audretsch and Keilbach, 2003; Acs, Audretsch and Carlsson, 2003) have identified entrepreneurship and new-firm start-ups as a key mechanism that reduces the filter impeding knowledge spillovers. Because entrepreneurship can serve as an important mechanism facilitating knowledge spillovers, policies that induce scientists to become entrepreneurs may have a significant impact on economic growth.

FIGURE 6-1 *The public policy-individual entrepreneur-regional environment nexus.*



Source: Adapted from Feldman et. al., 2001

As the following sections show, there has been no singular literature examining the linkages between public policy, individual entrepreneur and regional environment. For example, while there is a compelling literature

stream in psychology analyzing the cognitive process by which individuals make the decision to become an entrepreneur; this has never been linked, at least explicitly, to the public policy context. Similarly, while there is a growing literature examining the impact of universities and university research on innovation, most of the studies focus on firms but not necessarily on the decision by scientists and engineers to start a firm (Shane and Stuart, 2002; Mowery, 1999; Audretsch & Feldman, 1996 & Acs, Audretsch and Feldman, 1992).

The paper will first introduce some of the main research questions, methodologies, and insights gained in the distinct literature streams focusing on innovation from the perspective of the firm, the individual entrepreneur, the region, and public policy. Based on the void that is found in the nexus among these four research perspectives, four main research questions are then introduced that explicitly focus on the factors shaping the decision by scientists to alter their career trajectories and become an entrepreneur, and the role that universities, and public policy at the regional and national level can play. In the last section, a summary and conclusions are provided. In particular, the importance of understanding the impact of the policy and university context in altering the career trajectory decision of scientists is emphasized.

LITERATURE STREAMS INFORMING KNOWLEDGE CREATION AND INNOVATION

The Firm—Innovation Relationship

The question of why some firms generate more innovative activity than others has been the subject of considerable research in economics. The answer to the question is just as important to public policy and the strategic management of firms as it is to understanding the economic process of innovation and technological change. The conventional approach to analyzing innovative output at the microeconomic level has been at the level of the firm. The fundamental questions addressed in this literature are *"What do firms do to generate innovative output?"* and *"Why are some firms more innovative than others?"*

Griliches Notion of Knowledge Production Function

In what Zvi Griliches (1979) formalized as the *model of the knowledge production function*, the firm is assumed to be exogenous. The strategies and investments of the firm are then modelled as choice variables

generating innovative activity, and are therefore modelled as being endogenous. Thus, the model of the firm knowledge production function starts with an exogenously given firm and examines which types of strategies and investments generate the greatest amount of innovative output. Griliches, in fact, suggested that it was investments in knowledge inputs that would generate the greatest yield in terms of innovative output.

Subsequent to Griliches' seminal article, a massive series of studies empirically testing the knowledge production function emerged. Numerous measurement issues confronted this research agenda. Innovative output had to be measured and knowledge inputs had to operationalized. While the economic concept of innovative activity does not lend itself to exact measurement (Griliches, 1990), scholars developed measures such as the number of patented inventions, new product introduction, share of sales accounted for by new products, productivity growth and export performance as proxies for innovative output. Developing measures that reflected investments in knowledge inputs by the firm proved equally as challenging. Still, a plethora of studies (Cohen and Klepper, 1992a and 1992b, Griliches, 1984), developed proxies of firm-specific investments in new economic knowledge in the form of expenditures on R&D and human capital as key inputs that yield a high innovative output.

Cohen and Levinthal Absorptive Capacity Argument

The literature empirically testing the model of the knowledge production function generated a series of econometrically robust results substantiating Griliches' view that firm investments in knowledge inputs were required to produce innovative output. Cohen and Levinthal (1989) provided an even more compelling interpretation of the empirical link between firm-specific investments in knowledge and innovative output. According to Cohen and Levinthal, by developing the capacity to adapt new technology and ideas developed in other firms, firm-specific investments in knowledge such as R&D provided the capacity to absorb external knowledge. This key insight implied that by investing in R&D, firms could develop the absorptive capacity to appropriate at least some of the returns accruing to investments in new knowledge made external to the firm. This insight only strengthened the conclusion that the empirical evidence linking firm-specific investments in new knowledge to innovative output verified the assumptions underlying the model of the knowledge production function.

The Individual Entrepreneur—Innovation Relationship

Audretsch (1995) challenged the assumption underlying the knowledge production model of firm innovation by shifting the unit of analysis away from the firm to the individual. In this view, an individual, such as a scientist, engineer or other knowledge worker is assumed to be endowed with a certain stock of knowledge. She is then confronted with the choice of how best to appropriate the economic return from that knowledge. Thus, just as Cohen and Levin (1989) identified the appropriability question confronting the firm, there is an analogous appropriability question confronting the individual knowledge worker.

Under the assumption of no uncertainty about knowledge, no asymmetries involved in the expected value of that knowledge, and no costs of transacting that knowledge across economic agents, a convergence in the economic valuation of any new idea would be expected to occur between the individual and an incumbent firm.

However, as Arrow (1962) pointed out, new economic knowledge is inherently uncertain, characterized by significant asymmetries and is costly to transact across economic agents. This can lead to divergences in the valuation of new ideas between the individual economic agent and the decision-making hierarchy of an incumbent firm. Convergence in valuation would provide little incentive to start a new firm. If the scientist or engineer can pursue the new idea within the organizational structure of an incumbent firm and appropriate roughly the expected value of her knowledge, she has no reason to leave the firm. On the other hand, if she places a greater value on her ideas than does the decision-making bureaucracy of the incumbent firm, she has an incentive to start a new firm to appropriate the value of her knowledge.

As Audretsch and Stephan (1996) point out, the start-up of a new firm can actually provide the conduit for a knowledge spill over. In this spill over mechanism, the assumption underlying the knowledge production function is actually reversed. The knowledge is exogenous and embodied in an economic agent. The firm is then created endogenously in the worker's effort to appropriate the value of her knowledge through innovative activity.

Thus, entrepreneurship can be an important mechanism by which knowledge spills over and becomes commercialized. Within the economics literature, the prevalent theoretical framework has been the general model of income choice. The model of income choice dates back at least to Knight (1921), but was more recently extended and updated by Lucas (1978), Kihlstrom and Laffont (1979), Holmes and Schmidt (1990) and Jovanovic (1994), and addresses the fundamental question, *"Why and how do individual economic agents decide to start a new firm?"*. Thus, the unit of analysis is at the level of the individual economic agent. In its most basic rendition, individuals are confronted with a choice of earning their income either from

wages earned through employment in an incumbent enterprise or else from profits accrued by starting a new firm. The essence of the income choice is made by comparing the wage an individual expects to earn through employment, W*, with the profits that are expected to accrue from a new-firm start-up, P*. Thus, the probability of starting a new firm, Pr(s), can be represented as:

$$Pr(s) = f(P^* - W^*) \tag{1}$$

The model of income choice has been extended by Kihlstrom and Laffont (1979) to incorporate aversion to risk, by Layear (2002) to include characteristics of human capital, and by Lucas (1978) and Jovanovic (1994) to explain why firms of varying size exist, and has served as the basis for empirical studies of the decision to start a new firm in a broad range of countries, time periods and contexts (Audretsch, 2003).

This view of entrepreneurship corresponds to that in a different scholarly tradition- management- provided by Gartner and Carter (2003), "Entrepreneurial behaviour involves the activities of individuals who are associated with creating new organizations rather than the activities of individuals who are involved with maintaining or changing the operations of on-going established organizations."

Both the field of management and psychology have provided insights into the decision process leading individuals to start a new firm. This research trajectory focuses on the emergence and evolution of entrepreneurial cognition. Stevenson and Jarillo (1990) assume that entrepreneurship is an orientation towards opportunity recognition. Central to this research agenda are the questions, *"How do entrepreneurs perceive opportunities and how do these opportunities manifest themselves as being credible versus being an illusion?"* Kruger (2003) examines the nature of entrepreneurial thinking and the cognitive process associated with opportunity identification and the decision to undertake entrepreneurial action. The focal point of this research is on the cognitive process identifying the entrepreneurial opportunity along with the decision to start a new firm. Thus, a perceived opportunity and intent to pursue that opportunity are the necessary and sufficient conditions for entrepreneurial activity to take place. The perception of an opportunity is shaped by a sense of the anticipated rewards accruing from and costs of becoming an entrepreneur. Some of the research focuses on the role of personal attitudes and characteristics, such as self efficacy (the individual's sense of competence), collective efficacy, and social norms. Shane (2000) has identified how prior experience and the ability to apply specific skills influence the perception of future opportunities.

The concept of the entrepreneurial decision resulting from the cognitive processes of opportunity recognition and ensuing action is introduced by Shane and Eckhardt (2003) and Shane and Venkataraman (2001). They suggest that an equilibrium view of entrepreneurship stems from the assumption of perfect information. By contrast, imperfect information generates divergences in perceived opportunities across different people. The sources of heterogeneity across individuals include different access to information, as well cognitive abilities, psychological differences, and access to financial and social capital.

One of the best data sources available to analyze the cognitive process triggering the entrepreneurial decision is provided by the Panel Study of Entrepreneurial Dynamics (PSED), which consists of a longitudinal survey study on 830 individuals that were identified while they were in the process of starting a new business. The unique feature of the data base is that it provides information on how the entrepreneurial opportunity and action was conceived and operationalized (Gartner and Carter, 2003). Kim, Aldrich and Keister (2003) use the PSED to test the theory that access to resources, in the form of financial resources, such as household income and wealth, and human capital, in the form of education, prior work experience, entrepreneurial experience, and influence from family and friends, affect the decision to become an entrepreneur.

As the Kim, Aldrich and Keister (2003) paper suggests, the external environment has been found to strongly influence the entrepreneurial decision. The greatest focus of research has been on the influence of networks on the cognitive process involving entrepreneurship. Thornton and Flynn (2003) argue that geographic proximity leads to networking, which both creates opportunities as well as the capacity to recognize and act on those opportunities. They suggest that networks in which trust is fostered involve a context facilitating the transmission of tacit knowledge. In comparing Route 128 around Boston with Silicon Valley, Saxenian (1994) documented how entrepreneurial advantages are based on differences in network structures and social capital.

Research has considered both the formation as well as the impact of networks on entrepreneurship. Hoang and Antoncic (2001) characterize research as systematically focusing on network content, network governance and network structure. Thus, there is considerable evidence and theory suggesting that external linkages and influences will shape the context of the entrepreneurial decision made by the individual.

Accordingly, there is a solid research tradition focusing on the decision confronting individuals to start a firm. Theory and empirical evidence provide compelling reasons to conclude that both characteristics specific to the individual as well as context external to the individual help shape the cognitive processes guiding the entrepreneurial decision.

The Region—Innovation Relationship

Recognition of the role that firm-specific knowledge investments could play in accessing and absorbing external knowledge, and therefore enhancing the innovative output of the firm, triggered an explosion of studies focusing on potential sources of knowledge that are external to the firm. Some studies examined the role of licensing, cooperative agreements and strategic partnerships, all of which involve a formal agreement and a market transaction for the sale of knowledge. Thus, these all represent mechanisms by which a firm can access knowledge produced by another firm. As Cohen and Levinthal (1989) emphasized, presumably internal investments in knowledge are a prerequisite for absorbing such external knowledge, even if can be accessed.

A different research trajectory focused on flows of knowledge across firms where no market transaction or formal agreement occurred, or what has become known as knowledge spillovers. The distinction between knowledge spillovers and technology transfer is that in the latter a market transaction occurs, whereas in the case of spillovers the benefits are accrued without an economic transaction.

While Krugman (1991) and others certainly did not dispute the existence or importance of knowledge spillovers, they contested the claim that knowledge spillovers should be geographically bounded. Their point was that when the marginal cost of transmitting information across geographic space approaches zero, there is no reason to think that the transmission of knowledge across geographic space should stop simply because it reaches the political border of a city, state, or country.

However, von Hipple (1994) explained how knowledge is distinct from information and requires geographic proximity in transmitting ideas that are highly dependent upon their context, inherently tacit and have a high degree of uncertainty. This followed from Arrow (1962), who distinguished economic knowledge from other economic factors as being inherently non-rival in nature, so that knowledge developed for any particular application can easily spill over to generate economic value in very different applications. As Glaeser, Kallal, Scheinkman and Shleifer (1992, p. 1126) have observed, "Intellectual breakthroughs must cross hallways and streets more easily than oceans and continents."

Thus, a distinct research trajectory developed in the late 1980s and early 1990s trying to identify the impact of location on the innovative output of firms. These studies addressed the question *"Holding firm-specific knowledge inputs constant, is the innovative output greater if the firm is located in a region with high investments in knowledge?"* The answer to this question was provided in a series of studies shifting the unit of observation for

testing the model of the knowledge production function from the firm to a spatial unit of observation, such as a city, region or state.

Studies identifying both the extent but also the localization of knowledge spillovers were also based on the model of the knowledge production function. Jaffe (1989) modified the knowledge production function approach to a model specified for spatial and product dimensions:

$$I_{si} = IRD^{\beta_1} * UR_{si}^{\beta_2} * (UR_{si} * GC_{si}^{\beta_3}) * \varepsilon_{si} \tag{2}$$

Where I is innovative output, IRD is private corporate expenditures on R&D, UR is the research expenditures undertaken at universities, and GC measures the geographic coincidence of university and corporate research. The unit of observation for estimation was at the spatial level, s, a state, and industry level i. Estimation of equation (1) essentially shifted the model of the knowledge production function from the unit of observation of a firm to that of a geographic unit.

Compelling and consistent evidence provided first by Jaffe (1989), but later confirmed by Acs, Audretsch and Feldman (1991 and 1994), Feldman (1994), Jaffe, Trajtenberg and Henderson (1993), and Audretsch and Feldman (1996) suggested that, in fact, the presence of external knowledge sources in geographically bounded regions increased the innovative output of firms located in those regions. Thus, there was clear and compelling econometric evidence suggesting that external investments in geographically bounded regions would yield an increased level of innovative output by the firms located in that region as a result of knowledge spillovers.

The new findings from the studies on spatially bounded knowledge spillovers, in two main ways, supported the knowledge production model of firm innovation. First, the firms were still assumed to be exogenous, and second, knowledge inputs were still found to be important determinants of innovative output. The main distinction lies in the unit of analysis. Because of knowledge spillovers, the link between knowledge inputs and firm innovative output was found to be more important for spatial units of observation than at the level of the firm.

Public Policy—Innovation Relationship

A different strand of literature has focused on the impact of public policies and the role of universities in influencing the innovative output of firms. This literature typically addresses the question, *"What is the impact of the institutions/policy on innovative output?"* These studies generally focus

on the effect of universities/policy on performance measures at the level of the firm, industry or region. Performance measures include indicators of growth, employment change, patents, and productivity change (Rosenberg and Nelson, 1994; Jaffe, 1989; Abramson et al., 1997).

One approach has tried to link universities and/or public policy to performance at the regional level. For example, Florida (1999) proposed the hypothesis that the role of universities as a source for innovative activity in regions has increased over time. His methodology consists of measures such as the number of university-industry research centres, expenditures undertaken by these joint research centres, the share of academic research accounted for by industry funding, the number of faculty and graduate students involved in these joint research centres, and academic patenting. The trend of these indicators leads him to conclude that the role of the university as a source of economic growth has shifted away from knowledge transfer to knowledge creation. However, the absorptive capacity of the region also plays an important role in determining the impact of the university. While Feldman and Desrochers (2003) find less enthusiastic results for Johns Hopkins, the approach is not dissimilar in that they link university research activities to regional economic development.

An important strand of literature (Mowery, 1997; 1999; Mowery and Ziedonis, 2000 and forthcoming; Mowery, Sampat and Ziedonis, 2001) has identified the impact of the Bayh-Dole Act in generating university-based entrepreneurship. These studies generally find that enactment of Bayh-Dole has greatly increased the number of scientist based start-ups from universities.

Other studies (Wessner, Binks and Lockett, 2003; Wessner, 2003; Feldman and Kelley, 2002; Lerner, 1999, Di Gregorio and Shane, 2002; Lockett, Wright and Franklin, 2003; Nerkar and Shane, 2003 and Shane and Stuart, 2001) link universities or public policy to firm performance. These studies have generally found that both universities and national public policies, such as the ATP and SBIR enhance firm performance. Lerner (1999), for example, documented how the SBIR has increased the growth rate of firms. Other studies have focused on technology transfer as the measure of performance from universities. These studies generally analyze the number of licenses granted to firms as a measure of commercial success.

Only a handful of studies have examined the impact of public policy and/or universities on the career trajectories of scientists and engineers. Early studies by Audretsch and Stephan (1996) and Zucker, Darby and Brewer (1998) focusing on university-scientist linkages, led to subsequent research by Audretsch, Weigand and Weigand (2002) who examined how the Small Business Innovation Research Program (SBIR) impacted the career trajectory of scientists in making a decision to become an entrepreneur. Still, the impact of regional public policy and universities on the career trajectory and decision to become an entrepreneur remains relatively unknown.

MOVING TOWARDS A HOLISTIC APPROACH

The four separate strands of literature focusing on technological innovation each make a distinct contribution to understanding the determinants of firm innovation. In particular, these different approaches to innovation, suggest that four key units of observation are crucial in understanding the innovation process – the firm, the region, the individual and the institutional/ public policy context.

New-firm start-ups are important to innovation, because they embody a mechanism facilitating the spill over of knowledge that was produced with one intended application in an incumbent corporation or university laboratory, but is actually commercialized through the process of starting a new and different firm. Without new-firm start-ups, there would be fewer spillovers of knowledge and therefore less innovative activity.

The individual matters to innovation, because the individual scientist or engineer is confronted with a career trajectory decision – should she remain in a university laboratory or incumbent corporation, or should she start a new high technology enterprise? If no individual scientist or engineer makes the decision to start a new high technology firm, there will be fewer knowledge spillovers and therefore less innovative activity.

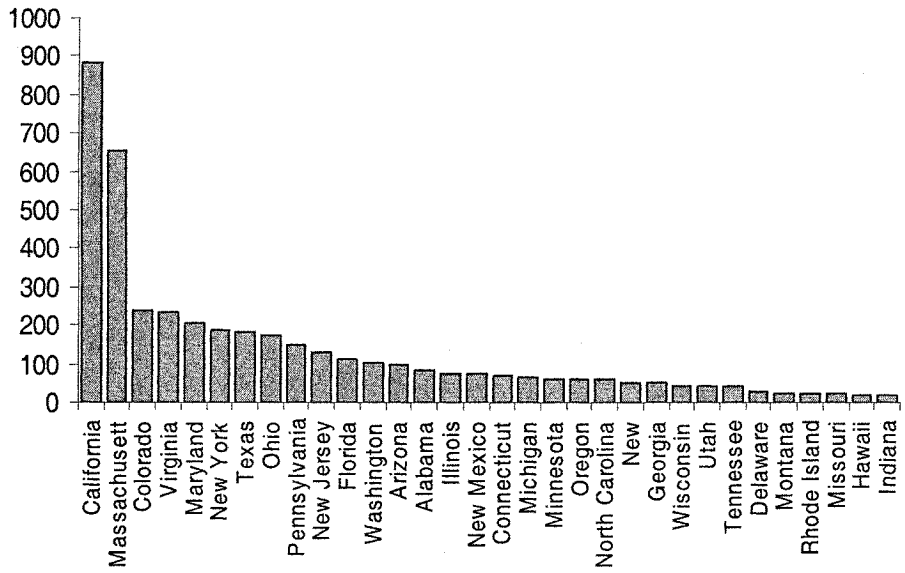
Geography matters because the region provides the spatial platform in which knowledge spillovers are generated, absorbed and ultimately commercially exploited and appropriated. The decision to start a new high technology enterprise is shaped by the presence of knowledge, financial, and other complementary assets that are available in the region.

While scholarship has provided striking insights in each of these research trajectories, the role of public policy in influencing this confluence among the firm, the region/university and the individual remains ambiguous, unclear and largely underdeveloped. This is partially because most of the studies evaluating public policy and universities have tended to focus on the impact of the policy on the performance of either existing firms, or on the entire region. Very little is known about the impact on the cognitive process of the individual scientist or engineer in (re)shaping her career trajectory in making the decision to become an entrepreneur. Yet, as has already been explained in this paper, new-firm start-ups are an important conduit for knowledge spillovers. Research has identified a number of ways that public policy and universities have influenced the performance of existing enterprises. However, not much is known about the manner in which universities and public policies influence the cognitive processes of scientists and engineers at universities in recognizing entrepreneurial opportunities and reaching the decision to become an entrepreneur.

This oversight is particularly striking for public policy, because an implication from the literature on regional agglomerations is that knowledge

spillovers generating new firm start-ups tend to be particularly prevalent in high-technology clusters. It is already well documented that not only does university research, venture capital, scientists and engineers, high-technology firms and start-ups tend to cluster in such spatial agglomerations (Saxenien, 1994), but federal support of innovation, such as the ATP and SBIR, also tends to be spatially concentrated in exactly these areas (Wessner, 2002; Black, 2003).

FIGURE 6-2 *SBIR Program, Total Awards by State, 2000*

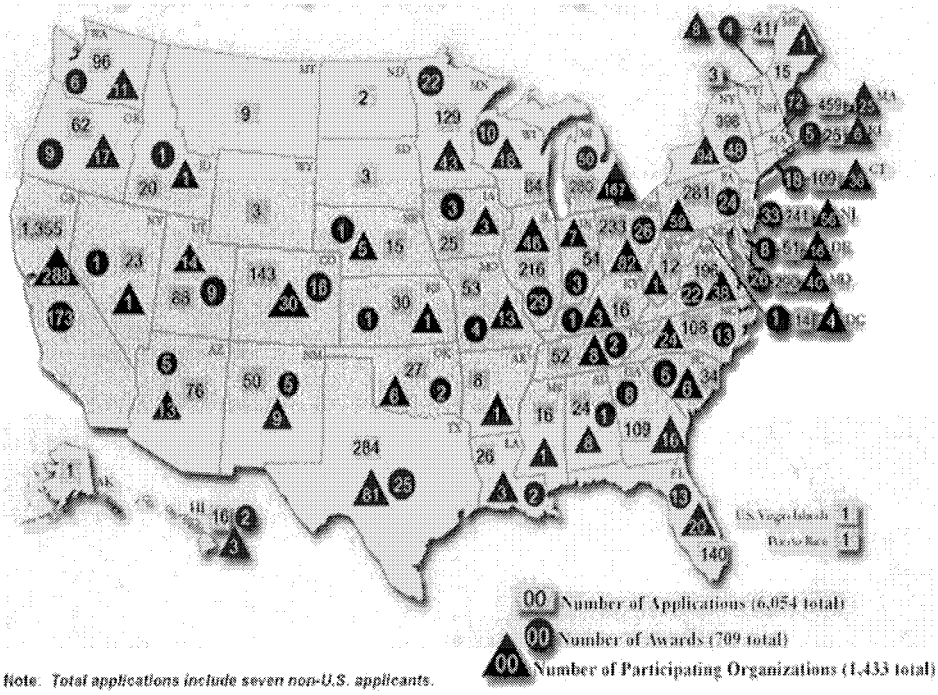


Source: The National Academies, Board on Science, Technology and Economic Policy

The spatial correlation of knowledge assets, high-technology programs and federal programs such as ATP and SBIR suggest that a "winner take all" policy may be emerging across regions. Those regions that have already established a successful high technology cluster are able to generate knowledge spillovers, attract firms, scientists and engineers, as well as draw a high share of federal support for innovation to their regions. By contrast, regions that have been technologically disadvantaged, or have not yet developed knowledge based clusters; tend to experience difficulties in procuring a high share of federal support for innovation. This raises the question about the relative contribution made by public policies at the federal level that have a local impact: Is there impact greater in existing successful

high technology agglomerations, where the technology firms are already established and knowledge spills over without being imbedded by a filter; or would public policy at the federal level have a greater, or at least different, impact in regions that have not yet established viable high technology agglomerations.

FIGURE 6-3 *ATP Applications, Awards and Participants by State, 43 Competitions (1990-September, 2003)*



Source: Advanced Technology Program, National Institute of Standards and Technology

In fact, there are theoretical reasons to conjecture that the contribution of public policy support may actually be greater in regions that already have some of the knowledge and human capital assets, but knowledge spillovers and successful commercialization, along with science-based entrepreneurship is limited as a result of the four fundamental sources of market failure impeding high technology entrepreneurship – network externalities,

knowledge externalities, learning externalities and demonstration externalities.

Network Externalities

Network externalities result from the value of an individual's or firm's capabilities being conditional upon the geographic proximity of complementary firms and individuals. As Saxenien (1995) pointed out, local proximity is essential for accessing these complementary inputs. This makes the value of an entrepreneurial firm greater in the (local) presence of other entrepreneurial firms. The value of any individual's or firm's capabilities is therefore conditional upon the existence of partners in a network. Firms and workers place a greater value on locations within clusters which contain complementary workers and firms than on those outside of clusters. Such market failure can occur where there is a potential for geographic, inter-sectoral linkages, or networks. Thus, this source of market failure involves the geographic context which provides the (potential) platform for interactions and networks.

Knowledge Externalities

The second source of market failure involves knowledge externalities. As Arrow (1962) pointed out, knowledge, which involves new ideas, is inherently a public good, so that its production generates externalities. However, as Porter (2000) identified, local proximity is essential for accessing these knowledge spillovers. This source of market failure involves the units of analysis of the individual scientist and firm, since these generate knowledge. It also involves the unit of analysis of the region because knowledge externalities have been shown to be spatially bounded.

Learning Externalities

The third source of market failure associated with entrepreneurship is that positive economic value for third-party firms and individuals is created even when entrepreneurial firms fail. The high failure rate of new-firm start-ups has been widely documented (Caves, 1998), and the failure rates in knowledge-based activities are especially great. This is not surprising since knowledge activities are associated with a greater degree of uncertainty. However, the failure of a high technology firm does not imply that no value was created by the firm. Ideas created by failed firms and projects often

become integral parts of successful products and projects in other (successful) firms. This unit of observation involves the individual scientist and firm since they are the conduits for learning. Once again, such learning may be greater within a geographically bounded context.

The externalities accruing from failed firms also create a market failure in the valuation of (potential) new enterprises by private investors and policy makers. Whereas the private investor can only appropriate her investment if the particular firm succeeds, a failed firm that generates positive externalities contributes to the success of other third-party firms. The private investor, however, does not appropriate anything from the original investment. Likewise, individual firms and workers would have no incentive to invest in the development of a cluster, which is the creation of other entrepreneurial firms, due to their inability to appropriate returns from such a cluster.

From the public policy perspective, on the other hand, it does not matter which firm succeeds, as long as some firms do, and growth, along with the other benefits accruing from entrepreneurship, is generated for that particular region.

Demonstration Externalities

The fourth source of market failure involves the demonstration effect emanating from high technology entrepreneurial activity. This is particularly valuable in regions where entrepreneurship has been noticeably lacking and where no strong tradition of entrepreneurship exists. Entrepreneurial activity involves not just the firm or the entrepreneurial scientist making the decision to start the firm. Rather, other colleagues will observe the process of opportunity recognition and action in the form of starting a new high technology firm, along with the results accruing from this entrepreneurial activity. The demonstration externality is in the form of learning by third-party individuals that entrepreneurship is a viable alternative to the status quo. As a result of this demonstration effect, others will be induced to also develop entrepreneurial strategies, and perhaps alter their own career trajectories to include an entrepreneurial activity. Thus, there is a strong and compelling positive externality associated with entrepreneurship as a result of the demonstration effect, particularly in regions with no strong entrepreneurial traditions. The demonstration effect focuses primarily on the individual scientist, but is also linked to the post-start-up performance of the firm. We would expect the demonstration effect to be greater within a geographically bounded regional context.

As a result of the market failures inherent in the externalities involved in high technology entrepreneurship – which stem from networks, knowledge,

learning and demonstration – a gap is created in the valuation of entrepreneurial activities between private parties and the local public policy makers. Just as Branscomb and Auerbach (2003) identified the existence of liquidity constraints (Audretsch and Elston, 2002) in the form of what they term as "The Valley of Death" and the "Darwinian Sea", it may be that the financing constraints confronting not just the new and young high technology enterprises but also potential entrepreneurs are even more severe in regions outside of a high technology cluster than for their counterparts located within a high technology cluster.

The role that high-technology entrepreneurship plays in knowledge spillovers, combined with the strong propensity for those knowledge spillovers to be geographically bounded and remain localized, suggests a special focus of public policy on the impact of local institutions, universities and policies on the cognitive process of changing career trajectories and making a decision to become a high technology entrepreneur. By filling the gaps created by the inherent market failure, public policy can create a virtuous entrepreneurial circle, where entrepreneurs become networked and linked to each other, and provide strong role models of high technology entrepreneurship for the local scientific community to emulate.

THE RESEARCH AGENDA

The importance of understanding the impact of public policy on the nexus between the start-up firm, the individual, the university and the region, combined with the absence of research and knowledge regarding how the entrepreneurial decision is made and acted upon in the high technology context of university based research, suggests four main research questions:

Career Trajectory of Scientists & Engineers

What are the career trajectory influences shaping the entrepreneurial decision to start a high technology company in a university context, and what are the key factors motivating the individual scientist and/or engineer to commercialize new technology? What factors, including, but not restricted to ATP and SBIR, but also regional public policies, have influenced and altered the career trajectories of university scientists and shaped their decision to commercialize research in the form of a new firm? Addressing this question will involve linking the units of analysis of individual scientists to the three other units of analysis discussed in this paper – the region, the firm and public policy, because all of these can shape the career trajectories of scientists and engineers.

The Demonstration Effect

To what degree have other scientists altered their career trajectory to include entrepreneurial and commercialization efforts because of the demonstration effect spilling over from colleagues involved in entrepreneurship and commercialization? This research question again involves linking the unit of observation of the individual scientist to the behaviour of scientist entrepreneurs observed within the other three analytical contexts – the firm, the region and public policy.

Network Effects

To what extent are networks critical in fostering academic entrepreneurship and commercialization? To what extent do public policies at the region, state and federal levels facilitate such networks. Are both networks and collaboration important for facilitating entrepreneurship and commercialization? This research question links the unit of observation of regions, or groups of scientific entrepreneurs within a geographic context, to the cognitive decision making process of the individual scientist.

Public Policy Context

In what ways have public policy influenced the entrepreneurial decision process of scientists? This research would link the dimension of the external policy environment and specific incentives to the entrepreneurial behaviour of individual scientists. Questions would be addressed such as what types of entrepreneurship and commercialization policies are being implemented by regions and universities and what impact have they had in generating new technology start-ups?

CONCLUSIONS

This paper was written with the goal of explaining what the academic and other research approaches have learned about the role of universities in the innovative activity of firms. The paper identified four distinct literatures focusing on four distinct units of observation – the firm, the region, the individual entrepreneur, and public policy. To some degrees, each unit of observation has fallen within the research domain of different fields. For example, while the individual entrepreneur has been the focus of research more in the disciplines of psychology and management, research on firm

performance has been of greater concern in economics. Sociology has had a particular interest in the role of regional networks. However, very little research has been done focusing on the nexus between these four units of observation. This has created a significant vacuum for public policy, because the process by which individual scientists start a new technology firm is a vital mechanism for knowledge spillovers. Yet, there is little known about the cognitive process shaping the entrepreneurial decision, and even less known about the influence of the regional and policy context in the making of such an entrepreneurial decision.

This paper has also explained why the policy need to overcome the market failures inherent in entrepreneurship may be particularly acute in less technology developed regions. As a result of the four types of entrepreneurial market failures identified in this paper – networks, knowledge, learning and demonstration – scientists may face greater barriers to entrepreneurship in universities and regions that are not included in high technology clusters than do their counterparts located within high technology agglomerations. This may suggest that the impact and potency of technology and entrepreneurship policies may be spatially dependent, or at least sensitive to location.

In an effort to gain new insights as to how public policy might help to alter the career paths of scientists and engineers to become entrepreneurs and commercialize their research, a research agenda probing the formation and evolution of scientist career trajectories is proposed. A central element of this research agenda is to learn about what factors shape the career decisions of scientists which involve the decision to become an entrepreneur, and the role that the university, along with local and federal policies play and can play.

NOTES

[1]Eugene Russo, Making the Switch from Science to Business, *Nature Magazine*, October 30, 2003, pp. 988-989.

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Factors Affecting Entrepreneurial Activity

LITERATURE REVIEW

David B. Audretsch & Doga K. Erdem

LEVEL OF ANALYSIS: INDIVIDUAL-LEVEL ENTREPRENEUR (COGNITIVE)

Source

"An eclectic Theory of Entrepreneurship: Policies, Institutions and Culture"
Ingrid Verheul, Sander Wennekers, David Audretsch and Roy Thurik
2001

Research Theme

Examines supply and demand-side influences on startup activity.

Methodology

Qualitative Research

Main Findings

Decision to engage in entrepreneurial activity depends on an individual's ability to identify opportunities, amass essential resources and demonstrate the necessary managerial capability, and know-how to adapt to market demand. While the supply side of entrepreneurship addresses the impact on startup activity of demographic composition of the population and resources available to individuals and their abilities and personal attributes; demand side of entrepreneurship focuses on entrepreneurial opportunities created by market demand for goods and services and as such focuses on the impact of economic development, globalization and technological development on entrepreneurial activity. Government intervention through macro economic and input related policies is fundamental to fostering demand and supply side of entrepreneurship.

Source

"Cognitive Psychology of Entrepreneurship," Norris F. Krueger, Jr., 2003

Research Theme

If we assume that entrepreneurship is an orientation toward seeing opportunities (**Stevenson and Jarillo, 1990**) then how does entrepreneurial cognition emerge and evolve? How do entrepreneurs perceive opportunities and how do these opportunities manifest themselves as credible? Author examines the nature of entrepreneurial thinking and cognitive process associated w/ seeing and acting upon opportunities. He examines whether entrepreneurs perceive and act upon opportunities or construct a set of conditions into a credible opportunity.

Methodology

Qualitative Research

Main Findings

There must be perceived opportunity and intentions toward pursuing that opportunity for entrepreneurial behavior to take place. Perception of opportunity depends on a strong sense of rewards and costs of a given entrepreneurial decision. No matter how

desirable a venture might appear, if the decision maker believes starting a business is completely infeasible, he will deter a decision to launch that venture. Organizations should facilitate the development of a cognitive infrastructure that promotes entrepreneurial thinking which requires addressing conditions that influence entrepreneurial intentions: personal attitudes such as self efficacy (individual's sense of competence), collective efficacy (an individual's sense of the organization's competence), and social norms. Prior experience (**Shane, 2000**) and ability to apply specific skills influence perception of future opportunities.

Source

Entrepreneurship, Networks and Geographies
Patricia H. Thornton and Katherine H. Flynn
2003

Research Theme

Examines the impact of networks and geography on entrepreneurship. Argues that geographical proximity leads to networking which creates opportunities for entrepreneurial undertaking. Networks in which trust is fostered are settings where tacit knowledge is transmitted easily, which is fundamental to reducing the uncertainty of innovation.

Methodlogy

N/A

Main Findings

Regions present entrepreneurial advantages based on differences in their network structures and cultures (**Saxenian, 1994**). Network structures, which are a benefit of proximity, are significant b/c they help potential entrepreneurs successfully identify and act upon credible opportunities, quickly transmit knowledge, obtain funding and foster the learning of entrepreneurship. Firms cluster for a variety of reasons including the need to mitigate the uncertainty of innovation (**Feldman, 1993**), realize economies of scale by locating where other firms are (**Krugman, 1991**), benefit from local know-how (**Sorenson and Audia, 2000**) and resources (**Stuart and Sorenson, 1999**) and through the work of entrepreneurs in the form of demonstration effect. Entrepreneurs locate their businesses in a region and adapt to specifics of that region. As their businesses grow, entrepreneurs create resources (capital, network etc.) to support them and draw human capital to the region. Location of the research university is fundamental to regional infrastructure since it is a source of knowledge, innovation and talent. (**also see Florida and Cohen, 1999**).

Source

"The Individual-Opportunity Nexus"
Scott Shane and Jonathan Eckhardt
2003

Research Theme

Examine the equilibrium and disequilibrium approaches to entrepreneurship and explain why entrepreneurship needs to be examined through the latter framework. Discuss the process of opportunity discovery and exploitation.

Also see **Shane and Venkataraman, 2001**

Methodology

N/A

Main Findings

Equilibrium perspective of entrepreneurship assumes perfect information (belief that prices accurately reflect present and future needs) and therefore depends on differences among individuals rather than differences in the information they possess. However, for entrepreneurial opportunities to exist, people should fail to agree on the value of resources which suggests that prices are an incomplete indicator of credible opportunities. Since prices don't provide info on what future demands will be, entrepreneurship is a process of incorporating info not reflected in prices. Opportunities manifest themselves in different ways including changes in different parts of the value chain, by the source of opportunities, and by actors that generate the change. Some people identify opportunities others can't due to variations in individuals' cognitive schema & variation across people in access to information. Individuals' ability to act upon opportunities also depends on various factors including informational advantages, cognitive abilities, psychological differences, and availability of financial and social capital.

Source

"Entrepreneurial Behavior and Firm Organizing Processes"
William Gartner and Nancy M. Carter
2003

Research Theme

Define the scope and boundaries of entrepreneurial behavior, examine why nascent entrepreneurs engage in different entrepreneurial activities then established new businesses and discuss the outcomes of entrepreneurial behavior.

Methodology

Panel Study of Entrepreneurial Dynamics (PSED)-longitudinal survey study on 830 individuals that were identified while they were in the process of starting new businesses. Offers information on how entrepreneurial behavior was conceptualized and operationalized.

Main Findings

Entrepreneurial behavior is an individual level phenomenon which occurs over time (process) and leads to organization formation (also see **Lumpkin and Dess, 1996**). Organization formation is viewed as a set of entrepreneurial behaviors involved w/ setting up business operations. Nascent entrepreneurs who are able to successfully start a new business engage in activities that make their businesses more visible to others (Also see

Delmar and Shane, 2002). It is possible to identify how nascent entrepreneurs concentrate their activities at founding by examining the extent to which they analyze their external environment and intrude into it for a better understanding of conditions surrounding them. Opportunities are enacted (rather than discovered) in that they are seen to emerge out of the imagination of individuals by their actions and interactions w/ others.

Source

"Network-based research in entrepreneurship
A Critical Review"
Ha Hoang and Bostjan Antoncic
Journal of Business Venturing
2003

Research Theme

Examines network-based research in three areas: the content of network relationships (resources exchanged btw actors), governance of these relationships (governance mechanisms coordinating and managing the exchange specifically trust), and network structure (pattern emerging from these cross cutting ties that link actors directly or indirectly to one another). Discusses the process of network development and how it leads to positive entrepreneurial outcomes as well as how entrepreneurial outcomes in turn influence network development.

Methodology

Qualitative Study (review article)

Main Findings

(A) Research on Networks as Independent Variables: 1) *Network Content*: Reliance on networks extends beyond the start-up phase of new venture formation and entails exchange of information, advice and emotional support. Positive assessment based on a firm's network linkages help nascent entrepreneurs obtain legitimacy and may pave way for resource exchanges. Network relationships also signal munificence and induce startup activity. 2) *Network Governance:* Trust between actors is fundamental to network exchange and dense networks underpin trust building 3) *Network Structure*: Strong ties (support acquired through ties that lie within an actor's immediate circle of contacts such parents, friends, family) are predictive of nascent startup activity. Bridging structural holes (absence of ties btw actors) benefits competitiveness as it provides an opportunity to exert influence over those who are "otherwise unconnected to the broader network"(Krackhardt, 1995). **(B) Research on networks as dependent variable**: 1) *Network Content*: Process of new venture formation entails drawing on pre-established ties as well as development of multiplex ties which occurs when business exchanges evolve into social relationships over time. 2) *Network Governance*: Dense ties are thought to reinforce trust building efforts and foster greater tie formation. 3) *Network Structure*: Gender is not a distinguishing factor as far as network characteristics are concerned; however there are differences in network characteristics between entrepreneurs and managers.

Source

Prior Knowledge and the Discovery of Entrepreneurial Opportunities
Scott Shane
Organization Science
2000

Research Theme

Examines the core assumptions of neo-classical economic, psychological and Austrian perspective on entrepreneurship and identifies the implications of the differences btw them. Based on empirical evidence, the author challenges the neo-classical and psychological theories and shows that source of entrepreneurship lies in differences in information about opportunities and that prior information related to a particular opportunity leads to opportunity discovery.

Methodology

Analysis of data from case studies developed through interviews, database and archival information on eight new venture opportunities to exploit a MIT invention. To understand how opportunity discovery materializes in a real world setting, the author investigates the validity of the following 3 propositions: 1) All individuals are not equally likely to recognize a given entrepreneurial opportunity 2) People can and will discover entrepreneurial opportunities without actively searching for them 3) People's prior knowledge enables him/her to discover an opportunity in which to use the new technology (Roberts, 1991)

Main Findings

Neo-classical perspective assumes that every individual can recognize all opportunities and focuses on differences btw individuals rather than differences in their information about opportunities. According to psychological theories, entrepreneurship is a function of individual attributes and psychological traits where focus is on decision to exploit rather than discovery. Austrian theorists, contrary to their neo-classical counterparts, assume people possess idiosyncratic information which leads them to value a given product/service differently and offer different prices to obtain it. The resulting price misalignment generates entrepreneurial profit. From this (disequilibrium) framework, entrepreneurship is a function of information about opportunities rather than human attributes. Accordingly, business opportunities are not obvious to everyone.

Results from the case study examining eight new venture opportunities designed to exploit a single MIT invention suggest that not all people are equally likely to recognize a given opportunity. Second, opportunity discovery is a matter of recognition than search. Third, differences in prior knowledge makes some people better equipped to discover certain opportunities and in this sense opportunity discovery is driven by recognition of knowledge already possessed rather than search for knowledge needed (Kirzner, 1997).

Source

Factors Influencing small business startups: A comparison with previous research
Mazzarol et al.
1999

Research Theme

Examine factors affecting new venture formation and model the impact of certain demographic variables on start-up activity.

Methodology

Testing for the importance of gender, previous government employment, and recent redundancy through an empirical analysis of 93 entrepreneurs in Western Australia consisting of both those who actually set up a new business and those nascent entrepreneurs who abandoned their effort prior to trading.

Main Findings

It is important to examine prospective entrepreneurs rather than existing entrepreneurs per se to gauge how and why individuals embark on startup activity. Evidence suggests that gender, previous gov't employment and recent redundancy serve as barriers to new venture formation. Accordingly, female respondents are less likely than males to engage in venture formation. Low participation rate of women may be explained by sectoral segregation still pervasive in today's society; dual commitments of family and employment facing most women etc. Previous experience in government employment also reduces tendency towards successful venture creation as individuals may not want to forego the financial security of their current job or are bound by the organizational culture and work environment associated w/ public sector employment. As well, respondents who reported recent redundancy are less likely to be successful entrepreneurs. If higher rates of venture formation are to be achieved, it is crucial that policy makers specifically focus on women, the retrenched and public sector employees by helping to prepare and orient them towards self employment.

Source

"Entrepreneurship as Social Construction: A Multi-level Evolutionary Approach"
Howard Aldrich and Martha Martinez
2003

Research Theme

Examines when and why new kinds of organizations emerge and looks at the role of entrepreneurs in constructing new forms. The author identifies four forces inhibiting innovation and discusses how innovation occurs despite thereof. Further, he examines problems confronting nascent entrepreneurs in new populations and discusses specific strategies help them gain (tacit) knowledge and legitimacy. Finally, the author identifies 8 possible relations between organizational populations and focuses on technological innovation as a force mainly responsible for the creation and transformation of new communities.

Methodology

Qualitative Study

Main Findings

Additional info:

4.3% of the population classified as nascent entrepreneurs in a representative sample of 683 Wisconsin residents in the US in 1993. In a nationally representative sample of all adult residents of the US (1997), 3.9% classified as nascent entrepreneurs (Reynolds, 1999).

Nascent entrepreneurs confront 4 impediments to innovative activity. 1) Given the uncertainty of innovation, they pick models to imitate. 2) They face a pressure for obedience w/ existing routines and cultural patterns. 3) Innovators face situations where key constituencies (i.e. resource providers) question their legitimacy. 4) Existing firms tend to assimilate competence enhancing innovations (based on improvements to existing routines) and competence extending innovations (based on extensions of current competencies to complementary domains) that deprive nascent entrepreneurs of sustainable competitive advantage. Innovations occur when entrepreneurs doubt the appropriateness, practicality of current practices, when pressures for obedience lead some to pursue their unique course of action, or when they simply want to explore new ways to perform tasks. Nascent entrepreneurs must develop effective new routines and competencies, create their own social environments and in doing so, engage in activities that make others aware of their existence (obtain legitimacy). There are different strategies that organizations pursue to gain legitimacy such as creation of Inter-organizational ties to companies within the industry, collective interest associations and educational institutions. To survive, new organizations must create a balance btw cooperation and competition. The author identifies 8 possible relations between organizational populations and focuses on technological innovation as a force mainly responsible for the generation of new communities. Accordingly, communities arise from the creation of new populations and/or from new symbiotic* and commensalistic** relations btw existing populations.

*Symbiotic: mutual dependence btw dissimilar units; i.e. venture capitalists make profits by investing in high tech firms thus enabling both populations to grow.

**Commensalistic: populations make similar demands on the environment; i.e. television stations' revenue grew at the expense of radio stations.

LEVEL OF ANALYSIS: FIRM-LEVEL INCLUDING UNIVERSITY START-UPS

Source

Why do some universities generate more startups than others?
Dante Di Gregorio, Scott Shane
2002

Research Theme

Dependent variable: Cross-institution variation in TLO startup rates.

Methodology

The impact of the following four factors (independent variables) is examined:
(1) Availability of venture capital in the university area (2) Commercial orientation of university R&D (3) Intellectual Eminence (4) University policies (equity investments in lieu of patent and licensing costs/inventor share of loyalties/use of incubators/use of internal venture capital funds).

Survey instrument used to gather data on startup activity from 1994-1998 for 116 universities (n=101 universities that are both in AUTM database and responded to the survey). Different databases used to obtain info on the independent variables (i.e. Thomson Financial Services' Venture Economics Database, Gourman Report, online database of US patents etc).

Main Findings

Factors that have significant impact on TLO startup activity:

- Universities' intellectual eminence and licensing policies. More eminent universities generated more patentable IP and more startups to exploit their IP.
- Two sets of university policies: distribution of royalties to inventors and whether the university is permitted to take an equity stake in licensees

Factors that ***don't*** have a significant impact on TLO startup activity:

- The presence of a university affiliated incubator and whether or not the university is permitted to actively make venture capital investments in licensees. Although the study finds that incubators don't significantly impact TLO startup rates, it doesn't determine if incubators influence the success of TLO startups.
- The amount of formal venture capital available in a particular location. Suggests that VCs are late stage investors in university technology.
- Only limited support for an effect of the commercial orientation of university research.

Source

Competitive Advantage of Nations
Michael Porter
1990

Research Theme

Examines the source of competitive advantage at the national and firm level. Author identifies the forces that drive competition in an industry and examines why certain companies in certain nations are capable of continuous innovation. Porter defines these forces as: factor conditions (nation's position in factors of production), demand conditions (bargaining power of buyers), related and supporting industries (bargaining power of suppliers), and firm strategy structure and rivalry (nature of domestic rivalry; the intensity of rivalry among existing competitors and threat of entry by new competitors)

Methodology

Qualitative Research

Main Findings

Productivity is the main source competitiveness at nat'l level and sustained productivity growth relies on the capacity of industries to innovate. Consistent innovation depends on how well forces of cmp'v advantage interact. Companies must have access to talent and demand conditions that provide an earlier signal of buyer needs. Companies must also have domestic rivals who create the pressure to innovate and suppliers that provide cost effective inputs. This model suggests that intense rivalry and competition result from entrepreneurial activity creating new business startups **(Acs et al., 2003)**. IOW, increases in competition at the local level increases entrepreneurship which leads to competitive advantage among regions and nation states at the global level **(P.H. Thornton and K.H. Flynn, 2003)**. Therefore, government should play a supportive role by encouraging change and innovation, and promoting domestic rivalry. Regions are most likely to succeed in industries where these forces are most favorable.

Source

Technology Transfer and Universities' Spin-Out Strategies
Andy Lockett, Mike Wright, and Stephen Franklin
2003

Research Theme

Examines the universities' transfer of technology from the public to the private sector through spinning out of inventions into separate companies. Considers university strategies and policies aimed at promoting the creation of spin-out companies and how they subsequently manage the development of these companies. Studies the extent to which the academic inventor seeks involvement in the commercialization of new technology through the spin-off, the role of expertise and networks in implementing spinning out strategies and sources of opportunity recognition.

Methodology

Analysis of data from a mail survey of technology transfer development officers at 57 British universities. Data gathered on university strategies towards spin-out activity, specific resource base for spinout companies, specific party recognizing the opportunity, role of the academic inventor following the spin-out activity and equity distribution in the new company.

Main Findings

Among the 41 universities that stated they had experience spinning out new companies, 10 indicated that they had secured some sort of private sector funding (termed the V10 sample).

Non-V10 universities are more likely to prefer licensing than spin-out companies as a means of commercially exploiting new technology while V10 universities prefer the spin-out option. V10 universities found to have clearer strategies towards the spinning out of new-technology based companies and the use of surrogate entrepreneurs in this process. Neither V10 nor non-V10 universities have strategies to encourage academics to pursue the management of spin-outs. V10 universities were found to possess a greater expertise and networks to develop a strategy to transfer technology through spin offs and develop initiatives promoting the use of networks in helping out the spin-offs. University commercial companies and the academic inventor appeared more likely to recognize an opportunity than individuals from outside the university. None of the parties (academic inventor, university, or surrogate entrepreneur) were found to hold a dominant equity position in the new spin-out; rather ownership was widely distributed among the parties.

Source

"When Do Startups that Exploit Patented Academic Knowledge Survive?"
Atul Nerkar and Scott Shane
2002

Research Theme

Examines why some spin-out companies survive while others don't. Examines whether or not new firm survival is enhanced by radical technology and broad scope patent protection in concentrated industries.

Methodology

Analysis of data from an empirical test of the survival of 128 new ventures founded to exploit MIT assigned inventions btw 1980 and 1996.

Main Findings

Existing literature suggests that new technology firms are likely to survive if they commercialize radical technologies that can't be imitated at the time of establishment when a firm's marketing and manufacturing assets necessary to exploit the technological opportunity are being developed. That needed assets are controlled by a few large existing firms in a concentrated industry inhibits the survival of new firms. Second, new firms entering a concentrated market have to build up assets on a larger scale to be able to compete w/ established firms whose average size is larger. Third, leading

firms in concentrated markets enjoy cost advantages and market power that threaten the survival rate of new entrants. Fourth, in fear of losing their market position, leading firms might retaliate by undercutting the new firm's patent protection.

Technological radicalness and patent scope increase new firm failure in concentrated markets: 1) Existence of dominant design in the industry may be survival destroying for new entrants 2) Control over radical technology will not support new firm competitiveness if leading firms have a high level of absorptive capacity 3) Introduction of a radical technology would not be survival enhancing in the event of slow market growth 4) Since industries w/ older technologies tend to be more concentrated, introduction of radical technology would not be survival enhancing if the industry were old.

Source

Organizational Endowments and the Performance of University Start-ups
Scott Shane and Toby Stuart
2001

Research Theme

Examines how initial resource endowments and the advantages they offer affect the early-stage performance of university startups.

Methodology

Analysis of archival and interview-based data from 134 high technology firms founded to commercialize MIT assigned inventions from 1980 to 1996. Authors model how resource endowments affect the likelihood of three outcomes: receiving venture capital funding, achieving IPO, and failure rate. The data examines whether company founders had preexisting social relations w/ venture investors at the time of founding, prior industry and startup experience of founders, technology assets of the company at founding, and attributes of the industries that new ventures enter. In particular, the study focuses on whether founder's social capital at the time of founding, by helping to secure venture capital, facilitates new venture performance.

Main Findings

That uncertainty about the future performance and quality of startups, and informational asymmetry elude precise evaluation of new ventures highlights the significance of founders' social capital in the resource acquisition process. The authors posit that new ventures w/ founders that have pre-existing relationships w/ venture investors and/or third parties who are connected to venture investors are more prone to obtain external funding since history of established ties reduces the perceived threat that an actor will behave opportunistically and facilitates exchange by increasing the level of reliability between the parties. Authors find out that the presence of preexisting direct/indirect ties w/ venture investors increase the probability that startups obtain venture funding and reduce the likelihood of failure. As well, presence of venture capital funding has by far the greatest impact on the rate of IPO. Consequently, social capital endowments positively influence the early stage performance of new ventures.

Source

Universities as a Source of Commercial Technology: A Detailed Analysis of University Patenting
Rebecca Handerson, Adam Jaffe and Manuel Trajtenberg
1965–1988
Year of Pub: 1995

Research Theme

Authors analyze university patenting behavior during the 1965-1992 period to better gauge whether university inventions remain more important and more basic than the average invention.

Methodology

Creation and analysis of a database consisting of all patents licensed to universities and a random sample of all US patents granted during 1965-1992 period including a complete set of all patents that cite either of these groups. Authors examine patent citations to capture the technological impact of an invention since "significance of any given invention is evidenced... by its role in... facilitating future inventions".

Main Findings

Increased commercial focus of universities (increasing propensity to patent), enactment of the Bayh-Dole Act that conferred to universities the right to retain rights to inventions resulting from federally funded research, expansion of institutional ability in the form of university technology offices and increased role of private sector funding of university research paved way for increased university patenting starting in the 1980s. University patents were more important and general than commercial patents in 1970s seeing that they were highly cited and cited by more technologically diverse patents. Yet, portion of university patents receiving citations decreased as of late 1980s that by 1990s, there was no significant difference btw the two groups. Consequently, an increase in university patenting may reveal an increase in their "propensity to patent" rather than an increase in the output of "important" inventions. In other words, decrease in average quality of patented inventions may be a function of an increase in many low quality patents.

IMPACT OF POLICY

Source

"Engine or Infrastructure: The University Role in Economic Development"
Richard Florida
1999

Research Theme

Universities function more as an enabling conduit than as a direct means for economic growth. Examines (deepening of) industry-university ties and implications associated w/ it {i.e. trade off btw universities' quest for eminence and pursuit of industry funding; fact that industry funds come w/ too many strings attached as control over publication, or secrecy}.

Methodology

N/A

Main Findings

Rejects David Noble's (1977) thesis that commercial sector disrupts academic research & argues that universities function as engines of economic development (i.e. through cultivating knowledge relevant to commercial R&D, offering the commercial sector talent and technology) Also see **Rosenberg and Nelson (1994), Jaffe (1989), Abramson et al. (1997).**

Indicators used to demonstrate increasing university-industry ties: (1)Carnegie Mellon Survey Study (CMU)

(2)Number of university-industry research centers in the US, (3) expenditure levels of these joint research centers, (4)share of industry funding of academic R&D, (5)number of faculty and graduate students involved in these joint research centers, (6) academic patenting (Association Of University Technology Managers website), amount of royalty income received from licenses issued.

Recent emphasis on role of knowledge as a source of economic growth leading to a shift in university emphasis from knowledge transfer to knowledge creation.

University is necessary but an inadequate condition for regional economic development since there are other factors such as a region's ability to use and absorb the university generated innovations and knowledge that is as much fundamental to regional wealth creation as the universities themselves.

Source

"Research Universities and Local Economic Development: Lessons f/m the History of Johns Hopkins University"
Maryann Feldman and Pierre Desrochers
2003

Research Theme

Examines the importance of institutional factors such as university founding mission, ownership of IP, funding sources, degree of risk aversion for local economic growth by examining how John Hopkins has responded to Post Bayh Dole technology transfer.

Methodology

Largely qualitative

Main Findings

Insert Table 1 at end of page [Indicators used: 1)Total research expenditures 2) # of licenses to industry that are generating income 3) Amount of royalties receives from licenses 4) # of startups formed]

Institutional factors largely worked against Hopkins in so far as its success in generating startup activity was concerned (esp. in relation to universities like Wisconsin, MIT, Stanford, and Colombia). The mindset of original faculty was hostile towards commercializing knowledge in light of general disdain for profit making arrangements, and belief that industry would interfere w/ pursuit of academic science. Therefore, the university was not able to develop an applied orientation in its early years and when it did, failure of earliest startups diluted commitment to change from then on and impeded university technology transfer. Thus, history and institutional context matter in defining university's role in local economic growth.

Source

Rise of the Creative Class
Richard Florida
2002

Research Theme

What should places do to respond to the shift in competitive advantage from mobilization of traditional inputs of production to 'creation of useful new forms of knowledge'?

Methodology

Four factors used to study a region's overall standing in the economy: 1) creative class share of the workforce 2)high tech index {Milken Institute's Tech Pole Index} 3) Innovation {patents per capita} 4)Diversity {Gay Index used to measure a region's receptiveness to different kinds of people & ideas}.

Main Findings

Places should work to attract the creative class since creative folks add economic value through their creativity. Places that offer various lifestyle amenities and where newcomers could fit in quickly, and find opportunities will succeed in attracting and retaining creative class people and generate wealth.

Whereas Washington DC region, Raleigh-Durham Area, Boston and Austin ranked among the large metro areas undergoing substantial economic growth, several small re-

gions were found to have some of the nation's highest creative class concentrations such as Madison, Wisconsin, East Lansing, Michigan.

Source

Policies Promoting Innovation in Small Firms: Evidence from UK and US
Donald Siegel, Charles Wessner, Martin Binks, Andy Lockett
2003

Research Theme

Provides background information on US and UK policies that promote innovation and assist in the development of small firms and provides synopsis of the studies that were presented at a workshop jointly organized by University of Nottingham Institute for Enterprise and Innovation (2000) and U.S. National Academy's division on Science, Technology, and Economic Policy.

Given their fundamental role in promoting technological spillovers, job creation and economic growth, numerous policies have been implemented by US and UK governments designed to promote the formation of new-technology based firms (NTBFs). While US policies focus on providing direct subsidies for projects financed by private firms (ATP), legislative set-asides for innovative and high-technology small businesses (SBIR), and permitting small business and universities to retain title to inventions resulting from federally funded grants (Bayh-Dole Act), UK policies such as University Challenge (UC), Science Enterprise Challenge (SEC) and Higher Education Innovation Fund mainly emphasize the role of higher education in the commercialization of university based research. The authors point out to the recent trend towards closer scrutiny of public investments in R&D and conclude that program evaluation is much more prevalent in the US than in the UK.

Source

Standing on the Shoulders of Midgets: The US Small Business Innovation Research Program (SBIR)
David Audretsch
2001

Research Theme

Discuss the link btw international competitiveness and promotion of small firms as a policy response and describe SBIR, explain why it has emerged as an important policy instrument designed to stimulate innovative activity in small firms, and provide an evaluation of the impact of the Program.

Methodology

Qualitative Research

Main Findings

Globalization and the telecommunications revolution reduced the cost of shifting economic activity from high cost locations to low cost locations which paved way for drastic levels of corporate downsizing not only in North America but Europe as well. To retain its global market share it was imperative that US shifted economic activity out of the traditional industries into those where the comparative advantage was compatible w/ high wages and employment levels—economic activity based on new knowledge. Given their performance in generating innovative output and technological change in newly emerging industries, small firms became the locus of initiatives at the federal level as policies were enacted that encouraged venture capital, R&D, new firm startups etc. The SBIR program was one such response to concerns regarding the erosion of US' competitiveness in the global economy that was designed to stimulate innovative small firms. Evidence shows that the survival and growth rates of SBIR recipients have exceeded those of non-SBIR firms (**Lerner and Kegler, 2001**), SBIR influences the career trajectories of scientists and engineers away from basic research towards entrepreneurship (**Feldman, 2001 and Audretsch et. al. 2001**), SBIR awards are associated w/ a demonstration effect in that scientists commercializing new economic knowledge in the form of a new firm prompt others to consider entrepreneurship as a career option.

Source

Purpose and Performance of the Small Business Innovation Research (SBIR) Program
Ronald S. Cooper
2003

Research Theme

Intended to clarify the purpose, rationale for the SBIR program, identify five dimensions of the innovation gap in small scale, early stage financing, discuss the commercialization obstacles confronted by certain SBIR firms and discuss ways to improve the program to enhance its ongoing success.

Methodology

Qualitative Study

Main Findings

Administrative flexibility of SBIR which allows different federal agencies to meet their needs is one of the program's unique attributes that has contributed to its success. One indication of quality of SBIR projects is that they deliver high quality research and provide value to agency missions. Further, they serve a certification effect in terms of making these businesses more visible to resource providers (venture capitalists, commercial banks etc.). Other benefits of the program include promoting commercialization of federally funded research and subsequent growth of small businesses, stimulating innovation by addressing a capital gap in early stage financing, providing additional incentives for startup activity by offering small firms a period of SBIR data rights, and influencing the career trajectories of other scientists towards commercialization.

One of the most important problems confronting SBIR firms is inadequacy of Phase II funding which might result in project failure if awardees fail to raise the needed capi-

tal. To address this problem, SBA is currently working on SBIR Phase III program to enhance program commercialization by providing early stage financing to firms that are eligible for Phase III funding and helping these firms meet their development needs through state level institutions.

Source

Leveraging Research and Development: Assessing the Impact of the US Advanced Technology Program
Maryann Feldman and Maryellen Kelley
2001

Research Theme

Considers the factors that affect a firm's chances of winning an ATP award and examines whether ATP award winners have R&D strategies with greater potential for diffusing knowledge and achieving broad based economic benefits. The author also examines whether or not non-winners continue w/ the project in the absence of ATP funding and the subsequent impact of the award on a firm's success in raising additional funds for its R&D activities.

Methodology

Analysis of data from a telephone survey of 119 awardees and 122 non-winners one year after the 1998 ATP selection process.

Main Findings

ATP leverages private R&D investment by identifying high quality research projects proposed by industry w/ strong potential for far-reaching commercial benefits and technical advance. When compared w/ non-winners, more ATP firms have a propensity towards openness in communications about their research and more are likely to have extensive connections to other firms (in preparing their business or marketing plan, portions of the proposal for ATP, and/or providing technical/financial resources to the applicant prior to application). Riskier research projects that involve new areas of research for the firm and ones that form new R&D partnerships btw organizations are more likely to receive an ATP award. Most of the non-winners have not proceeded w/ any aspect of their proposed R&D project and of those that have, most did so at a much smaller scale. An ATP award is identified w/ a halo effect in that winning one increases the firm's success in attracting additional funding from other sources.

Source

The Advanced Technology Program: Assessing Outcomes
Board on Science, Technology and Economic Policy, National Research Council
Charles W. Wessner (ed.)
2001

Research Theme

"Review of the Advanced Technology Program: Summary of Findings"
National Research Council's report provides a comprehensive review of the program's achievements to date and evaluation of outcomes.

Methodology

N/A

Main Findings

The ATP is a public-private partnership that provides a means of funding high risk R&D with broad based economic and social benefits. To this end, it facilitates the development of early stage, high risk, enabling technologies with positive spillovers. The NRC report defines as ATP's distinctive characteristics the diversity of ATP awards and their fair disbursement, and quality of program management and assessment. The key findings of this study include need for more stable and predictable funding base, more effective utilization of additional funds, and an accelerated decision making process. The report also suggests the creation of thematic competitions alongside general competitions to promote advancing technologies w/ broad based social and economic benefits. In addition, the report encourages ATP's collaboration with other government agencies and programs responsible for national initiatives and calls for closer coordination btw ATP and SBIR.

LEVEL OF ANALYSIS: REGIONAL (CLUSTER)-LEVEL AGGLOMERATION & SPILLOVER EFFECTS

Source

"R&D Spillovers and Recipient Firm Size"
Zoltan Acs; David Audretsch and Maryann Feldman
1994

Research Theme

Identifies the degree to which university and commercial R&D spills over to small firms and large firms. Analyzes the manner by which large and small firms generate innovations.

Methodology

Addition to inputs in knowledge generating R&D by both firms and universities generate increases in innovative output.

Main Findings

Commercial R&D plays a more important role in generating innovative activity in large corporations. Spillovers f/m research activities in universities play a greater role in the innovative activity of small firms.

Impact of geographic proximity btw university and corporate labs on innovative activity is greater on small firms than on large firms.

Source

"Agglomeration and the Location of Innovative Activity"
David Audretsch
1998

Also see:

"R&D Spillovers and the Geography of Innovation and Production"
David Audretsch and Maryann Feldman
1996

Research Theme

Research Questions:

- Where do innovative firms w/ little or no R&D get the knowledge inputs?
- Why is innovative activity confined to the geography where the new economic knowledge has been created?
- How has the focus of public policy changed given the resurgence in the importance of local regions as a significant source of cmp'v advtg?

Methodology

N/A

Main Findings

Innovative firms w/ little or no R&D able to receive knowledge inputs since they serve as 'agents of change' through innovative activity **(Acs and Audretsch, 1990)**; exploit R&D carried out by large firms **(also see Link and Rees, 1990)** ; develop the capacity to absorb new economic knowledge created in larger firms and capitalize on new economic knowledge by effectively valuating wage or no employment vs. self employment ahead of a decision to engage in startup activity

Innovative activity tends to cluster spatially given: 1) MC differentials btw transmitting knowledge and information 2) Difference in returns to R&D in different phases of Industry life cycle 3) Skilled workers/human capital **(also see Florida, 2002) 4)** Importance of regional idiosyncrasies.

Link btw agglomeration and policy:

In order to capture and sustain comparative advantage based on innovative activity, it is important to understand regional idiosyncrasies and cultural characteristics differentiating certain places from others and as such carry out enabling policies contributing to entrepreneurial growth.

Source

Entrepreneurs and Formation of Industrial Clusters
Maryann Feldman and Johanna Francis

Research Theme

Examines endogenous factors influencing individual decisions to become entrepreneurs and how exogenous factors influence the formation and location of high technology clusters **(Also see Appold, 2000 and Saxenian, 1994)**; uses the emergence of the high tech cluster in the US Capitol region as an illustrative case study.

Methodology

Case study: emergence of the high tech cluster in Capitol region. Entrepreneurial efforts grew as a response to federal downsizing and new opportunities generated by changes in the nat'l policy environment. As a consequence, entrepreneurs defined resources to protect their interests and the cluster self evolved around entrepreneurial activities.

Main Findings

Location of entrepreneurs w/ skills, resources and opportunities to capitalize on new economic knowledge affect how a cluster emerges in a region that otherwise would not be characterized as innovative. Clusters emerge from individual activities of entrepreneurs and the institutions, infrastructure and services created to support them. Thus, emergence of clusters is a function of individual decisions of entrepreneurs, environmental resources and government policy. Once entrepreneurs perceive opportunities and act upon them based on their preferences, risk-reward profile, and exogenous mar-

ket factors, they influence and are influenced by their environment. The success of initial startups generates new opportunities and gov't policy creates further incentives for entrepreneurial activity (Also see **Feldman, Entrepreneurial Event Revisited: Firm Formation in a Regional Context, 2001**).

Source

Clusters and the New Economics of Competition
Michael Porter
1998

Research Theme

Analyzes why clusters are critical to competition & identifies government's role in cluster development.

Methodology

N/A

Main Findings

Clusters are fundamental to economic growth since they increase productivity of companies by providing better access to employees, suppliers and specialized information; stimulate the formation of new businesses, and cultivate innovative activity by simultaneously fostering competition and cooperation. This being the case, government should promote cluster formation and upgrading by creating places that are able to support increasing productivity, cultivate talent (Florida, 2002) and benefit from new ideas and innovation (Also see **Markusen 1996** who defined such places as 'sticky' as opposed to places that are 'slippery' and not able to hold on to new ideas).

Globalization competitive advantage based on making more efficient use of inputs has rendered comparative advantage based on input cost advantages less relevant. Since the need to optimize factor productivity requires constant innovation which is geographically concentrated, cluster formation and growth should become the locus of regional policy.

Source

Endogenous Growth and Entrepreneurial Activity in Cities
Zoltan Acs and Catherine Armington
2003

Research Theme

Examine the role of externalities in generating growth.

Methodology

Regression model used to explain the differences in regional employment growth rates as a function of regional levels of entrepreneurial activity, agglomeration effects and human capital.

H= Increased entrepreneurial activity leads to higher economic growth rates of local economie

Main Findings

Differences in levels of entrepreneurial activity, diversity among industries that are geographically proximate and extent of human capital (**Glaeser et al, 1995**) are positively correlated w/ growth rates.

Firm birth rate is an important determinant of regional employment growth and that growth is higher in areas with greater competition and lower barriers to entry.

Greater geographic specialization leads to less growth. Specialization doesn't generally lead to higher levels of knowledge spillovers that promote growth in the same industry sector (also see **Feldman and Audretsch, 1999**)

The greater the proportion of the area's adults w/ high school degree the higher the growth rates; however once the human capital variables were dropped, no significant impact was observed on the estimated parameters for the remaining variables which suggests that a broad basically educated labor force may contribute more to growth than the presence of relatively large numbers of college students.

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7. Using Linked Employer-Employee Data to Study Entrepreneurship Issues

INTRODUCTION

It is tautological that all market driven phenomena are two-sided: there must be a supply-side and a demand-side. Empirical studies examining how human resource systems and strategic personnel decisions within firms are embedded in the external labor market that use only supply-side or only demand-side data are leaving part of the story untold. A new generation of data sources link employer characteristics with employee characteristics to create a resource where questions regarding strategic human resource management and personnel decisions can be examined from both inside and outside of the firm.

Linked employer-employee data are growing in availability and popularity in the economics literature, but are currently underutilized in other disciplines. Specifically, data sources that describe firm traits as well as employee traits can provide entrepreneurship researchers with vast amounts of data on large numbers of firms. Entrepreneurship researchers would be able to use these new data to test a variety of theories and examine the generalizability of lessons learned in case studies.

The leading linked employer-employee datasets not only include firm characteristics and worker characteristics, but are also longitudinal and near universal. Further, many of the most prevalent linked datasets come from administrative records so the data have a high level of accuracy. These factors combine to form a very powerful empirical resource that has a large sample size and allows for the study of dynamics and trends across time. Thus, these data create a strong base for empirical studies that examine the interaction between firms' personnel management decisions, worker outcomes within a firm, and worker outcomes on the external market.

Previous studies that use linked employer-employee datasets to examine areas of interest for the management disciplines include the

investigation of the connection between firms' choice of worker mix at start-ups and firms' productivity (Haltiwanger, Lane, and Spletzer, 2000), the relationship between firm pay setting policies and individuals' work histories (Abowd, Kramarz, Margolis, 1999), the effect of outsourcing on firm entry and exit rates (Benedetto, et al., 2002), the incidence of employee benefits within firms and the relationship between benefits provision and firm performance (Decressin, et al., 2003), the relationship between employer provided health benefits and worker turnover (Stinson, 2002), the effect of co-workers' characteristics on workers' earnings (Lengermann, 2002), firms' human resource decisions prior to lay-offs (Langermann and Vilhuber, 2002), and the long-term earnings implications of worker displacement (Jacobson, Lalonde, Sullivan, 1993)[1]. For more description of several landmark references on this topic, see Table 1.

However, the use of the data for investigating entrepreneurship issues has been scanty. The linked data provides new opportunities for researchers to examine and analyze human resource management (HRM) practices and outcomes at startups and to separate these outcomes from individual effects. Also, researchers will be able to examine the effects of a variety of conditions that may be related to start-up survival and success. Specifically, researchers could look at the effect on start-up outcomes of HRM choices and outcomes, industry clusters, employee networks, technological investment, product market conditions, labor market conditions, and interactions of all of these factors.

In this chapter, I will describe the construction and use of a leading longitudinal linked employer-employee dataset. I then discuss the limitations of the data and present the next steps in the evolution of linked employer employee data. Next, I provide a list of potential research frontiers for using longitudinal linked data to study entrepreneurship phenomena in order to demonstrate the broad, interdisciplinary research that can be performed. Finally, I finish with a brief example of research on entrepreneurship using a linked employer employee dataset. The goal of this chapter is to provide entrepreneurship researchers with knowledge of some promising data sets and also to promote researchers to frame new ideas and research topics for these relatively new and exciting sources of data.

UNEMPLOYMENT INSURANCE RECORDS

The most general and promising linked employer-employee data in the U.S. comes from Unemployment Insurance Records. In the section, I provide an overview of the data source and outline its utility to entrepreneurship researchers. First, I will discuss data collected by states related to the Unemployment Insurance (UI) Program. Every state requires

firms covered by the Unemployment Insurance Program to submit information on their workers and firm every quarter. These data are used primarily by states to administer the UI program. The key data programs from the UI system are:

State Unemployment Insurance Records - administrative data collected quarterly by all states on all workers covered by the unemployment insurance program. Fields include person identifier, firm identifier of employer, and quarterly earnings. These data are universal in their coverage of workers employed in covered sectors and are longitudinal. Some states have made data available as far back as 1990.

The UI program covers 96% of all jobs in the civilian workforce (Stevens, 2002). The sectors not covered by the UI program are typically quite small, although some may be of interest to entrepreneurship researchers. The uncovered sector includes interstate railroad employees, domestic help, persons employed by family members, out-of-season athletes, between term school employees, and several other very small groups of workers, however, the data also exclude the self-employed. Because self-employed workers are not covered by the UI program and do not appear in the data, the ability to analyze "grass-roots" entrepreneurs is compromised. However, as will be demonstrated below, the data are ideal for analyzing start-ups with paid employees.

ES202 Records - administrative data collected quarterly by states from all private sector employers in the state. The data come from quarterly tax records. Variables include a firm identifier, address, industry code, total employment, taxable wages and contributions for wage and salaried employees.

ES202 Records are universal in their coverage of firms that employ one or more individuals, pay total wages greater that $100 per quarter, and operate in the covered sector. These data are also longitudinal. Workers of all types of payroll are included (e.g. daily, weekly, monthly). Quarterly payroll figures include the total wages, share payments, bonuses, lump-sum vacation pay outs, and other covered compensation for all workers employed in that quarter.

These two data sources can easily be linked to each other through the firm identifier. Together, these two data sources provide great opportunities to researchers studying a variety of issues in entrepreneurial firms, especially for researchers interested in the human resource management and labor economics issues pertaining to entrepreneurship.

The universal and longitudinal natures of the data allow researchers to utilize the data in ways that are very meaningful to entrepreneurial research,

but would be impossible using other data sources. For example, one can identify new firm identifiers in the data. New firm identifiers can indicate several different types of firms:

- a start-up firm
- a spin-off (divested division) or spin-out (a start-up led by an ex-employee) of an existing firm
- an administrative re-code
- an established out of state firm opening their first plant in the state

However, again because the data are universal and longitudinal, researchers can write a series of algorithms based on worker flows to identify the true nature of a new firm identifier. Being able to track worker flows provides deep insights into the nature of firm births and facilitates identifying subsets of firms that meet specific requirements. If the data exhibit a case where most workers at the new firm came from the same firm and that firm continues to exist, then researchers could impute that the new firm is a spin-off or spin-out of the prior firm. If the data demonstrate that most employees at a new firm came from the existing firm, which disappeared at the same quarter that the new firm appeared, and the firms are approximately the same size, researchers could impute that this indicates an administrative recode, where the state changes the firm identifier of a continuing firm. After applying a series of rules such as these, researchers can do an excellent job identifying start-up firms in the data.

Once the "true" set of start-ups has been identified, researchers can track trends in employment growth, wage structures, turnover, tenure patterns. Because the data are longitudinal and universal, researchers know exactly who is employed by the start-up and what they earn for every quarter of a firm's existence. Additionally, one can track workers after they leave a firm as well as tracking workers before they join a firm.

These data can provide great value to the entrepreneurship field. The longitudinal and universal natures of the data allow researchers to examine many aspects of start-up firm growth and survival as well as start-up employment. Although there are many interesting ways to use linked UI record data, for many research topics the data are exciting but ultimately unsatisfying. Lack of technology variables, investment variables, product market variables of firms limit the level of detail that can be explored in firm-focused research. Similarly, lack of skill measures, age, and gender of workers limits the research on employee-driven effects. In the next section, I look at the limitations of the data and several solutions to extend the explanatory power of linked UI-style data and to extend the research frontiers.

LIMITATIONS OF DATA AND NEXT STEPS

Although linked UI record data are very powerful, limitations of scope, lack of detail in the data, and confidentiality concerns constrain the entrepreneurship research that can be performed using this data. First, Unemployment Insurance records only include ventures that are paying payroll taxes. This is a potential concern for researchers interested in studying "grassroots" entrepreneurs (i.e. entrepreneurs that have yet to progress to a stage where there venture is paying payroll taxes). None of these very early-stage companies will appear in the data.

Second, the data contain few personal characteristics and firm characteristics other than that which can be deduced from examining patterns of worker flows. One solution is for researchers to focus on specific regions or industries in which they have detailed institutional knowledge. Potential sample sizes in the data are extremely large, so researchers can examine very specific industries or regions and still have statistical power.

A second, more robust solution is to integrate other data sources into the longitudinal and universal UI records. An improved data set would contain personal characteristics such as occupation, education, age, gender, race and the data would contain firm characteristics such as revenues, investments, cost structures, technology, products, competition, institutional factors, and social factors. Recognizing these limitations of the data, the Longitudinal Employer-Household Dynamics (LEHD) project at the US Bureau of Census is in the middle of a massive project linking a variety of detailed data holdings including states' UI records, skill measures and demographic information of workers, and technology and product information of firms to the state level UI records.

For example, all decennial census data can be linked to the UI records to provide demographics for each observation. Also, any worker who has been selected to participate in the Current Population Survey will have all of their education, occupation, and geographic variables linked to their longitudinal records. On the firm side, data from the Census of Manufactures can be linked to firm identifiers. The Census of Manufactures has detailed observations on technology, products, inputs, and investments.

This additional level of detail in the data opens up a variety of new research directions for entrepreneurship research. The added variables permit more robust specifications and analysis of more complex issues and relationships. Examples of research of interest to a management audience using these data include a study of the effect of clock speed on firms' HR management decisions (Andersson, et al, 2004), the impact of market competition on wages and turnover in the retail food sector (Davis, McCall, and Park, 2004), the effect of diversification strategies on internal labor markets in financial services firms (Hunter and Seo, 2004). These are all lines

of research that would provide great value to the entrepreneurship literature if extended to focus on start-up firms.

An additional limitation is one of access. The U.S. Census, Internal Revenue Service and other data collection agencies must protect the confidentiality of respondents, otherwise respondents would not provide data. Because it is very difficult to preserve the anonymity of workers and firms when longitudinal records are publicly available, data collectors typically limit access to the data and mandate disclosure review for any output that is transmitted to the public. These can provide a very large hurdle for researchers who wish to access the most common linked employer-employee databases. However, the U.S. Census Bureau in conjunction with their partner data collection agencies are investing resources in developing the infrastructure to make anonymous versions of the data available to more researchers[2].

Currently, thirty-one states are participating in the LEHD program to some extent[3]. However, all fifty states collect Unemployment Insurance wage records and ES202 data. Each state differs in their access policies and data availability. For more information on any state's policies for data access, contact the state's Labor Market Information Division.

KEY DEBATES

I now turn to some of the key debates surrounding the use of linked employer-employee data for entrepreneurial research. The first key debate is the trade-off between generalizability and lack of institutional knowledge. Linked employer-employee datasets can have very large sample sizes, they can offer universal coverage of the firms and workers of interest, but what many of these data sets offer in terms of volume, they lack in terms of detail. All firms are, in some sense, idiosyncratic, so relying on generic data to identify phenomena is questionable. In entrepreneurship research, large datasets are not a replacement for detailed institutional knowledge and detailed understanding of the firms and workers being studied.

The great benefit of these data to the entrepreneurship community is to test theories and test the generalizability of researcher's case studies. These data do not replace getting inside a firm or a set of workers and understanding all of the phenomena that interact to create the dynamics of the institution.

The second key debate revolves around confidentiality concerns and access. One side of the debate calls for more linked data to be made available to outside researchers, the other side of the debate wants to insure that worker and firm identities are protected from disclosure. The government agencies which collect the data that go into linked employer-employee datasets take respondent confidentiality very seriously, and linked date create very large

problems for confidentiality protection. Even if records are made anonymous, it is still often possible to use longitudinal variation and variation across linked data sets to identify individual people and firms. Much research and many resources have been invested in creating versions of the linked datasets that are immune from confidentiality concerns and available for public access, however, the costs are very large, and the progress slow.

As mentioned earlier, the primary confidentiality philosophy for the largest linked datasets is one of restricted access. The government agencies who "own" the data act as gatekeepers developing secure sites for data access, limiting the availability of data to outside researchers and instituting strict disclosure review processes to control the flow of confidential information out of the secure environment. However, the accessibility of these data to researchers is improving. In the next section, I look at how linked Unemployment Insurance data which connect firm-level data to longitudinal records of workers' earnings could be used to study a variety of topics of interest to entrepreneurship researchers.

EMERGING RESEARCH FRONTIERS

Linked Unemployment Insurance data (i.e. employee wage records linked with employer ES202 information) permit an analysis of issues that span across the fields of economics, sociology, and the broad spectrum are of management topics including the interrelationship of entrepreneurship with strategy, human resources, technological and industrial evolution, managerial and employee incentives, and micro-level organizational behavior. In entrepreneurial firms, employees are a critical stakeholder, perhaps even more so than in established firms. Because the workforce of entrepreneurial firms is essential to long-term survival and success, it is important to think about quality of new hires, retention of key employees, and effectiveness of incentive systems as key firm performance metrics – metrics that perhaps are as important to measure as the standard metrics of productivity, revenue and growth. In the next section, I focus on developing potential research questions that compare outcomes between start-ups and established firms, and fit into the framework of thinking of employment outcomes as a performance measure. Emerging research questions include:

What are the Earnings Outcomes of Workers who choose to Join Start-ups Relative to those who Stay at Established Firms?

Very little is known about the long-term earnings profiles of entrepreneurs and other early-stage employees. There is a small, but growing

literature on the labor market outcomes for entrepreneurs and other forms of self-employment. Most existing studies look at the characteristics that lead to self-employment (Blanchflower and Oswald, 1998; Rees and Shah, 1986) including gender differences (Devine, 1994) and racial differences (Fairlie and Meyer, 2000). There are several studies that compare the earnings and hours worked between self-employed and paid workers, but can not construct a strong counterfactual group[4] (Hamilton, 2000; Carrington, McCue, and Pierce, 1996). Although linked UI records are limited in their scope over self-employed workers, UI records can be used to construct a strong counterfactual group comparing start-up workers to workers in established firms and examine the long-term earnings profiles of workers who choose to work in early-stage firms.

In many industries, start-ups are thought to offer a high-reward/high-risk employment relationship to potential employees. On the upside, relative to workers at established firms, workers at start-ups may have steeper earnings profiles as they progress through a small growing firm. Also, early employees may reap greater benefits from an initial public offering (IPO) than workers who join the firm later. On the downside, start-ups may be cash constrained and pay lower initial wages than workers' alternative employment, and workers at start-ups may face a greater risk of involuntary displacement due to firm death.

Workers faced with the opportunity to leave an established firm to join a risky early-stage firm must decide if the potential reward of working for a start-up justifies the potential risk.

As demonstrated in Campbell (2004), UI records can be used to analyze the earnings profiles of *charter employees* at start-ups, where charter employees are individuals who leave an established firm to work for a start-up in the start-up's first period of record. By identifying all charter employees and a matched sample of comparable workers who choose to stay at established firms, one can examine the following counterfactuals on charter employees' earnings:

- What would charter employees' career profiles look like had they not left their previous employer to join a start-up?
- What would charter employees' career profiles look like had they changed jobs to an established firm and not to a start-up?

Later in the chapter, I present a detailed example of how UI records can be used to answer such questions.

What Happens to Workers when Start-Ups Fail, and How does This Compare to Workers' Outcomes when Established Firms Fail?

Unemployment Insurance data provide an excellent foundation for studying the impact of firm death and plant closure on the future earnings of individuals. Typically, job displacement analysis relies on the Displaced Worker Survey (DWS), but the DWS has small sample sizes, short time coverage, and is subject to ``retrospective bias'' where workers do not accurately recall their displacement status and recall levels vary across population (Evans and Leighton, 1995). UI data have large sample sizes and extensive longitudinal time frame. Additionally, UI data are administrative and eliminate the problem of ``retrospective bias''.

There is an extensive literature in economics on the impact of layoffs and plant closure of established firms on earnings profiles, but there is currently no research on what happens when start-ups fail. Podgursky and Swaim (1987), Ruhm (1991), and Fallick (1996) all examine the relationship of personal characteristics and the effect of job displacement on earnings. Weinberg (2001), Neal (1995), Carrington and Zaman (1994), Carrington (1993), and Howland and Peterson (1988) all argue that post-separation earnings losses are driven primarily by industry, occupation, and local recessions and are not driven by the loss of firm-specific earnings power. Kletzer (1989) demonstrates that returns to tenure do not dissipate after displacement for high-skill workers, while returns to tenure do dissipate for low-skilled workers. See Kletzer (1998) for additional review.

There are some studies that use UI data to examine the impacts of established firm death on workers' future earnings. Jacobson, LaLonde, and Sullivan (1993) is the seminal article. The authors leverage the longitudinal nature of the data by constructing dummies for each year pre- and post- job change for each displaced worker and estimate a model including fixed effects and time varying characteristics. The Jacobson, LaLonde, and Sullivan methodology has also been implemented in Kletzer and Fairlie (2003), Stevens (1997) and Schoeni and Dardia (1996).

Although there is an extensive literature on worker displacement, there is a huge gap in looking at what happens when start-ups fail. The impact on workers' earnings of involuntary displacement due to failure of start-ups may be fundamentally different from the impact of involuntary displacement due to failure of larger, older firms. As implied in Jacobson, LaLonde, Sullivan (1993), established firms tend to die because they are in dying industries and workers in these industries may have skills that are no longer valuable on the labor market. Thus, displaced workers have out-of-date skills and do poorly after job displacement. This may not be the case for many start-ups. In many industries, employment at a failed start-up is not

necessarily indicative of out-of-date skills. In fact, joining a start-up that soon fails may have a positive effect on individuals earning profiles: joining a start-up may signal to the rest of the labor market that the worker has unobserved entrepreneurial skill which alternative employers may value highly.

Is Organizational Structure Related to Start-Up Growth and Survival, and Do These Relations Differ from Those at Established Firms?

Within each start-up firm, researchers can investigate the organizational structure of establishments, as defined by firms' job ladders, wage growth, and turnover for different categories of workers within a firm. One can use organizational structure to classify firms into groups, such as those who design compensation and incentive structures consistent with the reduction of principal-agent issues and incentive compatibility while operating in spot markets or internal labor markets. Once establishments are characterized by their organizational structure, it is possible to analyze the dynamics of organizational choice conditional on establishment, firm, and economy-level variables as well as the differential impact of organization on growth and survival of start-ups operating in similar markets. Similarly, it is possible to examine if the differential impact of organizational choice on start-up performance is different from that of the impact on established firms.

Using the linked UI data, one method to quantify a firms' organizational structure is to examine job ladders defined by entry wage, earnings growth, turnover, and promotion paths. These ladders can be characterized into the following patterns:

Internally-focused organization

- ILM (average entry wage, high growth with low variance, long tenure);
- union (high entry wage, low growth, long tenure);
- bureaucratic (average entry wage, average growth with low variance, long tenure);

Externally-focused organization

- spot market (average entry wage, high growth (high variance), average tenure);
- secondary (low entry wage, low wage growth, low tenure).

Given these imputed organizations, one can compare the survival rates and growth rates of start-ups and established firms who have implemented each structure. This work builds on the seminal theoretical

constructions of Doeringer and Piore (1970) who examine the structure and function of internal labor markets. Empirically, this work extends the ideas in Pendergast (1986) who reviews the relationship between compensation practices and firm performance, Baker, Gibbs and Holmstrom (1994) who implement a similar methodology to examine the organizational structure at one large, established firm and the ideas of Lazear and Oyer (2003) who use matched employer-employee data from Sweden to analyze the organization of a large number of firms.

What Role Do the Knowledge Flow Channels of Interpersonal Networks and Industry Clusters Play in Start-Up Performance?

Another benefit of utilizing data that are longitudinal and universal is that one can identify not just the current co-workers of an employee, but also all previous co-workers of the employee. Specifically, identifying past work relationships allows the quantification of work-related employee networks (i.e. have two current co-workers ever worked together in the past?). Knowing the previous co-working dyads is important to analyzing the success of start-ups, because if workers have worked together in the past, there may be inherited knowledge on worker quality and their ability to work well together.

Similar to Agarwal, Echambadi, Franco and Sarkar (2004), who examine the impact of inherited knowledge on the performance of spin-outs, one could test the hypothesis that spin-outs and traditional start-ups with a high incidence of inherited co-working experience are more likely to survive than start-ups without the co-working experience. In young start-up firms—where it is vital to hire strong workers and develop a strong culture—firms with a large incidence of workers who have worked together previously may be more likely to succeed than firms where workers who have little previous co-working experience. This is similar in spirit to the work of Appleyard (1996), Almeida and Kogut (1999), and Almeida, Dokko, and Rosenkopf (2003) who examine the effect of firms' participation in regional networks on firm performance.

Additionally tracking worker mobility across firms could be used to identify knowledge flows across firms and industries. Assuming that knowledge is embedded in workers and workers are free to transfer knowledge from prior employers to new employers, researchers have access to a universal data set of how embedded knowledge could move across firm boundaries. Similar to worker networks, researchers can use linked employer-employee data to examine industry clusters. The impact of industry clusters on start-up activity and survival is not theoretically intuitive. A start-up created in the middle of an industry cluster may have local resources that

allow it to be more productive and more innovative, but there may also be greater competition within the cluster. Start-ups may benefit from location in a cluster because they could tap into the already established institutions that currently exist to support industries in the cluster. Easy access to regional resources such as employee networks, universities, distribution channels, support industries may facilitate start-up success. On the downside, start-ups located in industry clusters may face greater competition for workers and investment capital, also competition in product markets may be stronger than if the start-up located outside of a cluster. Using worker flows to analyze knowledge flows complements the extensive knowledge flow literature using patent citations (for example Jaffe, Trajtenberg, and Henderson, 1993; Almeida, 1996; Jaffe, Trajtenberg, and Fogarty, 2000; Rosenkopf and Almeida, 2003).

The precise geographical variables in the data allow researchers to not only identify regional clusters of related industries, but also create continuous measures of key regional and firm-specific variables that may impact firm performance and survival. Further, using worker flows to identify knowledge flow creates a more clean measure of knowledge flow than patent citation studies. In addition to the well documented limitations associated with the use of patent data for knowledge flows (Jaffe, Trajtenberg, and Fogarty, 2000), patent citations may not capture inter-organizational flow of knowledge to the extent that the citations may be added by patent examiners (Alcacer and Gittleman, 2004; Cockburn, I. M., S. Kortum, and S. Stern. 2002).

How Do the Organization and Performance of Spin-Outs Compare to Outcomes at the Parent Firm?

As mentioned earlier, worker flows can be used to identify spin-outs. Researchers could build on the spin-out work of Klepper (2001), Bhide (2000), and Agarwal, et al (2004) to compare the organization, structures and outcomes at spin-outs and their parent firms to facilitate understanding of the outcomes of management issues at spin-outs. Are there firm performance implications of keeping the same organizational structures as the parent firm, or from adopting different structures? Do HR structures stay in tact at a spin-out? Do spin-outs use their new independence to fix problems prevalent at the parent firm? Is employment at spin-outs more risky, and if so, does management compensate workers for bearing additional risk?

Similarly, researcher could analyze these same types of questions comparing systems and outcomes at start-ups that are acquired compared to those at their acquiring firm. Are the organizational structures at acquired firms assimilated into those of the acquirer, if so, what is the rate of

assimilation? Does acquisition correspond with increased turnover among acquired employees?

One last set of valuable comparisons that could be drawn from looking at start-ups using UI data is the comparison of spin-outs to traditional start-ups. Both types of firms are new firms, but spin-out s come with already established working relationships, networks, technology, and inherited knowledge, while traditional start-ups develop all of their institutions from scratch. The use of linked UI data would be very valuable in testing hypotheses related to the relative performance of spin-outs and other start-ups operating in the same industries.

The previous research ideas are in no way comprehensive, but demonstrate the type of research that may be performed, and hopefully demonstrate the strengths and limitations of the data in order to help other researchers identify their own research streams. In the next section, I illustrate the type of research that may be performed with linked employer employee data by presenting a brief example using UI-based linked data to study entrepreneurship issues in California's semiconductor industry.

A BRIEF EXAMPLE FROM THE SEMICONDUCTOR INDUSTRY

In this section, I provide a short example from California's Semiconductor industry to demonstrate the utility of longitudinal universal data to entrepreneurship researchers. This example is adapted from Campbell, 2004.

In this demonstration, linked data from California's UI program are used to investigate the long-term earnings outcomes of workers who choose to join start-ups in the semiconductor industry over the course of the 1990s. Understanding the long-term implications of joining a start-up is valuable not just for the worker making the decision to join a start-up but also to managers at start-up firms who design HR systems to attract top workers and managers at established firms who need to retain key workers.

California's semiconductor industry in the 1990s is a good laboratory to study firm start-ups because changes in the industry structure led to a take off in start-up activity in the decade. The traditional market structure was altered with the introduction of the semiconductor foundry model. Foundries owned fabrication capacity and would fabricate the designs for other firms on a contract basis, eliminating the need for new firms to invest in fabrication plants. Soon after the birth of the foundry model, competition in the market for design tools put downward pressure on the cost of designing chips.

As the barriers to entry decreased in the late 1980s and 1990s, the semiconductor industry experienced large numbers of firm births and deaths in an innovative and competitive environment. In order to compete in such an

environment, start-up firms participate in regional networks (Appleyard, 1996; Almeida and Kogut, 1999; and Almeida, Dokko, and Rosenkopf, 2003) and develop alliances with stronger firms (Eisenhardt and Schoonhoven, 1996). As a result, workers in start-ups often have strong social networks and may be more likely to find alternative employment if their firm fails than workers with less extensive social networks.

I use UI program records from the state of California to identify all firms in the Semiconductor Industry (as defined by NAICS codes) and focus on all workers who ever worked in the industry at any time between 1990 and 2002, and pull their entire wage record over the time period. The resulting data consist of over 17 million observations over 52 quarters on over 800,000 unique individuals.

Employment in the industry increased from approximately 56,510 in 1990 to a peak of 94,766 in the second quarter of 2001, then decreased to 83,583 in the fourth quarter of 2001. Payroll growth accelerated sharply at the tail end of the late-1990s technology boom and quickly decelerated after the market turned. Total real quarterly industry payroll was $600M in the first quarter of 1990 and grew to $3.5B in the first quarter of 2001, by the end of the sample, payroll decreased to $2.1B. The earnings covered in the data include wage and salary earnings, all taxable bonuses (including cash and non-pecuniary bonuses), and taxable stock options. The run-up in earnings at the peak of the boom may be partially attributable to an increase in non-wages/non-salary compensation.

Table 2 presents tabulations of firm births and deaths by year for the California semiconductor industry. In the raw data (not shown), there are 808 potential firm-births. I identify that 266 of these are likely to be artificial births leaving 542 firm births that do not appear to be the result of spin-offs, entry of an out-of-state firm, or administrative recode. Similarly, there are 481 potential firm deaths in the raw data. After accounting for 56 events that appear to be mergers or acquisitions and administrative recodes, there are 425 valid firm deaths. 481 firms enter the sample by Q1 1990. Of these 481 firms, 218 survive to the end of the sample. The years with the greatest number of firm births are 1996-1998 with 68, 57, and 58 new firms respectively. The years with the smallest number of firm births are 2001 and 1993 with 3 and 36 valid firm births.

At the end of the sample, there are 558 surviving firms, 542 of which have valid firm births. Of the 425 valid firm deaths, 58 occurred in 2000 and 56 occurred in 1999. The years with fewest deaths are 1995 and 1991 with 26 and 28 firm deaths.

Of the valid firm births, 12% die within their first 4 quarters of existence, 19% die within their first two years of existence, and 27% die within their first three years of existence. These mortality rates are comparable to the findings of Agarwal and Gort (1996), who demonstrate that

8 to 10 percent of firms die in any particular year across industries and life cycles stages. In this study, firm birth is dated by the first quarter that a firm pays payroll taxes, so these start-ups are more established than the iconic garage-based company. The firms have already acquired some form of revenue or venture financing that allows them to pay employees. Given that these start-ups are mature enough to have a payroll, it is not surprising that the mortality rates of these start-ups are similar to the mortality rates of all firms.

Within the data, I identify all charter employees (employees employed at a start-up in the firms first quarter of record). As demonstrated in Figure 1, employees who have ever been a charter employee at a start-up have substantially greater median earnings than the rest of the sample. Because charter employees are observably different from the rest of the sample and there are few controls in the data, I construct a reference group of similar workers who have never worked at a start-up. Each charter employee is matched to his or her nearest neighbor in the wage distribution of the charter employee's pre-start-up employer in the charter employee's last full quarter of employment at the pre-start-up employer.

In other words, in the quarter before a charter employee leaves for a start-up, they are matched with an employee at the same established firm who earns a very similar amount. Additionally, each charter employee is matched to a worker with very similar skills, background, and other characteristics that may affect earnings potential. The fundamental counterfactual is that the matched employees represent the outcomes for the charter employees had they not chosen to work for a start-up. The two groups are constructed to have similar observable characteristics and to face similar economic conditions. The groups may differ across unobservable characteristics such as age, experience, occupation, field of specialization, "entrepreneurial skill", opportunity to work at a start-up, or underlying risk-preferences.

The distribution of outcomes after five years is graphically represented in Figure 2. These figures depict kernel density estimates of the total earnings after start-up separation for both the charter employee and the matched sample. It is easily seen that the distribution of the charter sample has a larger median and mean value. The charter distribution also has fatter tails, as a result, the variance of outcomes for workers who join start-ups is much larger than the variance of outcomes for the matched workers.

In this ex post analysis, UI data demonstrate that the decision to join a start-up involves some downside risk as well as large potential rewards. There is great likelihood that a charter employee will earn more at a start-up than they would earn if they stayed with their original employer, but there is a fraction of workers who are not made better off by joining a start-up, and the increase in variance of outcomes as a result of joining a start-up is very large. The risk preferences of workers determine whether they maximize utility by selecting the high-mean/high-variance earnings draw of working at a start-up

or the lower mean/lower variance earnings draw of staying at the established employer.

An understanding of the outcomes of worker decisions is beneficial to HR system designers in the industry. Managers of both start-ups and established firms who are well-informed of the outside options of their workforce can design an efficient human resource management system to retain key workers and attract key workers.

CONCLUSION

Many issues facing the interdisciplinary field of entrepreneurship are fundamentally issues of the interactions of firms and workers. In no other area are the outcomes and identities of workers and firms so closely tied together than that of entrepreneurs and start-ups. Linked employer-employee data allow researchers to examine the empirics of the interactions between firms and workers and to disentangle their competing effects.

Firms' human resource strategies and personnel decisions are embedded in the labor markets of the industry and the region. The effect of firm HR decisions on start-up performance and survival reflects the combination of internal factors, external factors and the interaction of the two. Empirical work that does not account for internal and external factors is necessarily not telling the whole story. The next generation of large scale studies that examine empirical issues relating management strategies at start-ups to current and future outcomes of start-ups will use linked employer-employee data.

While using large generic data sets will not replace well-crafted research on entrepreneurs and start-ups using smaller, more detailed data, linked employer-employee data sets are a resource that allows researchers to test the portability of their results to other firms, industries, and regions. Despite the weaknesses of the data and current access issues, linked data sets open a multitude of doors for empirical entrepreneurship researchers.

TABLES AND FIGURES

TABLE 7-1 *Landmark References using Linked Employer-Employee Data*

Paper	Description
Haltiwanger, Lane, Spletzer (2000)	The authors use data from the Longitudinal Employer-Household Dynamics Project to examine the effect of start-ups choice of worker mix on compensation patterns and productivity.
Abowd, Kramarz, Margolis (1999)	The authors use longitudinal, linked employer employee data to disentwine firm pay setting strategies from worker effects. They develop a methodology for measuring and separating out the firm effect and worker effects on worker earnings.
Jacobson, Lalonde, Sullivan (1993)	The seminal work in using longitudinal data from the Unemployment Insurance program. The authors use worker flows to identify mass lay-offs and examine the effect of displacement on the long-term earnings profiles.

TABLE 7-2 *Firm Birth and Death by Year (in California's Semiconductor Industry)*

Birth Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 and later	
1990 and earlier	31	28	29	26	30	13	15	18	19	24	25	275	533
1991		0	5	4	0	1	3	3	0	1	0	20	37
1992			2	5	1	1	1	3	0	3	3	20	39
1993				3	3	1	5	3	2	1	1	17	36
1994					1	6	4	1	3	4	4	25	48
1995						4	4	2	4	8	2	26	50
1996							4	5	6	4	5	44	68
1997								5	4	5	7	36	57
1998									3	5	7	43	58
1999										1	3	45	49
2000											1	44	45
2001												3	3
	31	28	36	38	35	26	36	40	41	56	58	598	1023

Note: Author's own tabulations from California UI and ES202 data. "Birth Year" indicates the first year a firm has a payroll in California. "Death Year" indicates year of last appearance in the data.

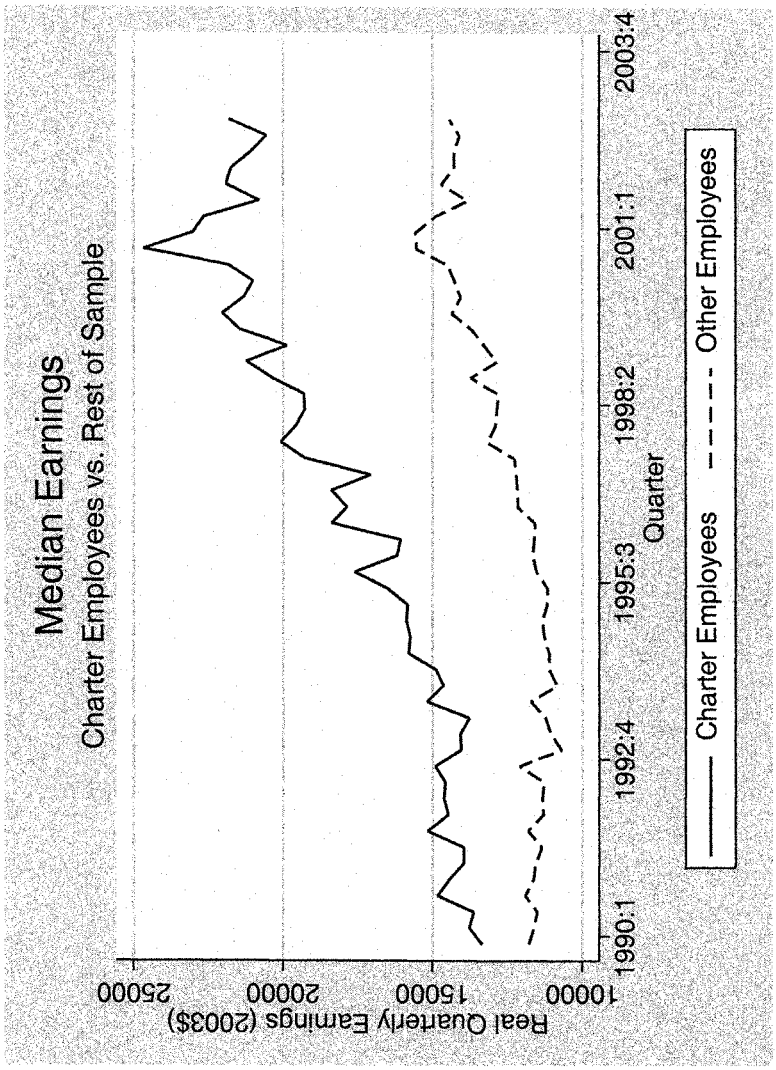

FIGURE 7-1 *Earnings of Charter Employees vs. Rest of Sample-Median.*

Note: Author's own tabulations from California UI and ES202 data.

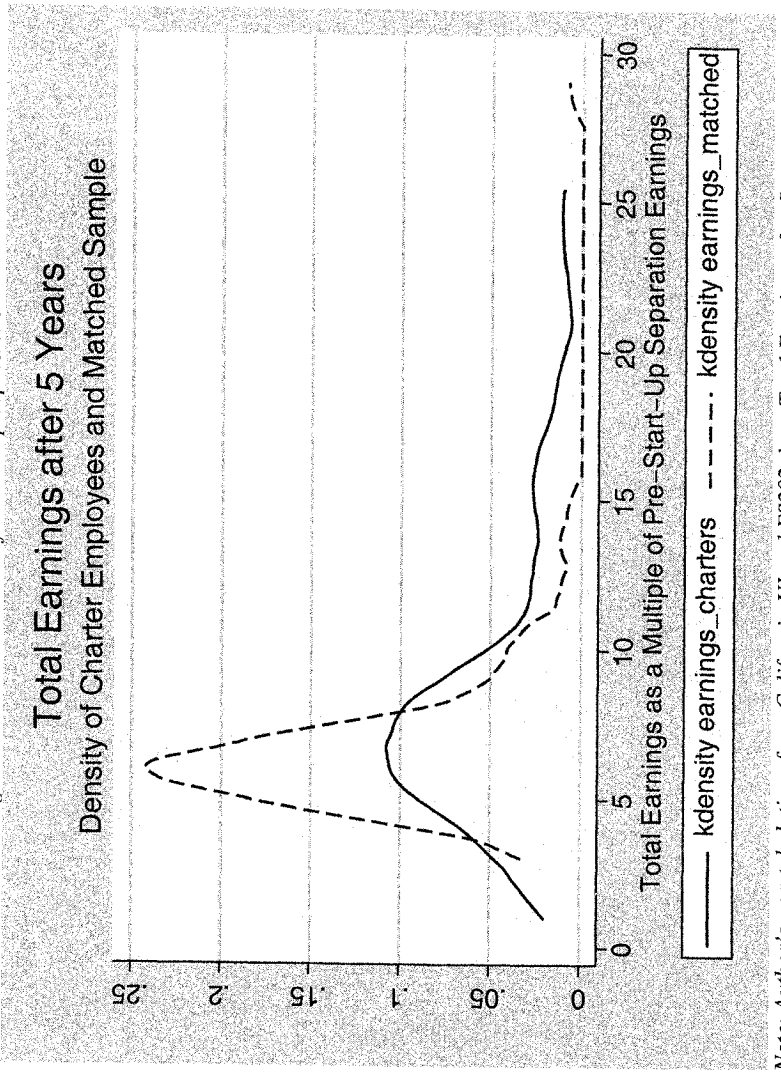

FIGURE 7- 2 *Total Earnings in the First Five Years after Start-up Separation*

Note: Author's own tabulations from California UI and ES202 data. Total Earnings after Start-Up Separation are total earnings earned since charter employee left for a start-up. The figures presented are multiples of pre-start-up separation annual earnings.

NOTES

[1] For an overview of linked employer-employee data, see Hamermesh (1999). For a comprehensive review of studies using linked employer-employee data and use of linked data, see Abowd and Kramarz (1999).

[2] For more detail on the LEHD project and contact information, go to http://lehd.dsd.census.gov.

[3] Participating states include Alabama, Arkansas, California, Colorado, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, Montana, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Texas, Vermont, Virginia, West Virginia, Washington, and Wisconsin.

[4] For a given event, a counterfactual group is a group that represents the outcome had the event never occurred. In this case, the counterfactual group is a group that represents the answer to the question: "What would have happened to the set of workers who became involved with entrepreneurial firms if they had not joined entrepreneurial firms?"

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8. The Ecology of Entrepreneurship[1]

INTRODUCTION

Although entrepreneurship has been defined in many different ways, a common definition ties it closely to the establishment of new organizations and their viability in early years.[2] By this view, the focal entrepreneurial event is the operational inception of a new firm, and an entrepreneur is an individual who plays a central role in opening a new firm. The associated entrepreneurial process consists of resource mobilization to facilitate and sustain the opening event; it typically involves many individuals, agents and social institutions, with a variety of interests. Accordingly, an entrepreneurial area or industry is one characterized by high rates of new firm establishment.

Within organizational sociology, the most active line of theory and research investigating the establishment of new organizations is commonly referred to as organizational ecology (Hannan & Freeman, 1989). As is well known, organizational ecology studies populations of organizations, focusing on how they change over time, especially through demographic processes of selective replacement – organizational founding, mortality, and growth. The major theory fragments of organizational ecology predicting levels of new organizational establishments include density dependence, structural inertia, niche width, resource partitioning and others (see Carroll & Hannan, 2000). Outsiders Pfeffer (1993) and Hargens (2000) view research within the perspective as exceptionally cumulative for social science.

Despite the apparent relevance of organizational ecology, little theory and research in the field of entrepreneurship uses it, builds on it, or even acknowledges its existence through citations. For instance, we examined all articles in a recent year (2003) of issues of the *Journal of Business Venturing*, the top specialized publication outlet in entrepreneurship. Of the 43 articles published, a total of 2,225 other articles were cited in the reference lists. Of these, only 59 (roughly 2.7%) cited organizational ecology articles and books, loosely defined.[3]

It is not clear why entrepreneurship analysts commonly ignore the ecological body of scientific work that might inform their efforts. We speculate that at least two different reasons might be responsible.[4] First, the discipline of sociology, within which organizational ecology emerged, is not particularly concerned with applications, especially those of a managerial nature. This is true of much ecology as well.[5] Because of the long time lag required for basic research to affect practice, it may therefore take substantial periods[6] for the practical implications of new developments in sociology to be fully understood and appreciated in an applied domain such as entrepreneurship.[7] Second, organizational ecology theory typically casts predictions about new organizational establishment at the population level of analysis: these arguments predict the rates of founding expected in populations under various environmental conditions. Historically, entrepreneurship has been examined as an individual-level phenomenon, with an emphasis on rationality of action. Inferences about individual behavior from empirical analysis of aggregated data can be misleading. Moreover, the types of theoretical explanations offered for population-level processes may not be directly applicable to individuals (see Aldrich & Wiedenmayer, 1993).

What this situation suggests to us is that organizational ecology likely requires some translation before its relevance and applicability become apparent to entrepreneurship theorists and researchers. Background conditions that induce or limit the propensity with which individuals and others start new organizations will almost always be relevant to the study of entrepreneurship. But both the abstract conceptualization of those conditions and the aggregate level of empirical analysis common in ecology may leave implicit the significance of theory and research for the individual level so engrained in the entrepreneurship area. In our view, translations to the individual level are not necessarily straightforward and may be open to multiple interpretations.

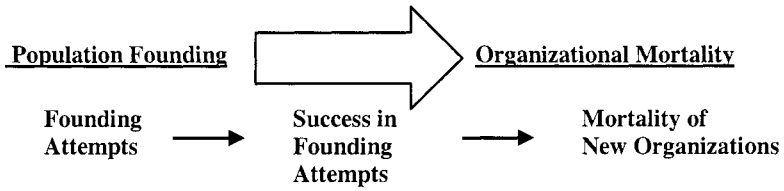

FIGURE 8-1 *Sequential processes involved in founding and success of new organizations*

Given the ambiguity in deriving the implications of ecological studies to the level of primary interest in the entrepreneurship area, one of our primary aims here is to ease this task by offering a conceptual framework. The framework involves viewing new venture success and failure as a process involving rates of event occurrence: a population founding rate (decomposed into two constituent rates) and an individual organizational mortality rate.

Within this framework, the observable founding rate of a population is depicted as the outcome of two underlying rates, each associated with a stage in the start-up process. The first is the rate at which attempts at founding are initiated; the second is the rate of success of those attempts. Success in this second process is associated with the founding event itself and is to be distinguished from the success or failure of the organization once founded, which is a separate issue involving the third rate in the framework, the organizational mortality rate. The mortality rate is associated with individual organizations in a population, given that they have been founded. As depicted in Figure 8-1, new potential organizations travel down a sequential process, which involves step-by-step winnowing of the number of units.

Organizational ecology provides theory and research about each of these pertinent types of rates, as we review in greater depth below. Among other things, our translation consists of sorting the various ecological arguments of founding rates into the two underlying component processes. We also point to several findings from ecological studies of organizational mortality that may potentially interest entrepreneurship scholars. We then shift to examine key debates about the sources of variation in founding rates in the ecological perspective. These include differences about the roles of: (1) macro vs. task environments, (2) endogenous vs. exogenous processes, and (3) agglomeration vs. differentiation. Finally, we identify a number of emerging research areas that present interesting prospects for the future of ecological studies of founding, and perhaps entrepreneurship as well.

ECOLOGICAL VITAL RATES AND ENTREPRENEURSHIP

Most ecological theories of organizational founding make predictions about the rate at which new organizations will appear in a population under specified conditions. These analyses take the organizational population as the unit of analysis for basic conceptual and methodological reasons. In particular, to avoid endogenous sampling on the outcome, the founding event must occur to some pre-existing unit, which is viewed as "at risk" to experience the event. For many biological organisms, the female members of the species (perhaps only those within a certain age range) are viewed as the risk set. Organizations, however, do not have the requisite identifiable maternal unit around which to construct such a set. Even using individuals or natural persons as the unit of risk falls short on this dimension because they have multiple identities and can combine in numerous ways in starting organizations, thus generating an uncountable number of potential units at risk (see Hannan & Freeman, 1987).

In our view, a population's rate of founding can be usefully decomposed into two underlying component rates. As Delacroix & Carroll (1983: 276) note:

> *The number of organizations founded in a given period will reflect both the level of organizational attempts and the relative success of these attempts. Increasing either of these factors will result in an increased number of foundings.*

That is, organizational founding consists of two separate processes, first about the rate at which individuals are propelled to initiate actions that attempt to start new organizations, and second about the success of those attempts, in the sense that a firm actually gets opened.

In a few cases, researchers have found social or legal contexts that allow them to study these two processes more or less directly (Carroll & Hannan, 2000, Ch. 15; Sørensen & Sorenson, 2003; Ruef, Aldrich & Carter, 2003; Ruef, 2004; Jovanovic, 2004). But in most cases, the only available information is on the actual founding events, which represent a culmination of the operation of both processes.

Nonetheless, we maintain that the theoretical arguments that ecologists typically offer to explain the overall founding rate commonly rely more heavily on one or the other process, and ignore the second process. We believe that clarifying and classifying these arguments will go some distance in making organizational ecology accessible to entrepreneurship analysts. This is because, in conceptual terms, each of these constituent processes seems easier and more straightforward to link to entrepreneurship theory and research than the typical aggregate founding study.[8] So, the first part of our review consists of sorting the various ecological arguments of founding rates into these two processes and pointing to some illustrative studies.

Rate of Founding and Its Component Parts

Decomposing the population's founding rate into its component parts presents some conceptual challenges but also serves to provide a clearer connection to theory typically used in the study of entrepreneurship. The major conceptual challenge, about which there is no consensus, entails specifying the activities associated with the event defining the initiation of an organizing attempt. Abstractly, one can imagine the process beginning at a variety of stages including idea formulation, development of a business plan, assembly of human resources, capital acquisition, and the like.[9]

In the sparse empirical research on this process, investigators have adopted a practical stance, using convenient unambiguous indicators that clearly precede any true founding event. For instance, in studying potential automobile producers, Carroll and Hannan (2000) use listing in an industry

directory, legal incorporation or development of an automobile (usually a prototype). For potential television broadcasters, Sørensen and Sorenson (2003) use applications for television broadcasting permits. For heterogenous potential entrepreneurs, Ruef et al. (2003) survey individuals to identify those actively involved in the process of resource mobilization for a firm in which they held an ownership stake.[10] Ruef (2004) uses public announcements of the planned opening of medical schools.

For present purposes, the major reason for decomposing the population's founding rate is that it allows us to understand ecological theory in light of ideas and arguments common to the entrepreneurship area. To see this, first note again that most theory and research in the entrepreneurship area are tied to the individual level of analysis. Recognize also that the most commonly held theoretical model of individual entrepreneurs found in the traditional literature assumes rational action and efficient markets. In its unreconstructed form, this view holds that entrepreneurs are profit-seeking individuals who make (basically) accurate cost-benefit calculations of the likelihood of success of their planned enterprises and then behave accordingly.[11] That is, an entrepreneur is someone who sees a market opportunity when it appears, moves to take advantage of it, and then reaps ample rewards after entering the market. Decisions and actions in this view of the world are forward-looking: current behavior is explained as a result of future expectations, which (in interpretations) are often assumed to be accurate (March, 1978). March and Olsen (1989: 5-6) call the set of assumptions underlying this view "historical efficiency," because "institutions and behavior are thought to evolve through some sort of efficient historical process" leading rapidly to a unique outcome.

In terms of the set of sequential component rates of the founding process described above, the model of individual rational action under historical efficiency implies a tight coupling of the two rates, meaning that the rates only move together in consistent directions. Under strong historically efficient rationality, entrepreneurs attempt to enter markets more often when they are likely to succeed in doing so and when their new enterprises are more likely to succeed in competition with others (see related discussion in Barnett, Swanson & Sorenson, 2003). These assumptions allow analysts to move back and forth from empirical facts to theoretical interpretations with ease, and without regard to causal directionality. For instance, an observed high founding rate implies that new ventures are more likely to succeed (because future favorable outcomes were seen by the many new entrepreneurs and these projections motivated them). It also implies higher rates of initiation of organizing attempts (because more entrepreneurs saw the future conditions and tried to enter) and success at founding attempts (the entrepreneurs who tried to enter worked harder, and were more likely to secure resources from gatekeepers and others who also came to see the future favorable conditions).

Ecological theory and research depart from the entrepreneurship tradition in two ways. First, ecological theory operates at the population level of analysis. Second, and more important from a conceptual viewpoint, ecology does not assume a tight coupling between the two constituent parts of the founding rate. For instance, Hannan and Carroll (1992) regard each of the population's component founding rates as driven by environmental selection processes. In their view of the world,

> *An empirically estimated organizational founding rate reflects both types of selection processes, and these may work at cross-purposes. High rates of founding attempts can be coupled with low rates of success in organizing and vice versa. The same observed level of founding may be the result of very different environmental forces. Moreover, rationality may characterize only one of the two portions of the founding process. That is, the apparent rationality of a founding process may reflect the rationality of selection operating on random founding attempts. (Hannan & Carroll, 1992: 199-200)*

Note that their argument is not just about the mathematical possibility of rates diverging but about the likelihood of social and economic environmental forces making them do so. Hannan and Carroll (1992) go on to list a few factors that might drive one rate high while carrying opposing implications for the other rate. For instance, involuntary unemployment or forced retirement likely increases the likelihood of attempting to found a new business but may not increase its odds of success. Conversely, a strong regulatory regime may decrease the rate of attempts but increase the success rate of those that do.

The level of analysis difference between ecology and entrepreneurship is widely recognized. But, we think that the abandoned assumption of tight coupling across the constituent parts of the founding rate is not generally recognized – or at least its full implications are not. We attribute this situation to a lack of complete conceptualization by ecologists. In our view, in formulating predictions about population level founding rates, most ecological theories rely primarily on arguments about either the rate of initiation of attempts or the rate of success of those attempts but not both. The typical theoretical argument discusses factors or processes affecting one component rate but not the other, and then proceeds to derive a consistent population-level prediction. But, such a derivation is *only* valid if the other, second rate moves in the same direction, is neutral, or, if opposing in its direction, exerts less force than the focal rate. That is, only with some degree of coupling of the component rates does the usual population-level prediction make logical sense when based on an inference from only one of the components.

In fact, after reviewing empirical studies of founding, we determined that reliance on arguments about the rate of founding attempts is the most popular mode of theorizing among organizational ecologists.[12] For illustration, Table 8-1 provides classifications of some selected studies that adopt this approach. More abstractly, we suggest that, as currently developed,

theories about founding that focus on the following mechanisms tend to use the rate of founding attempts: legitimation processes of various kinds (Marrett, 1980; Hannan, 1984; Studer-Ellis, 1995; Hannan & Carroll, 1995) including those associated with laws and regulations (Dobbin & Dowd, 1997; Wade, Swaminathan & Saxon, 1998); freed organization-specific resources (Delacroix & Carroll, 1983), including labor (Haveman & Cohen, 1994); collective action processes that increase visibility, commitment, solidarity (Carroll & Swaminathan, 2000); and niche formation (Swaminathan & Delacroix, 1991; Swaminathan, 1995).

But other ecological studies and theories about founding do rely on arguments about the success of founding attempts. Typically, these point to market or other environmental conditions that should serve to increase the viability or fitness of a particular type of organization, whose founding rate is then expected to increase. Table 8-1 also provides some illustrative quotes of studies of this type. In terms of general mechanisms, we suggest that, as currently developed, theories relying on the following tend to use the rate of success: competition processes, including density (Hannan, 1984), niche width (Dobrev, Kim & Hannan, 2001), niche overlap (Baum & Singh, 1994), and experience distributions (Barnett & Sorenson, 2002); differentiation processes, including resource partitioning (Carroll, 1985); collective action processes that provide support and defense for a set of organizations (Hannan & Freeman, 1987); and trust engendered through homophily (Ruef et al., 2003).

To make these theories and studies more useful to the entrepreneurship area, we suggest that analysts should attempt to complete the conceptualization across the sequence of rates and work through the implications at the individual level (for an admirable example, see Ruef, 2004).[13] While tight coupling of the component rates may be the easiest and most straightforward way to accomplish this task, we personally doubt that it is the most interesting and, ultimately, the most sociologically valid. Widely held notions of bounded rationality suggest that while expectations about the future may guide individual behavior, common social situations are frequently filled with uncertainty, ambiguity and imperfect information, thereby making them tenuous at best.[14] Much of the recent literature on entrepreneurship builds on these notions in attempting to construct a new model of entrepreneurship (see Ruef et al., 2003). If properly integrated, ecological theories and studies might provide fresh ideas and evidence for the enterprise. For instance, Ruef (2004) shows that entrepreneurial inertia, slowness in moving to the operational stage of organization, may induce cycles in the evolution of the organizational population.

TABLE 8-1 *Illustrative arguments drawn from ecological studies of founding*

Arguments about the rate of attempts	*Arguments about the success of attempts*
Potential entrepreneurs react to signals, created by previous failures, foundings, and new niches. Delacroix, Swaminathan and Solt (1989)	Success in building a concrete organization depends on the availability of resources, both human and material...founding rates rise when the level of resources rises... Hannan and Freeman (1987)
Organizational failures in the previous year may act as a signal of a poor environment for league success to entrepreneurs so as to slow the founding rate in the subsequent year. Land et al. (1994)	Increasing concentration frees peripheral resources that allow more foundings at the niche periphery. Swaminathan (1995)
When ethnicity is highly salient, the niche for ethnic organizations expands inducing members to build ethic organizations. When society is polarized, it becomes dangerous to erect and strengthen ethic boundaries. West (1995)	Competitive relationships can be asymmetric, i.e., expansion in one population may legitimate the other, but growth in the second may worsen the life chances of the first by eroding its resource base. Lomi (1995a)
Potential founders will be more sensitive to local variations in the levels of legitimation and competition because of limits in their capacity to collect information on non-local resource conditions and because of the ambiguity involved in interpreting events in more distant sites. Lomi (1995b)	Organization density initially opens opportunities for protest and organization building, but later closes them. Growing density of SMOs establishes a resource and institutional space facilitating mobilization by other movements. Minkoff (1997)
Most new policies create constraints and incentives, rather than dictating firm behavior, and managers conduct new business strategies taking them into account. Dobbin and Dowd (1997)	Cross-movement adoption of tactics entails inter-movement competition, which in turn impedes a movement's ability to mobilize social support. Olzak and Uhrig (2001)
State-level anti-alcohol prohibition frees resources... entrepreneurs in neighboring states found breweries. Breweries in the prohibition state also have an incentive to shift their production to adjacent states. Prohibition's normative effect: entrepreneurs less likely to found new breweries, because they fear losing investments. Wade et al. (1998)	Foundings occur at a higher rate in industrial clusters because in such areas entrepreneurs more likely obtain the resources necessary for launching new firms. Stuart and Sorenson (2003)
Entrepreneurial action occurs within a web of social relations that both enable and constrain activity ...dense local concentrations of structurally equivalent organizations increase the pool of potential entrepreneurs in a region, thereby increasing founding rates. Sorenson and Audia (2000)	
Political instability leads to economic recession, which in turn diminishes the willingness of entrepreneurs to commit resources and invest capital, given the uncertainty of future returns. Dobrev (2001)	

Rate of Mortality (Success of New Ventures)

The entrepreneurship literature concerns itself not only with the founding of new organizations but also with their viability in early years. Within this tradition, ecological studies are notable because of their comprehensiveness of coverage, often including observations on all organizational members of a historical population (see Carroll & Hannan, 2000). In our view, the ecological design provides a sounder basis for inference about many questions of interest and sometimes leads to different findings.

For instance, it seems to us that most scholars of entrepreneurship assume that new organizations are at a higher risk of failure than established firms (Venkataraman, 1997). But a long tradition of ecological studies of historical populations now suggests that this assumption is wrong. Specifically, two different streams of empirical research find that new firms do not display higher mortality rates than those of established organizations. One stream of research, concerned with modeling age-dependence, focuses on how survival rates of firms change as they gain experience in a focal industry. The second stream of research compares survival rates by entry mode, in particular, of new ventures with those of pre-existing entrants from other industries.

Age Dependence

The key objective of research on age dependence in organizational mortality is to understand how and why the viabilities of organizations change as their tenure in a market increases (for reviews see: Hannan, 1998; Carroll & Hannan, 2000; Carroll & Khessina, 2004). Initially, organizational ecologists took a position similar to that of students of entrepreneurship: they assumed that newly founded organizations fail at a higher rate than older firms (Carroll & Delacroix, 1982; Freeman, Carroll & Hannan, 1983). In terms of modeling, this view implied organizational mortality rates with negative (or declining) age dependence. Theoretical support for this belief originated with Stinchcombe (1965), who argued that new organizations do not possess well-developed organizational routines and employment structures and established relationships with environmental actors. As a result, new firms are capable of only suboptimal operation and are at a high risk of failure. Over time, however, as surviving new ventures develop organizational routines and establish relationships with the environment, they operate more efficiently and their mortality rates decrease. Evidence of this "liability of newness" is found in many early empirical studies in ecology (Carroll & Delacroix, 1982; Freeman, Carroll & Hannan, 1983; Singh, Tucker & House, 1986; Olzak & West, 1991).

Beliefs about negative age-dependence were later amended in the light of new theoretical and empirical developments. Some scholars propose that organizations might be subject to a "liability of adolescence." They argue that at the time of founding, firms enjoy relatively low mortality rates, because they can draw from the initial resource endowment. During the first months or years of operation, as the initial supply of resources gets exhausted, the mortality rates of new firms increase. Subsequently, failure rates decrease, because in the process of aging, firms develop operational routines and environmental positions (Carroll & Huo, 1987; Brüderl & Schüssler, 1990; Fichman & Levinthal, 1991). Because mortality rates are still seen as declining over most of an organization's life, this view is often regarded as a modification or refinement of the negative age dependence pattern rather than a contradiction (Hannan, 1998).

A recent set of studies challenge the very idea of negative age dependence. They find that organizations exhibit positive age dependence in mortality, meaning that older organizations fail at a higher rate than young firms. In interpreting these findings, scholars argue that as firms get older, they are more likely to deplete their resources and become misaligned with the changing environment (i.e., experience a "liability of obsolescence"), and develop dysfunctional capabilities, such as political coalitions and the like (i.e., experience a "liability of senescence"). Positive age dependence has been detected in a number of empirical studies, including especially those that control for the time-varying effects of organizational size, something that previous studies did not (Barron, West & Hannan, 1994; Hannan, 1998; Khessina, 2003).

Entry Mode

The second stream of ecological research that provides insight into understanding the viability of new ventures examines entry mode. It explores how and why firms entering an industry as new ventures (*de novo* firms) and those entering by diversification away from another industry (*de alio* firms) differ in their survival chances.

Analysts typically assume that at the time of entry into the industry, start-ups and diversifiers differ systematically in their initial resource endowments and prior experiences. These differences, in turn, ought to create variations in organizational survival (Bruderl & Schussler, 1990; Carroll, Bigelow, Seidel & Tsai, 1996; Freeman, 1990; Hannan, Carroll, Dobrev & Han, 1998; Mitchell, 1994). A basic prediction contends that *de alio* firms enjoy significant advantages in survival, because at the time of entry they possess more resources and greater experience than *de novo* firms.

The initial advantage of *de alio* firms has been documented in numerous empirical studies, spanning industries, countries, and historical

periods. Specifically, it has been shown that *de alio* firms exhibit significantly lower mortality rates than *de novo* firms in the following populations: American labor unions (Hannan & Freeman, 1988), U.S. semiconductor producers (Freeman, 1990; Barnett & Freeman, 2001), in the population of new firms in West Germany (Bruderl, Preisendorfer & Ziegler, 1992), U.S. automobile manufacturers (Rao, 1994; Carroll et al., 1996), facsimile transmission service organizations in Manhattan (Baum, Korn & Kotha, 1995), British, French, and German automobile producers (Hannan et al., 1998; Dobrev et al., 2001), U.S. television receiver manufacturers (Klepper & Simons, 2000), and U.S. computer companies (Swanson, 2002; Barnett et al., 2003).[15]

In studying the U.S. automobile industry, Carroll et al. (1996) elaborate on the basic argument that *de alio* firms possess survival advantages. They reason that *de novo* firms enjoy greater flexibility and that, over time, this fact shifts the comparative advantage to *de novo* firms if the environment changes fast enough. Empirical studies in the U.S. automobile industry (Carroll et al., 1996), in the British, French, and German automobile industries (Hannan et al., 1998), and in the U.S. medical equipment industry (Mitchell, 1994), show, indeed, that while mortality rates of *de novo* firms are initially significantly higher that those of *de alio* firms, the survival rates of *de novo* firms converges with those of *de alio* firms as firms' tenure in the focal industry increases.

Despite the evidence about *de novo* and *de alio* firms' differences in their organizational outcomes, questions remain about the mechanisms driving them. In addressing this deficiency, Khessina (2003) speculates about the relationships between entry mode and innovative behavior, on the one hand, and entry mode and product dynamics, on the other hand. She suggests that the greater flexibility of *de novo* firms should allow them to innovate at a higher rate than *de alio* firms, but more developed organizational competence should allow *de alio* firms to attain more beneficial product outcomes.

Khessina's (2003) empirical analysis of product innovation rates in the worldwide optical disk drive industry during the period of 1983 to 1999 confirms much of this speculation. She finds that *de novo* firms do, in fact, innovate at a higher rate in their products than *de alio* firms.[16] *De alio* firms, however, display an advantage at product dynamics: their products show longer market life and generate stronger competitive pressures (Khessina, 2003; Khessina & Carroll, 2002). Given these countervailing effects, it is not surprising that although *de novo* firms show higher failure rates than *de alio* firms in this industry, the difference is not statistically significant. Otherwise, this non-effect would be an odd result given the vast empirical evidence of the survival advantages of *de alio* firms reviewed above (but see Banbury & Mitchell, 1995, for another exception).

KEY DISTINCTIONS IN PROCESSES DRIVING FOUNDINGS

Ecologists approach the study of organizational foundings from a variety of viewpoints and conceptual frameworks. Indeed, the difference around which we organized the review of empirical studies in the above section represents one such background conceptual variation, namely, whether theoretical arguments rest primarily on ideas about the ease of launching founding attempts or on ideas about the likelihood that such efforts will succeed in producing a founding. Another related conceptual difference lies in the degree to which ecologists emphasize the causal importance of entrepreneurs' assessments of market openings versus the facilitating role played by available resources and institutional gatekeepers. For instance, the theory of resource partitioning (Carroll, 1985) predicts that market opportunities arise in certain environmental conditions and that entrepreneurs will appear with organizations designed to exploit these opportunities; by contrast, Halliday, Powell and Granfors (1987) argue that state associations should be founded at higher rates in environments where organizational knowledge has accumulated because founding costs will be lower.

In this section, we identify and discuss three additional conceptual or theoretical differences in the ways ecologists typically seek to account for variations in foundings. These are differences about the roles of: (1) macro vs. task environments, (2) endogenous vs. exogenous processes, and (3) agglomeration vs. differentiation. It is our view, that while an analyst's position on one or more of these issues is frequently used as a point of emphasis, the underlying theoretical differences are usually not investigated or appreciated in their entirety. We think that theory and research would be improved if these differences rose to the level of debate and spurred competitive empirical tests. At the current moment, we know little about the relative importance of many of the detailed effects documented in the literature.

Macro Environment vs. Task Environment

One difference in the ways ecologists analyze foundings involves the degree of specificity (or proximity) conceptualized in environmental variables. Many studies include variables measuring some aspect of the macro socio-economic environment (e.g., GNP, war-year dummies, depression-year dummies, collective violence), while others include variables that impinge more directly on the focal population, variables that organizational theorists sometimes refer to as part of the "task environment" (e.g., product market size, number of competitors, prices of supplies, prohibitions of various kinds). In the typical study, both types of variables are included but the theoretical

and analytical focus lies almost exclusively with the task environment variables; the macro environmental variables are treated as controls.

An interesting popular variable in this context is population age, a measure of the time elapsed since the first appearance of an organization in the population. This variable is often used in model specifications but it has been treated in various ways, as part of the macro environment and as part of the task environment. While commonly regarded as a control, population age has also been seen as reflective of some underlying process. For instance, Halliday et al. (1987) suggests that population age reflects the accumulated stock of organizational knowledge in a population. In the most developed theory, Hannan (1997) argues that population age tracks population inertia, the process by which organizational processes become structurally locked in and institutionalized.

Our view is that ecologists in general have been too casual in their treatments of the macro environment, simply taking whatever data is handy and regarding macro variables as providing controls so as to avoid interpretation. The problem is that while these variables often show big effects, the effects often vary across studies and specifications; inclusion or exclusion of these variables in a model often affects the findings for the variables of primary theoretical interest. Accordingly, we suggest that research would be improved if greater attention were paid to these specifications. We also suggest it would improve the situation if researchers were expected to make substantive interpretations of these effects, which could then be compared across studies. At least then anomalies could be identified as such. Although it is a long way off, this approach might ultimately lead to a conceptual framework for theory about the macro environment, something current practice seems unlikely to generate.

Endogenous vs. Exogenous Processes

Perhaps the most active broad conceptual difference in the way ecological analysts approach the study of organizational founding concerns whether they focus on endogenous or exogenous processes. Broadly defined, in this context endogenous processes are those that involve the postures and interactions of the individual entrepreneurs and organizations, while exogenous processes are those that involve individual and organizational responses to extra-population agents and social infrastructures, including the state, professional bodies and norms.

Within the endogenous approach, we would place processes of density dependence, niche overlap, organizational differentiation and resource partitioning. Density dependence theory holds that foundings decrease in high-density populations (Hannan, 1984). Whether this is because

entrepreneurs avoid highly competitive settings and thus attempt fewer foundings, or because their attempts are less likely to succeed, remains unresolved.

Research on niche overlap looks at individual organizational niches and identifies their points of intersection, as when, say, two banks target the same consumer market with similar products within a geographic locale. Theory predicts that areas in the population's niche space with less overlap will experience higher numbers of foundings. Arguments about organizational differentiation use very similar logic but extend it to proximity in non-overlapping areas of the niche space. By this view, proximity in the niche space indicates competition. Empirically, studies of agglomeration often analyze, separately, one-dimensional continuous representations of niche space, say geographical location or price.

Resource-partitioning theory holds that when large generalists dominate a market, they cover a central position where most environmental resources are located – thereby leaving open previously occupied space in the periphery of the market. Under such conditions, the theory expects specialist organizations to be founded in the less competitive periphery. This argument, like those of niche overlap theory and organizational differentiation, assumes (at least implicitly) that aggregate entrepreneurial behavior is strongly rational in the sense that highly competitive contexts will show fewer foundings than less competitive ones.

None of these arguments, however, advances very specific characterizations about individual entrepreneurial behavior, its motivations or its consequences, thus making difficult the sort of conceptual links advocated above. Frequently, theorists explain their predictions by resorting to implicit rational behavior. For instance, Hannan and Freeman (1989: 132) claim that "Given a set of environmental conditions that set a carrying capacity, the more abundant the competitors, the smaller will be the potential gains from founding an organization at a given level of demand for products and services." At other times, as with Carroll and Swaminathan's (2000) resource partitioning analysis of the microbrewery movement, entrepreneurs appear to be passionately driven by social movement-like goals. But, conceptually speaking, there should be no doubt that most theories of competition leave plenty of room for a fully rational interpretation, whereby individual entrepreneurs attempt more foundings when conditions are favorable and these attempts are more likely to meet with success in the same conditions.

For exogenous processes, broad historical changes in the normative order of a population are often well known at the time of study. Research that resorts to descriptions of these broad sweeping changes, or interpretations of such based on historical time or period effects, runs the risk of restating what seems obvious to those who know the history (e.g., Studer-Ellis's, 1995, description of the evolution of women's colleges). The difficulty for empirical

research lies with identifying specific environmental actions or events that drive these processes. To accomplish this task, researchers often look to governmental actions as well as those of professional bodies that lie within the institutional domain.

In our view, there is no applicable general theory about how entrepreneurs react to exogenous institutional and governmental changes in the environment. These studies almost always base their predictions on a detailed understanding of how particular types of entrepreneurs and organizations are likely to react to specific institutional developments. Some of them make arguments about how newly available organization-specific resources are likely to encourage or thwart entrepreneurs. For instance, Tucker, Singh and Meinhard (1990) show that initiation of a governmental funding program for social service in Canada (Opportunities for Youth) increases the rate of founding of voluntary social services program; and, conversely, a subsequent funds reduction program by the government (Provincial Restraint) lowers the founding rate. Likewise, Swaminathan (1995) demonstrates that passage of a law allowing farm wineries to operate under special rules leads to a higher founding rate of specialist wineries. Similarly, Ingram and Inman (1996) show that development of a tourist park around Niagara Falls (as a result of public investment) generates a higher hotel founding rate. In a study of African-American protest organizations, Minkoff (1995) finds that the availability of outside funding yields more new organizations.

Wade et al. (1998) offer a more subtle analysis in their study of the effects of state-level prohibitions on brewery founding. They argue that prohibitions in adjacent states initially increase foundings in a focal state because consumers will seek products there; however, as the number of adjacent states with prohibitions increases, the effect reverses and dampens foundings because these developments reflect general normative changes about alcohol.

Other studies of how exogenous processes affect founding typically look at broad governmental actions and trace their effects to particular populations. For instance, Dobbin and Dowd (1997) document the ways in which federal pro-cartel and anti-trust policies affect the founding rate of railroads; they also examine the effect of public capitalization of corporations. Similarly, Studer-Ellis (1995) shows that passage of women's suffrage laws in the U.S. increases the founding rate of women's colleges.

The best of these studies examines both specific and general institutional changes and ties them to founding processes in subtle and unexpected ways. For instance, Simons and Ingram (2002; 2004) show the complex ways that organizational foundings of the ideologically charged (utopian socialist) kibbutz organizational form are affected by the political environment of Israel–manifested in state establishment, political violence,

size of the Jewish population, and the densities of politically competitive organizations (Moshav and capitalist corporations). They find that the kibbutz founding rate is enhanced by the size of the Jewish population, and lowered by the density of the ideologically oppositional capitalist organizational forms and Moshav organizations. They also find that the rate is usually lowered when the state takes on greater authority (i.e., establishment of the state in Palestine and Israel). However, they also find that political violence raises the founding rate, as does location in a politically contested geographic region.

Whether looking at specific or broad exogenous changes, the underlying model of individual entrepreneurial behavior used by institutional theorists is typically not well specified; and arguments about, or implying, individual behavior are often incomplete and inconsistent. Nonetheless, in our view, most of these arguments concern primarily actions that facilitate attempts at foundings rather than the success of those attempts. Enabling laws, public funds and resources, and norms about appropriate ways to organize all likely affect entrepreneurial perceptions about opportunity. In fact, these actions may over-stimulate such perceptions, leading to overly high numbers of organizing attempts, thus making success at founding less likely.

Agglomeration vs. Differentiation

The final conceptual distinction we consider is between those studies that posit forces of agglomeration as driving organizational foundings as opposed to those that focus on differentiation processes. When niche space is explicitly operationalized and entrepreneurs are assumed to be rational and possessing accurate market knowledge, this conceptual difference is clear and straightforward. For instance, Baum and Haveman (1996) predict hotel foundings in Manhattan by assessing geographic positions on two separate dimensions of niche space: room price and hotel size. They find that hotels tend to locate near similar hotels on the price dimension, thus showing agglomeration effects (as entrepreneurs are assumed to benefit from spillovers in this situation), but avoid similar hotels on the size dimension, thus showing differentiation tendencies (as entrepreneurs are assumed to benefit from avoiding head-to-head competition on size).

With such assumptions and an explicit representation of niche space, empirical analysis readily tells which force operated in producing an observed pattern of foundings. It is much more challenging, however, to specify *a priori* which force will operate on a given dimension and to explain why. It is also more complicated, but potentially more interesting, if we do not assume rationality or accurate market knowledge on behalf of the entrepreneurs. In other words, we need a better theory about the conditions and mechanisms behind the operation of agglomeration or differentiation.

In many ecological studies of founding, the agglomeration/ differentiation distinction is only implicit, perhaps because only one or the other of the processes is entailed in the main argument advanced. For instance, several empirical studies examine the role of population niche overlap and non-overlap in generating foundings (Baum & Singh, 1994; Baum & Oliver, 1996), with expectations that foundings will be more prevalent in areas of non-overlap than those of overlap. Such an approach relies on the differentiation principle and assumes that entrepreneurs are at least intendedly rational in avoiding direct competition along the dimensions contained in the overlap measure.[17] Similar assumptions are implied, we suggest, in the usual predictions about founding drawn from theories of density dependence (competition component only, Hannan, 1986), resource partitioning (Carroll, 1985), and Red Queen competition (Barnett & Sorenson, 2002), although in many of these cases the implied differentiation in the face of high competition is not elsewhere within the population but in another population.

Studies that rely on the logic of agglomeration also invoke a variety of specific mechanisms including economic benefits that spillover (Baum & Haveman, 1996), legitimation (Hannan & Carroll, 1992; Studer-Ellis, 1995), collective action (Carroll & Swaminathan, 2000; Swaminathan & Wade, 2001), and social networks (Sorenson & Audia, 2000). With the exception of spillover economic benefits, what is especially interesting about these mechanisms is that they do not require assumptions about entrepreneurial rationality or knowledge in order to operate. For instance, in discussing how social networks operate to induce foundings in the footwear industry, Sorenson and Audia (2000: 426) claim that, "...entrepreneurial action occurs within a web of social relations that both enable and constrain activity...dense local concentrations of structurally equivalent organizations increase the pool of entrepreneurs in a region, thereby increasing founding rates." Here there is no implication that these entrepreneurs are individually rational or that they possess (or think they possess) any information about what will lead to market success. Instead, they are propelled into action because of the pressures that affect information that comes to them by virtue of their location in the social structure.

EMERGING RESEARCH AREAS

A number of new research questions concerning the founding rates of new ventures have been addressed recently by organizational ecologists. Progress has been made in understanding how entrepreneurs move from preproduction activities into production, why established firms spin-off new ventures, how new venture formation is related to niche position, what the

dimensions of market niches are (with special emphasis on identity), and how social movement-like behavior arises (how niches are socially constructed).

Preproduction/Initial Organizing

Although many ecologists consider the founding of a new organization to be a result of a sequential two-step process (as discussed above), very little is known about what happens between an organizing attempt and an actual founding. Many entrepreneurs manage to mobilize initial resources, register their organizations, and even create a prototype of their product or service, but do not yet deliver their products to the market. Ecologists and others call such organizations and their organizers preproducers (Carroll & Hannan, 2000; Jovanivich, 2004) or preoperational entrants (Ruef, 2004). Recent research has made some progress in understanding factors affecting the activities and fates of preproducers.

Carroll and Hannan (2000) suggest that the rate at which entrepreneurs enter into preproduction depends on organizational density. Assuming that entrepreneurs react to changes in the environment, preproduction attempts should increase during the legitimation period of industry evolution (when resources abound, founding attempts succeed and mortality rates are low) and decrease during the competition period (with scarce resources, founding and survival prospects are dull). However, analysis of the U.S. automobile industry reveals that the rate of initiation monotonically increases with the density of either producers or preproducers (Carroll & Hannan, 2002). This pattern makes sense if preproducers require only limited resources.

Another important question about preproducers concerns how they assemble human resources. Ruef et al. (2003) propose that the membership of preproducer teams draws from preexisting social networks as well as ecological constraints on the availability of others. Such recruitment processes will likely reflect homophily, disproportionate similarity based on gender, family, and ethnicity. In other words, entrepreneurs are likely to recruit their team members among people they have strong ties with (i.e., family, friends, and colleagues).

In studying organizational founding teams sampled from the U.S. population, Ruef et al. (2003) find indeed that the composition of founding teams is primarily homophily-driven. That is, founding teams are composed disproportionately of persons of the same gender, ethnicity, and occupation. The drive toward homophily is so strong that it overcomes the necessity for (functional) occupational diversity in entrepreneurial teams. This study also finds that social networks strongly affect team composition, with team members being drawn disproportionately from persons possessing strong

social ties with other team members (strangers and those with weak ties are not more likely to be included). Both findings suggest a theoretical interpretation that entrepreneurs are more likely to rely on persons they are comfortable with and trust rather than persons who might hold needed technical and other skills but differ socially. Finally, the study also finds some weaker support for the notion of ecological constraint, which holds that numerical minorities become disproportionately isolated in the team composition process because of their relative lack of availability. That is, numerical minorities are more likely to become solo entrepreneurs.[18]

How long does it take preproducers to move into the production stage and start shipping their products to the market? What determines the length of the transition from preproduction to production? Schoonhoven, Eisenhardt and Lyman (1990) propose that entrepreneurs' characteristics, as well as organizational and environmental factors affect the transition time into production. The transition takes longer in industries with a high level of technological change and in industries with intense competition. Ventures founded by entrepreneurs with either relevant industry experience or experience in starting ventures, or by former colleagues display a shorter transition time in the semiconductor industry. Contrary to expectations, abundant financial resources slow this transition. Attributes of entrepreneurs do not have any significant effect.

Schoonhoven et al. (1990) assume that all preproducers sooner or later become producers. Yet in the real world this transition may never occur. Carroll and Hannan (2000) find that in the U.S. automobile industry during 1886 to 1982, only 11% of 3,845 preproducers were able to move to the production stage. What factors affect the probability that a firm succeeds in becoming a full-fledged producer?

A firm's successful movement from preproduction into production may depend on a variety of factors. Hannan and Freeman (1989) propose that success in the transition differs across organizational forms. For example, complex organizations (which are difficult to build) likely spend more time in the preproduction stage and may never move into the production. Hannan and Freeman further suggest that the probability of successful transition may depend on a preproducer's ability to understand the industrial environment. The more difficult it is to predict the future, the less likely is the successful transition from preproduction to production. Since the ability to forecast the future declines with the length of the forecast period, firms that spend a long time in preproduction are less likely to move into production. Carroll and Hannan (2000) find partial support for this proposition when analyzing transitions from preproduction into production in the U.S. automobile industry. They establish that the transition rate is nonmonotonically related to the time a firm spent in preproduction. Specifically, the rate of a preproducer's transition into production is very low for the first half-year in

preproduction, then increases rapidly through year six, and then declines slowly. Carroll and Hannan (2000) also find that the transition rate depends strongly on preproducer density and weakly on producer density. The transition rate increases with increasing preproducer density, at low densities, but decreases with increasing either producer or preproducer density, at high densities.

Besides interest in the transition from preproduction to production, organizational ecologists also study how preproduction activities affect organizational and industrial evolution. Carroll and Hannan (2000) propose that the density of preproducers in the industry has similar effects on legitimation and competition processes, and, therefore, on organizational founding rates, as the density of producers. Specifically, at low densities, an increasing number of organizing attempts should enhance the taken-for-granted status of a population by facilitating recognition of the organizational form by society, facilitating collective action by the populations' members, and accelerating collective learning about the form. At high densities, the preproducer density should increase competition for the limited resources as the population reaches its carrying capacity. As expected, these inverted U-shaped effects of preproducer density are found in a study of American automobile producers (Carroll & Hannan, 2000). Moreover, these effects are weaker than those of the producer density, because (it was speculated) preproducers have lower social visibility than producers. The idea of different social visibility of preproducers and producers is further supported by Ruef's study (2004) of the establishment rates of medical schools in the U.S. He finds that the density of operational schools (i.e., producers) shows greater impact on the entry rate than does the total density of preoperational and operational schools (i.e., preproducers and producers) because of social visibility.

Not all new entrants go through preproduction activities before entering the industry. Some new ventures start production as soon as they collect resources (Carroll & Hannan, 2000). Are there any differences between *de novo* entrants with and without preproduction experience? Carroll et al. (1996) propose that preproduction activities may help *de novo* firms build capabilities and accumulate resources before entering into production. Consequently, *de novo* firms with preproduction experience should have lower morality rates initially than those without such an experience. Firms with preproduction experience, however, are likely to be more inertial. Therefore, as time passes and the environment changes, the mortality rates of *de novo* firms with preproduction experience may become higher than those of *de novo* organizations without such an experience. Carroll et al. (1996) find empirical support for these predictions, analyzing the American automobile industry. In a similar vein, analyzing U.S. medical schools, Ruef (2004) finds that organizations with longer preoperational tenures enjoy better survival

chances. He interprets this finding as entrepreneurial inertia and shows that it can induce cycles in the size of organizational population.

Research on preproducers is still in its infant stage. There is a need for a better theory explaining which firms are capable of making the transition from preproduction into production and what the consequences of this transition are. Toward this end, the formal model advanced by Jovanovic (2004) to explain waiting times between the preproducer and producer stages should prove very influential.

Spin-offs

A central question of entrepreneurship research asks where the entrepreneurs come from, and how their origins affect venture performance. Recent research in organizational ecology makes contributions to the understanding of this issue by studying entrepreneurial activities initiated by industry veterans (i.e., spin-offs). This research explores a number of issues, such as what firms are likely to produce spin-offs, whether spin-offs differ in their performance from other ventures, and what effects spin-offs have on the performance of their parent companies.

Brittain and Freeman (1986) initiated ecological research on spin-offs. They suggested that organizational differences predict the rate at which employees leave firms to start their own businesses. When analyzing the semiconductor industry in the Silicon Valley, they found that firms are more likely to generate entrepreneurs when they experience an external shock, such as outside succession of a chief executive or the recent acquisition of the firm by a non-semiconductor firm. Firms with blocked career mobility, measured as firms with low growth rates, show a higher rate (though the effect was weak) of spin-offs as well. Employees working for generalist firms are more likely to start ventures, allegedly because they are exposed to the variety of knowledge and skills at their parent firms useful for starting ventures. More innovative firms also tend to generate more entrepreneurs. Somewhat surprisingly, effects of the environment, including organizational density, are weak and inconclusive.

Current research continues to focus on the factors that influence the rate at which firms spawn spin-offs (see Klepper, 2001, for a review). Ecologists continue to make contributions to understanding the issue of employees' ventures by focusing not only on the precedents but also on the consequences of spin-offs for both parental companies and their progenies. For example, Philips (2002) suggests that industry veterans transfer both routines and resources from their former companies to their ventures. Since transfer of routines and resources help new ventures to survive through the first difficult years, the greater this transfer, the higher the survival rate of

spin-offs. Parental companies, in turn, may experience negative consequences from the lost resources and, as a result, suffer worse performance and reduced survival chances when they generate spin-offs. Philips (2002) finds support for these predictions analyzing Silicon Valley law firms. Another interesting finding of his study is that firms founded by people who left failing law firms show lower survival chances than non-spin-offs.

Founding by Niche Position within a Population

The success of new venture initiation and survival may depend on the specific resource niche in which the venture is founded. Many industries consist of multiple potential resource niches, and whereas some of these niches provide a fertile ground for new ventures, others can be difficult to enter and survive in. In our view, work on resource-partitioning theory has motivated interesting theoretical and empirical developments about the founding rates of new ventures in different resource niches (Carroll, 1985; for a review, see Carroll, Swaminathan & Dobrev, 2003).

As mentioned above, resource-partitioning theory proposes that (given specific environmental and organizational conditions) when market concentration goes up, the number of new venture foundings may paradoxically increase, whereas their mortality rates decrease. This process is driven by the partitioning of the resource space, so that different types of organizations operate successfully in different resource niches and do not compete directly with each other. Large generalist organizations strive to occupy the center of the market where they can exercise economies of scale. As competition intensifies, weaker generalists exit. Winning generalists get larger but paradoxically they leave some resource space on the industry periphery unused. Peripheral niches are not very appealing to generalists because of the diseconomies of scale but are attractive enough for small specialists. Since much of the peripheral space emerges as market concentration increases, greater numbers of smaller firms can successfully enter the growing peripheral niches. Therefore, industries that experience resource partitioning provide fertile ground for founding new ventures.

By entering and filling peripheral niches, new ventures may expand these niches and eventually render them quite attractive in terms of economic returns. As a result, peripheral niches that were not appealing in the past may become attractive in the present to generalist organizations. For example, the brewing industry in the 1980s was dominated by a handful of large mass producers that made few varieties of generic beer. Then small brewers came into play by producing high-quality specialty beer. Although the market for the specialty beer was initially very small, it grew large and eventually attracted the attention of mass producers (Carroll & Swaminathan, 2000).

However, despite later active attempts, generalists were not able to occupy these new niches. Resource-partitioning theory describes several mechanisms explaining why even when peripheral niches become attractive, generalist producers cannot enter them, whereas entrepreneurs have a substantial advantage over established firms both in terms of entry and survival.

One mechanism is authenticity of an organizational form that a firm embodies. Carroll and Swaminathan (2000) propose that in order for a firm to be approved by external observers, it has to offer products or services that are authentic to its organizational form or identity. In the study of the U.S. brewing industry, Carroll and Swaminathan identify four different organizational forms: large mass producers, microbrewers, brewpubs and contract brewers. Microbrewers and brewpubs produce and sell high-quality specialty beer, usually on the production site. Their organizations resemble 19th century craft-like production firms and their consumers respond to an anti-mass production sentiment. Although specialist brewers began on the market periphery, over time they built an attractive, expanding market niche. When mass producers tried to move into this niche, they failed because customers perceived their product as inauthentic and refused to buy it. It is interesting that although contract brewers are also specialists they did not hold the same form identity as microbrewers and brewpubs, because they sell specialty beer they did not make themselves. The illusory identity of a specialist firm helps contract brewers succeed better than mass producers in the midst of the anti-mass production sentiment, but they do not perform as well as either microbrewers or brewpubs.

Another mechanism that may prevent generalists from occupying profitable peripheral niches is service customization. For instance, in the Dutch audit industry, large generalists can provide service to any firm. However, many small client firms prefer to deal with small specialized audit organizations, because the latter are more willing to cater to their specific (changing) needs (Boone, Carroll & van Witteloostuijn, 2002). Among Silicon Valley law firms, small specialist law firms are preferred by many clients to large generalists, because specialist firms provide personalized service, whereas generalists firm are not willing to be so accommodating to small clients (Jaffee, 2002).

New ventures may also have a higher founding rate in markets that are partitioned based on conspicuous status consumption. In industries where environmental uncertainty is low, small specialist organizations may achieve high status, which generalists cannot replicate by the nature of being big and unfocused. For example, conspicuous status consumption is clearly observed in the California wine industry where only small specialist wineries are perceived as "boutique", "chateau", and "farm wineries" (Swaminathan, 1995). These wineries are associated with production of a wide variety of low-volume, high-value-added products that are appreciated by customers

who consider wine consumption as a sign of status. Such customers avoid buying similar wine from mass-production wineries, because mass producers do not posses high status. When environmental uncertainty is high, however, consumers are likely to attach high status to generalist firms, as occurred in investment banking (Park & Podolny, 2000). Generalists with high status are very unlikely to enter low status niches even if profitable, because this action can damage their prestige (Podolny, 1993). Thus, in markets partitioned along a status dimension, small firms do not directly compete with large ones. Therefore, new ventures can be successfully founded in niches with an appropriate status.

Resource space can be partitioned by geography. Geographic areas not attractive to generalists may provide a fertile ground for founding new firms (Lomi, 1995a, 1995b). Moreover, geographic co-location near other organizations of either similar or complementary forms may prove attractive (Sorenson & Stuart, 2001; Stuart & Sorenson, 2003).

Finally, the resource space can be partitioned along technological dimensions. Recent research suggests that new ventures are more likely to be founded and to survive in certain technological niches. Khessina (2003) proposes that *de novo* firms do better than *de alio* firms in niches at the technological frontier. Such differentiation happens because *de novo* firms possess greater flexibility in their internal routines and their relationship with the environment that allows them to be more innovative than *de alio* firms. She finds empirical support for this idea while analyzing product innovations in the worldwide optical disk drive industry. Interestingly, she did not find that *de novo* firms have a higher failure rate than *de alio* firms; she attributes this finding to the importance of innovation in this industry and the superiority of *de novo* firms at innovation. Khessina and Carroll (2002) pursue this idea further by looking at product demography to understand the technological niches that firms compete in. It turns out that new ventures generally compete at the high end of technology, whereas preexisting firms are evenly spread out.

Identity Space as a Resource

Success in founding a new venture depends not only on physical resources but also on socially constructed resources. Specifically, venture formation may be affected by the ecology of organizational form identities.

Industries usually host more than one organizational form. For instance, the brewing industry consists of mass producers, microbrewers, brewpubs, and contract brewers (Carroll & Swaminathan 2000). Organizational forms can be distinguished by the identities attached to them. Identity is a system of descriptive and prescriptive codes that connote

cognitive recognition and imperative standing (Pólos, Hannan & Carroll, 2002). Identity delineates the magnitude of actions that a firm may undertake without violating expectations of its audiences. For example, consumers expect specialty beer to be brewed by traditional hand crafted methods. Therefore, it is not surprising that consumers perceive specialty beer as authentic only if it is made and sold by microbrewers and brewpubs but not by mass producers and contract brewers. On the other hand, consumers who prefer generic beer are likely to buy such from mass producers. The example of the brewing industry shows that identity is an important resource and the industry is usually partitioned into different identity spaces. Entrepreneurs are more likely to succeed in their attempts to found firms when they choose an appropriate identity for their ventures.

Ruef (2000) conducted a broader study examining how new organizational forms emerge in the health care sector of the U.S. Between 1965 and 1994, he counts 19 new forms emerging, complementing a pre-existing set of 29 forms. Ruef's analysis focuses on the emergence of these 19 new forms as social identities. In particular, he develops testable arguments about form emergence, drawing from institutional (regulatory acts and government funding) and ecological (density dependence, competition, symbiosis, and punctuated equilibrium) theories of organization as well as social movement analysis.

Analyzing texts drawn from over one thousand journals and other publications, targeted to disparate kinds of participants in the health care sector, Ruef constructed an identity space within which forms might emerge. The dependent variable for the empirical analysis consisted of the counts of the forms appearing in each cell of the identity space. The study finds that new form emergence depends on the positions of existing form identities in the sector, and on the density and size of organizations matching those identities. The density and size of organizations possessing a form increases the rate of new form emergence up to a point, at which point the rate declines. The curvilinear relationship is interpreted as reflecting legitimation initially (in the rising phase) and the competition due to saturation (in the downward phase).

Identity of an organizational form does not need to be based only on product characteristics. Baron (2004) proposes that identity can also be defined by the labor relationships prevalent in a given market. Labor market identity indicates what kind of employment relationships are considered acceptable. Baron contends that although each organizational form embodies both product-based identity and labor-based identity, one or another can be more salient to the audience. Labor market identity may dominate when employment relationships and human or social capital are of paramount importance. Therefore, entrepreneurs who think about founding a firm might focus simultaneously on both market-based and product-based identities.

Issues of organizational form and identity are of paramount importance in emerging industries. New industries lack legitimation. One reason for the lack of legitimation is an undeveloped organizational form on which the industry activity is based. When the organizational form is underdeveloped, it does not generate a legitimate signal and, as a result, the industry fails to attract resources and institutional approval.

Organizational ecologists propose that an organizational form is more likely to develop and acquire a legitimate status with increasing density of organizations that embody this form. Furthermore, the process of organizational form development is facilitated and accelerated when firms that enter a new industry have *focused identities* (McKendrick & Carroll, 2002). New ventures play an especially important role in this process. In general, *de novo* firms should have more focused identities than *de alio* firms. This is because *de novo* firms are typically founded with a goal of operation in the focal industry and, therefore, their activity is focused on one type of business. In contrast, *de alio* firms likely participate in multiple industries (or did so previously, creating a legacy) and project multiple identities associated with these industries. While *de novo* firms would be quite visible to an audience in the focal industry, *de alio* firms in the focal industry may not be perceived so readily at all (especially if *de alio* firms derive the bulk of their revenues from other industries). As a result, a simple increase in the numbers of *de alio* firms may not contribute to increasing the legitimation and institutionalization of a new organizational form.

In an analysis of founding and survival rates of disk array producers, McKendrick, Jaffee, Carroll and Khessina (2003) find empirical support for these arguments. They find that the density of *de novo* firms (but not that of *de alio* firms) has a legitimating effect on the industry by increasing founding rates of all firms and decreasing failure rates of all firms. They also find that geographically clustered firms, especially geographically clustered *de novo* firms, have a beneficial effect on industry dynamics. This too is interpreted as a consequence of perceived focus in organizational identities.

Social Movement-Like Behavior

Organizational ecologists sometimes explore how entrepreneurs in certain industries undertake collective action to reach and persuade audiences of their worth. Founders of new ventures undertake different collective action strategies to promote the awareness of their activities. They establish industry associations (McKendrick et al., 2003), they organize advertising campaigns in the form of competitions, races (Rao, 1994; Hannan, Carroll, Dundon & Torres, 1995), conferences and rallies (Carroll & Swaminathan, 2000) and

they try to reach and educate the market in many other ways (Swaminathan & Wade, 2001).

Such collectively oriented behavior of entrepreneurs often resembles that of social movements (Carroll, 1997; Swaminathan & Wade, 2001). The analogy is potentially important for theory development because social movements and their leaders often defy (or least suggest arguments alternatives to) rational action interpretations (Tilly, 1978). This means that the collective action aspects of entrepreneurship may provide some clues as to how to decouple the two component rates of the founding process discussed above without assuming rationality.

Although the tendency of founders to organize collectively in new industries (or in new market segments) is well documented, no compelling theoretical model has yet been advanced to analyze the patterns of these activities in this way. The density dependence model has been applied to analyses of vital rates of social movement organizations (Olzak, 1989; Olzak & West, 1991; West, 1995; Minkoff, 1997). However, this model does not really predict what types of collective action are undertaken by organizations or entrepreneurs in different industries and why. A more explicit model of collective action by entrepreneurs has yet to be proposed despite its allure and apparent promise.

TABLE 8-2 *Key references among ecological studies of founding*

Theoretical contributions	*Methodological contributions*
Hannan (1984). Advances theory of density-dependent legitimation and competition. Predicts foundings will show an inverted U-shape relation with organizational density.	Hannan and Freeman (1987). Proposes modeling foundings as arrivals in a stochastic process. Parameterizes covariates' effects on the rate of arrival using Poisson regression.
Carroll (1985). Advances theory of resource partitioning. Predicts foundings of specialist organizations will increase with market concentration.	Barron (1992). Identifies estimation problem created by overdispersion in count data on foundings. Proposes negative binomial model (possibly with autocorrelation) as solution.
Tucker et al. (1990). Accounts for foundings of voluntary social service organizations in terms of governmental policy changes.	Lomi (1995b). Models unobserved heterogeneity in spatially defined founding processes.
Baum and Singh (1994). Founding rates explained as a consequence of differentiation using concepts of niche overlap.	Ruef (2000). Provides methodology for inferring organizational form identities from textual sources.
Hannan et al. (1995). Extends model of density-dependent legitimation and competition to allow global competition and local competition.	Ruef (2002). Advances structural event analysis to model demographic composition of entrepreneurial teams.
Baum and Haveman (1997). Highlights the tension between processes of agglomeration and differentiation in driving foundings.	McKendrick et al. (2003). Examines a possibly emergent organizational form by choosing a less than institutionalized case to study.
Dobbin and Dowd (1997). Explains railroad foundings as a consequence of public policy changes.	
Wade et al. (1998). Analyzes unintended effects of state-level prohibitions in brewery foundings of neighboring states.	
Sorenson and Audia (2000). Proposes social network explanation for regional concentrations of foundings.	
Ruef (2000). Conceives of foundings within identity space of organizational forms in a community.	
Swaminathan and Wade (2001). Draws inferences about foundings using social movement theory and research.	

CONCLUSION

Entrepreneurship and ecology are both huge research areas with very large literatures of theory and research. Given a common strong interest in organizational founding and the success of newly founded organizations, it is striking how unconnected the two literatures are at present. While possibly understandable, this disjuncture seems to us to be counterproductive. Accordingly, our review here has tried to provide motivation as well as accessible conceptual linkages to ecology for those in the entrepreneurship area. Along the way, we have offered comments on the ecological ways of doing theory and research that might be of interest to those from that tradition.

NOTES

[1] We appreciate the helpful comments of Olav Sorenson, Bill Barnett and Mike Hannan on an earlier draft.

[2] Other common definitions associate entrepreneurship with innovativeness, with passionate motivation, or with organizational change. The perspectives behind these definitions are beyond the scope of this chapter, although other chapters in this book do consider them at length.

[3] We used our extensive knowledge of the organizational ecology literature to identify the articles and books used in making this calculation.

[4] We reject the notion that these analysts might not be aware of organizational ecology as generally implausible. The journals for organizational theory and entrepreneurship do overlap.

[5] Compared to the "entry decision" of economics, the ecological appellation of "foundings" commonly used in studies of organizational births or entries into markets suggests less volition and more detachment.

[6] In the physical sciences, the time lag for basic research to affect practice has been estimated at 75 years.

[7] If this proposal seems unrealistic, then consider how long industrial economics existed as a discipline before its translation by Porter (1980) created a foundation for the applied field of strategic management.

[8] It is common these days to regard the micro level processes as more fundamental than the macro level. Hannan (1992) provides a compelling counter argument, however. Citing the case of Darwin and genetics, he argues that a robust macro theory is important.

[9] Note that the challenge of creating a widely agreed upon conceptual definition of the activities defining this event should not be seen as unusual or especially debilitating to theory or research. Indeed, a similar lack of consensus about what exactly constitutes an organizational founding can be found in the earlier ecological literature, and remains a slightly unsettled issue today. As long as researchers define and clearly operationalize their concepts, research can continue to progress and be compared.

[10] Specifically, Ruef et al. (2003) asked two questions to randomly selected interviewees: (1) Are you, alone or with others, now trying to start a business? (2) Are you, alone or with others, now starting a new business or new venture with your employer? If respondents answered affirmatively to either question, they were asked two additional questions to ascertain that (1) they were actively involved and (2) they held an ownership stake. Affirmative answers to both of these later questions were required to be considered a nascent entrepreneur.

[11] Of course, the assumptions of strong individual rational action and historical efficiency are not held by all entrepreneurship researchers. Many subscribe to a model of bounded rationality where action is intendedly rational but blurred by uncertainty, ambiguity and lack of information. We discuss these models below as we develop our argument.

[12] We found this somewhat surprising because as Hannan and Carroll (1992: 199) note, "Images of rationality in organization building seem to focus on...the causes of attempts to start organizations." Many ecologists would not necessarily view themselves as rational action theorists.

[13] We doubt that this task will be taken on with eagerness by ecologists themselves. Indeed, Hannan and Carroll (1992; 194-8) argue against the fashionable practice of motivating macro theories by building

up from micro assumptions and models, contending that this increases the fragility of a macro theory. They propose instead that macro theories be designed for robustness with respect to micro assumptions, and point to Darwin's theory of natural selection as an example.

[14] The consequences of different models of entrepreneurship on organizational populations are also of great potential interest. See, for instance, Ruef's (2004) analysis of how entrepreneurial inertia might generate population cycles of boom and bust.

[15] *De alio* firms also obtained higher market shares in the American television receiver industry (Klepper and Simons 2000).

[16] Specifically, Khessina (2003) found that *de novo* firms introduced products with performance parameters that improved over those of these firms' previous best products at a significantly higher rate than *de alio* firms. Additionally, *de novo* firms introduced products with performance parameters that were among the top of the industry (i.e., with performance parameters close to the technological frontier) at a significantly higher rate than *de alio* firms. Hence, *de novo* firms outperformed *de alio* firms in product innovation.

[17] We say intendedly rational because location in the non-overlapped region of a particular dimensionalization of the niche may or may not lead to a greater chance of success once the enterprise is operating. That question would need to be demonstrated in a separate empirical study of organizational viability or mortality.

[18] The empirical analysis uses a novel conceptualization strategy the investigators call "structural event analysis" pioneered by Ruef (2002). In a nutshell, this technique uses combinatorial methods to generate all possible combinations of potential group members (based on the social characteristics of theoretical interest) and to specify the expectations of their distributions under different assumptions about sorting implied by the hypotheses; it then uses Poisson regressions to account for deviations between the sample data and these expected distributions.

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9. Institutions and Entrepreneurship[1]

INTRODUCTION

Much of the literature on entrepreneurship examines the attributes of individuals, the networks of affiliations in which those individuals are enmeshed, the resources they assemble, and the openings that are present in the competitive environment. More recently, scholars have attended to the legal and political conditions that support entrepreneurial behavior, and the wider ecosystem that serves to deter or reinforce risk-taking behavior. We follow this line of research in our review of work on institutional aspects of entrepreneurship. Our aim in this chapter is to assess the role of various institutional actors and processes in fostering entrepreneurial behavior.

We take a broad view of entrepreneurship, focusing not only on the creation of new business organizations, but also on the generation of new organizational models and policies that change the direction and flow of organizational activity. Common to these diverse activities and domains is the recognition of opportunities. In contrast to much research on entrepreneurship that assesses either the capabilities of individuals or organizations to recognize such possibilities, our attention is directed towards the wider environment that both defines and creates opportunities. We also focus on how individuals and groups attempt to shape the institutional context in a fashion that privileges their preferred policies and programs.

We begin with a discussion of the social context of entrepreneurship, considering how the larger social environment lends both cognitive and socio-political legitimacy to entrepreneurial activity. We observe that the cornerstone of entrepreneurship is the belief in individual autonomy and discretion, a liberal creed that locates agency in individuals as the primary unit for creating new activities (Meyer, Boli, and Thomas 1994; Meyer, 1996; Meyer and Jepperson, 2000). While such a view is widely embraced in the United States, and more generally in Anglo-Saxon countries, it is worth noting that there is considerable variation in acceptance across other nations,

due in part to religious, cultural, or political factors. We consider the extent to which entrepreneurship is, in fact, a modern western institution.

Following Schumpeter (1934, 1991; Swedberg, 2000; Fagerberg, 2003), we recognize that much entrepreneurial activity entails recombination of existing materials and structures, rather than "pure" novelty. Schumpeter regarded this combinatory activity as "the entrepreneurial function." He was open-minded as to whether the entrepreneur was an individual or an organization, and the latter could be either a firm or a political organization. His focus was on the nature of the activity, not the identity of the participant. He famously described five types of innovative activity, involving the creation or introduction of: a.) new products, b.) new methods of production, c.) new sources of supply, d.) new markets, and e.) new ways to organize. Presumably, the latter might entail the emergence of a new industry or reorganization of an existing one. Notably, for our purposes, he did not discuss in detail the introduction of new organizational practices or structures in his writings on entrepreneurship. Yet many of the innovations that fostered economic growth in the United States in the twentieth century were organizational, notably in the design of sales and distribution (Chandler, 1962, 1977). We extend Schumpeter's ideas on recombination to include the generation and translation of organizational practices and structures.[2]

We thus ask how existing institutions are remade or reassembled to create new combinations that may, in turn, generate social, political, or economic change. We discuss how shifts in the institutional environment create opportunities for individuals and organizations to seize upon recombined tools or constructs to subvert existing ways and bring about new forms of organizing. We also consider how existing institutions are transformed and how standards and practices are altered by individuals and organizations who may, nevertheless, reaffirm the larger institutional system. We should stress at the outset that an institutional perspective on entrepreneurship is more "constructivist" than "agentic." By this distinction, we mean that while much entrepreneurial activity is purposive, it is not necessarily directly intentional. As organizational goals and missions are contested and reshaped, organizational participants often discover their interests "on the fly," so to speak, as strategies and goals co-evolve.

THE SOCIAL CONTEXT OF ENTREPRENEURSHIP

The historical literature on entrepreneurs points out that such individuals were often outsiders or strangers (Barth, 1963, 1978; Collins, 1980; Simmel, 1950:402-408). As alien to existing and often deeply conservative social orders, these outsiders were able to serve as bridges between different groups or across different spheres. In settings where

novelty was often actively resisted by political and/or religious authorities, strangers were among the few members of society who did not feel sharply constrained. The role of strangers was to connect groups that would not otherwise interact, deriving value from the exchange. In work on both Norway and Central Africa, Frederik Barth (1963,1978) has stressed this bridging role, whether in using financial means to garner political support or in commodity trading in rural communities. The African village of Darfar had long had a division into two distinct spheres, one in which cash was used and the other based on barter. The two domains had traditionally been kept separate, until, as the story goes, an Arab merchant linked the two spheres by swapping beer in exchange for tomatoes, which he sold at a profit. Swedberg (2000) points out that entrepreneurial activity of this type is often deeply corrosive to the values of a traditional community.

The expansion of entrepreneurship from an unusual activity conducted by outsiders to a widely accepted practice embraced by small businesspersons, business and political leaders, as well as social movement activists, is no small feat. Weber's (1930) classic treatise, *The Protestant Ethic and the Spirit of Capitalism,* argued that commerce and an acquisitive, pecuniary logic were viewed as rivalrous to dominant religious ideologies all over the medieval world. In the 16th and 17th centuries, the rise of Calvinism and other forms of ascetic Christianity had the unintended consequence of shifting largely hostile views toward commerce to a more accommodating acceptance. The methodical, rational character of Protestantism fostered the growth of capitalism, which over time became more secular and lost many of its religious underpinnings. This elective affinity between Protestantism and capitalism did not readily translate across the globe, however. Lipset (1970) has argued that predominantly Catholic countries, notably in Latin America, have preserved values of family, particularism, and patriarchy that hinder capital accumulation and entrepreneurial behavior.

Even in the U.S., often regarded as the wellspring of entrepreneurial activity, small business has historically been regarded as a conservative group. In the 1950s, support for the deeply conservative, anti-communist views of Senator Joseph McCarthy was strongest among small business owners (Trow, 1958). In recent years, however, small businesses have been singled out as the fountain of new job creation, critical to regional economies, and challengers to large stagnant firms. This transformation in which the concept and practice of entrepreneurship is enshrined with virtuous status is a potent act of institutionalization.

Consider the academy as but one illustration. Despite an absence of a theoretical underpinning or a core disciplinary basis, the teaching of entrepreneurship in U.S., European, and Asian business schools has grown remarkably in recent decades. Aldrich (2004) notes that despite the struggles for legitimacy that have accompanied growth of the field, the area has

proliferated with respect to books, specialized journals, and business school course offerings.

Critical to this growth and celebration of entrepreneurship is the re-framing of all manner of activities as entrepreneurial. Founding a small business is an effort that entails hard work with limited prospects for success. Battling entrenched interests in large corporations or political parties is fraught with risk and long odds. Pursuing socially responsible goals, such as environmentally friendly production or inner-city investment, were once counter-cultural activities, now such efforts are championed in business schools as "social entrepreneurship." In short, a diverse array of activities that have long been regarded as "tilting at windmills" have been redefined as entrepreneurial. Indeed, the very notion that research on institutions, things we tend to regard as relatively fixed, durable, and potent, can inform the study of entrepreneurship is further evidence of this expansion. We find some considerable irony in the growth in usage in the scholarly literature of the term "institutional entrepreneur" (DiMaggio 1988; 1991; Fligstein 1997; 2001; Beckert 1999).

THE REMAKING OF INSTITUTIONS

Typically, most discussions of institutions focus on their durability or fixity. Whether conceived of as shared mental models (North, 1990), the rules of the game (Schepsle,1989; Powell and DiMaggio, 1991), or taken-for-granted understandings (Berger and Luckman, 1967), most social science research assumes that institutions are relatively stable and settled. Such a focus, however, elides questions of emergence and transformation. How do new practices and structures become institutionalized? And how do existing arrangements that are widely regarded as appropriate and normatively sanctioned become unsettled and lose their force?

We identify several strands of research that address the question of how creating change in existing institutional arrangements can be considered as a form of entrepreneurship. One key force in the redefinition of what practices and structures are appropriate is professional knowledge. By expanding their jurisdiction, professionals reshape the landscape, particularly with respect to definitions of the law. Similarly, a second trend occurs when occupational groups and professional and technical communities engage in the creation of standards. When these generalizing technical procedures are widely diffused, the existing set of organizational practices can be altered in subtle or profound ways.

A third process of institutional change involves rule-making, or the creation of formal laws that define the playing field, enabling certain groups and retarding the efforts of others. In some cases, rule-making is highly

instrumental and driven by specific agendas. In other circumstances, institutional entrepreneurship may occur as a result of unintended consequences, particularly when groups seize upon unexpected opportunities created by legislative change.

The Expansion of Professional Jurisdiction

Professionals, as well as some categories of authorized actors in particular issue or jurisdictional domains, are often key institutional entrepreneurs who help redefine and reconfigure existing institutions by facilitating the adoption of new organizational practices or models. One of the main contributions of neo-institutional scholarship has been to focus on the spread of various organizational practices, models, and governance mechanisms. Over the last decade and a half, several studies have deepened our substantive understanding of the influence of Civil Rights legislation in the American workplace, enriching a theoretical account of the mechanisms by which broad government mandates in a fragmented and weak state system bring about the widespread adoption of new organizational practices and models. While the enactment of these Civil Rights laws made clear the federal government's intent to eliminate employment discrimination, the policies were deeply ambiguous regarding standards of compliance and lacked effective mechanisms for enforcement. Employers, faced with the federal government's broad mandates to halt discrimination on the one hand, and the legal consequences of their actions on the other, had to develop and experiment with their own compliance strategies and mechanisms. Consequently, various organizational practices, including internal labor markets (Dobbin et al. 1993), grievance procedures (Sutton et al. 1994; Edelman et al. 1999), due-process governance (Sutton and Dobbin 1996; Edelman 1990), and sex discrimination and maternity leave policies (Kelly and Dobbin 1999) have been created and widely diffused, becoming standard features of the American workplace.

Frequently, legal changes have broad and ambiguous mandates and often do not specify clear standards of compliance, especially under a weak state regime such as the United States (Sutton and Dobbin 1996). Consequently, responding to legal changes is often problematic for organizations who are left to their own devices to develop appropriate standards and mechanisms of compliance. As organizations formulate measures and breathe substance into legal ambiguity, organizations help constitute legal change. Dobbin et al. (1993) describe an iterative process in which the state provided a broad mandate through the Equal Employment Law, and human resource professionals and lawyers elaborated specific practices that were eventually approved by the courts. Through this recursive

process, "Legal change engenders a process of institutionalization whereby new forms of compliance are diffused among organization and gradually become ritualized elements of organizational governance" (Edelman 1992: 1545).

The central entrepreneurs in this development of employment practices are personnel professionals. First, professionals serve as "filtering agents" (Kidder 1983; Edelman and Suchman 1997). Professional groups through their professional discourses construct the meaning of initially ambiguous laws, determine the situations to which legal reasoning applies, and more generally, advocate for the legality and legitimacy of particular worldviews (Edelman and Suchman 1997: 499). Personnel experts put forth their interpretations of the laws, and develop and prescribe recipes for compliance through such venues as professional journals, conferences, professional networks and conventions (Edelman 1990, 1992; Sutton et al. 1994).

As mediating or filtering agents, professionals interpret legal doctrines, formulate appropriate compliance strategies, and diffuse these strategies. In doing so, they employ various means that enhance and legitimate their prestige, standing, and authority within organizations. Further, in order to promote their solutions as the appropriate response to ambiguous legal mandates and to persuade employers of their usefulness, professionals couch their solutions and strategies in the rationalist language of efficiency and equity, or progress and justice.

Edelman and her colleague's (1999) extensive analysis of the business literature in their study of the creation of Equal Employment Opportunity grievance procedures revealed that personnel professionals framed the advantages of their proposed strategy—that is, the adoption of internal grievance procedures—in the rhetoric of equity and efficiency. While protecting organizations from legal liability, "grievance procedures provide a sense of justice to employees and will therefore improve morale and productivity" (Edelman et al. 1999). The professional literature was replete with arguments that claimed instituting new internal grievance procedures would deter employees from seeking litigation and would therefore result in significant cost savings. These experts often exaggerated the legal threats to employers when championing their policies. Similarly, Dobbin et al. (1993) showed in their analysis of the diffusion of employment practices that by couching the necessity of formal evaluation and promotion systems in the language of equity and efficiency, personnel managers successfully persuaded their superiors about the putative usefulness of these practices in both battling discrimination and rationalizing the management of human resources.

In this sense, personnel professionals are the structural linkages to the wider environment (Sutton et al. 1994: 966). By their active interpretation of the law and promulgation of organizational responses, they play an

entrepreneurial role as mitigating or filtering agents at the interface of the legal environment and organizations. They "proffer stories about the legal value of grievance procedures to organizations ..., as they are told and retold in the professional journals, the stories tend to become widely accepted in organizational fields and to influence ideas about organizational rationality across organizational, professional, and legal realms" (Edelman 1999: 408). In this way, professionals created a new legal environment in which beliefs about the efficacy and appropriateness of certain practices and models become taken for granted. Further, organizations with direct connections to the wider environment proved to be more likely to adopt these newly dominant models and practices, thus institutionalizing these new views. Sutton et al. (1994) showed that involvement in this wider environment had palpable effects on the adoption of grievance procedures. Organizations' structural linkages to the national environment through professions were operationalized as having personnel offices and/or labor attorneys on retainer; and analyses showed that organizations that had personnel offices or retained labor attorneys were more likely to adopt them. Coupled with the finding that direct linkage to the state through federal contacts did not prove to be a significant predictor, the effect of embeddedness in the wider legal environment showed that "due-process mechanisms are not a direct result of federal regulatory pressure, but rather a symbolic response to diffuse and ambiguously perceived shifts in the legal environment" (Sutton et al. 1994: 966).

Although both personnel professionals and lawyers were important in the institutionalization of these novel organizational practices, Sutton and Dobbin (1996) argued that these two groups played different roles in the process, describing personnel administrators as "explorers" and labor lawyers as "settlers." More generally, "institutionalization can be conceptualized as a sequential process in which different sets of agents—each of which occupies a different position in the organizational field, has different stakes in the outcome, and controls different kinds of discursive resources—commit themselves to a given practice only at certain stages of the game" (Sutton and Dobbin 1996: 808). Personnel experts or semiprofessions—who are unconstrained by professional orthodoxy and occupy marginal positions in the organizational field—are much more entrepreneurial and likely to embrace novel or untested policies or practices in their attempt to expand their occupational jurisdiction. In contrast, more established professions like lawyers are conservative and slower to embrace these new ideas. Nevertheless, when these dominant and mature professions act, they serve as "settlers" that theorize practices, rendering them integral parts of the organizational field.

In sum, the enactment of equal employment opportunity and affirmative action laws has transformed the American workplace as

employers faced with broad and ambiguous compliance standards have reinterpreted their own compliance measures. These efforts were championed by personnel, human relations, and legal professionals. The new institutional literature suggests that the enactment of EEO/AA law did not have direct impact on the specific practices that were eventually created and adopted. Instead, the ambiguity of the laws and the lack of enforcement mechanisms created uncertainty about the proper means of compliance, opening space for personnel experts to be engaged in institutional entrepreneurship. Beyond the institutionalization of particular organizational practices and compliance strategies as formalized elements of the American workplace, these practices and strategies also reflected the expansion of individualism in the form of employee rights and organizational citizenship both in organizational governance and the wider environment (Dobbin et al. 1993; Sutton et al. 1994).

This modern account of EEO/AA law also has strong parallels in the past. From the 1930s to 1970s, labor relations were mediated by industrial relations departments in large U.S. companies. Labor relations professionals maintained harmony, or at least a truce, between management and labor, pressing workers to be more compliant during lean times, and encouraging management to be less frugal during expansive periods (Katz, 1985). Sluggish productivity growth, foreign competition, and oil price shocks in the 1970s interrupted this long era of labor-management peace, and led many firms to adopt anti-union policies, such as subcontracting or the building of nonunionized "greenfield" plants, typically in Southern states. As the dominant system of industrial relations unraveled in the 1970s and 1980s, leading practitioners and academic experts began to re-theorize labor relations, which dealt largely with unionized work forces, and articulated a broader vision of human relations management, which was applicable to the entire work force (Kochan, Katz, and McKerzie, 1986; Walton, 1985; Cole, 1989). In some companies, the human relations function even became an integral part of corporate strategy. In these settings, a core group of personnel professionals and academic experts were central to the recasting of labor-management relations into a new framework that fused elements of an older industrial relations or personnel approach with an expansive view of the employment relationship as a key organizational asset.

The Creation of Standards

Another significant area in which neoinstitutional research has made important contributions concerns the salience and ubiquitous nature of standards (Brunsson and Jacobsson 2000). We consider the creation of standards that guide the activities and behavior of a class of organizations as

an entrepreneurial act. The modern social world is replete with various kinds of standards or rules of behavior that are thought to improve human conditions. At the most general level, there are two kinds of rules: some rules are described as voluntary, while others are described as mandatory or as directives. The distinction is an analytical one; empirically the same rule can be mandatory for a certain set of actors, while for others it is conditional. For example, the rules governing basketball games of the National Basketball Association are mandatory for all NBA franchises, but are rarely followed in local playground basketball games. In other words, whether a rule is a binding directive or a standard to follow voluntarily depends largely on one's membership in particular collectivities.

From how to play a game of basketball to how to organize a school, or how to report a financial transaction or the steps to prepare osso buco, standards are everywhere in modern life. Similarly, self-proclaimed experts who know best how certain things should be done increasingly populate the modern world. Some of these experts, armed with professional knowledge, have more legitimate professional claims than others, and therefore their preaching is more readily followed than that of other less legitimate proselytizers. In this vein, Jacobsson (2000:40) has observed that: "Reference to expert knowledge is often used to give standardization legitimacy." This observation parallels Sutton and Dobbin's (1996) argument about the role of mature professions as "settlers" that theorize and help institutionalize certain practices or models in an organizational field.

Increasingly, these experts—self-proclaimed and otherwise—and professional groups, operate at the global level. Haas (1992) described networks of professionals with authoritative claims to expertise in a certain issue domain or a body of (policy relevant) knowledge as "epistemic communities." Abrahamson and Fairchild (2001:148), examining a more commercial and market context, point out the growing importance of "knowledge industries" and "idea entrepreneurs" in the contemporary world. The former refers to "set[s] of organizations that produce substitutable knowledge products" and the latter, to actors that operate within knowledge-intensive industries.

While both standards and standardization are frequent and have become a routine aspect of an increasingly globalized society, various stages of standardization involves moments of (institutional) entrepreneurship. Initial conceptualization and construction of a standard or a model and its subsequent championing involve considerable entrepreneurial activity and zeal—in both the traditional sense of entrepreneurship, as well as from an institutional perspective. Each step of standardization involves various actors, including original innovators, proselytizers, and proselytes, and these actors, if successful, contribute collectively to the wide diffusion and eventual institutionalization of a standard or model. Nevertheless, the processes of

popularization and institutionalization of particular models may require more than expertise or professional knowledge, which although a crucial ingredient that provides credibility and legitimacy, may not be sufficient. Proselytizers often deploy significant social and political skills to convert would-be followers to adopt a given model or technology as a standard (Fligstein 1997, 2001; Garud et al. 2002; Hargadon and Douglas, 2001).

Garud et al. (2002), in their study of Sun Microsystems' sponsorship of Java as a technological standard, illustrate the challenges an individual firm faces in sponsoring its own technology as a common technology standard. In making Java an architectural standard for the Internet, the importance of political and social skills to negotiate through difficulties in the process cannot be overstated. In sponsoring Java as a common standard, Sun Microsystems initially relied on an "open systems" strategy by allowing third-party developers to download Java for free and to aggressively market their product. Further, in drafting licensing agreements for commercial use, Sun permitted licensees to modify the technology as long as the modifications were freely shared with Sun and other licensees (Garud et al. 2002). As a result, Sun was successful in mobilizing firms around its technological standard so that Microsoft, who had been developing its own alternative software, had to license Java.

There is an inherent tension, however, in technology sponsorship. "To enable Java's evolution into a technology that justified its original promise, Sun had to allow members of the collective to adapt it for their own use. At the same time, Sun had to exercise control to ensure that the technology was not compromised by the creation of incompatible versions" (Garud et al 2002:204). Thus, as the technology became widely accepted as a standard and licensees developed their own modifications, Sun faced the problem of fragmentation within the Java field. Consequently, Sun attempted to prevent fragmentation with its certification initiative to test the compatibility of different Java applications. This attempt to control the standardization process, coupled with Sun's introduction of Java-based products that essentially competed with Sun's licensees created concerns about Sun's credibility as a technology sponsor. Further, Sun's initial refusal to hand over the control of Java to a neutral international standards body, such as the International Organization for Standardization, further exacerbated the problem.

The case of Sun Micrsosystems and Java illustrates the difficult process of standardization, particularly the challenge of juggling the dual roles of creator and enforcer. In the process of standardization in a competitive setting, Sun was increasingly seen as changing rules of the game to favor and advance its own self-interests. This tension points to the necessity or importance of a division of labor among the participants involved in

standardization, as well as institutional change more broadly: creators and mobilizers, on the one hand; and rule enforcers, on the other.

Bengt Jacobsson (2000:45) has noted that there may be a comparable conflict between professional expertise and standardization: "If standardization is carried too far, as with systems of medical knowledge, it may even be viewed as a threat to professional expert knowledge." That is, if professional authority and prestige stem from the exclusive control over a particular domain of knowledge, then standardization and the consequent routinization of expert knowledge could undermine and threaten the legitimacy and the social standing of professional groups who are the "standardizers." Many innovators may not have the necessary entrepreneurial skills and/or the willingness to propagate their innovation without being perceived as engaging in a power grab. Moreover, the inherent difficulty of juggling the dual responsibility of creation and enforcement may hamper the prospects of standardization.

While the Sun-Java case illustrates the challenge of sustaining the dual responsibilities of innovator and propagator, there are increasingly more organizations and individuals that take on the propagation role. The International Organization for Standardization (better known as ISO) is one of the most often-cited examples. Founded in 1947 in Geneva, Switzerland by representatives from 27 national standardization associations, ISO has grown into a global organization with 76 members as well as 22 corresponding and 4 subscriber members (Loya and Boli 1999).[3] ISO has published over 9000 sets of standards in over 500,000 documents since its founding in the middle of the last century.

In a rapidly globalizing, acephalous world in which there is no dominant regulatory authority, ISO has become a significant force in global governance and coordination (Mendel 2001; 2002). Between the introduction of its famous ISO 9000 Quality Certification in 1987 and 1999, over 400,000 certificates have been issued to organizations in 158 countries and territories. Indeed, "quality certification has emerged as a key organizational practice helping companies worldwide establish rationalized production processes" (Guler et al. 2002: 208-209). The spectacular growth and prominence of ISO, however, begs the question: why?

The answer seems to lie, more than anything else, with the disinterested and rationalized nature of ISO as a neutral and democratic body, uncorrupted by private interests. As Loya and Boli (1999: 181) aptly put it: standardization is perceived as "the rational means to solve some of humanity's most serious problems." As an organization involved in such endeavors, ISO's stated goal is to "promote the development of standardization and related activities in the world with a view to facilitating international exchange of goods and services, and to developing cooperation

in the spheres of intellectual, scientific, technological and economic activity" (quoted in Guler, Guillen, and Macpherson 2002: 208).

There are various categories of actors who have strong interests in developing and spreading ideas and standards. Such groups have been referred to as carriers (Sahlin-Andersson and Engwall 2002; Meyer 2002; Jepperson 1991), translators (Czarniawska and Sevón 1996), knowledge entrepreneurs (Abrahamson and Fairchild 2001), teachers of norms (Finnemore 1993), and "others" (Meyer 1994, 1996; Meyer and Jepperson 2000). Typically, such groups seek to promote and expand their agendas, while not directly challenging dominant institutions. Nonetheless, sometimes their activities result in institutional change indirectly (Sahlin-Andersson and Engwall 2002: 293-296).[4]

Many diverse participants can facilitate or trigger institutional changes even if they are not dominant members of a given field, nor particularly interested in shaping the field in their own image or interests. They do so by way of carrying out their routine activities as carriers and translators of standards, standardized models, and templates. Finnemore's (1993) case of the United Nations Educational, Scientific, and Cultural Organization (UNESCO) and its role as the teacher of norms regarding the virtues of science policy organizations for modern nation-states in the post-World War II period is a good example. Initially, UNESCO's science programs were aimed to "increase the world sum of scientific knowledge and access to that knowledge without regard to national boundaries" (Finnemore 1993: 577). As such, its programs served science and scientists rather than nation-states. In the context of the shifting international climate during the Cold War and the rising tide of national self-determination in the 1960s, UNESCO shifted the focus of its science programs from international nongovernmentalism that favored science and scientists to the national or statist conception of science in which science was increasingly seen as a means to national development and progress. Consequently, UNESCO became an advocate for the importance of national science policy making. UNESCO's shift in focus reflected a need to adapt to the changing international climate to remain relevant on the international scene, but its promotion of science at the national level led to the widespread diffusion of science policy organizations around the world over the last few decades. In turn, these organizations contributed to the theorization of the role of scientific institutions in national innovation systems. For example, Jang (2000) showed, in his study of the worldwide diffusion of science and technology ministries, a dramatic increase in the number of countries adopting a cabinet level ministry concerned with science and technology, particularly since the 1960s. We should note that UNESCO does not fit many conventional definitions of an actor. Nonetheless, UNESCO's advocacy of the conception of science as a primary means for national development and

national science policy led to significant changes in ministerial structures of contemporary nation-states worldwide as states increasingly incorporated science and technology ministries to their expanding governmental structures (Kim, Jang, and Hwang 2001).

Rule Making and Institution Building

While standards are voluntary, there is another category of rules that can be described as mandatory. The main distinction between these two categories is analytical, whether particular rules or standards can be voluntary and binding depends on the contexts in which they are observed. As with cases of standardization, rule making and policy innovation stem from entrepreneurial efforts by skilled actors (Fligstein 1997, 2001). Indeed, the idea of a political entrepreneur was introduced by political scientist Robert Dahl (1961:6) to characterize a leader who "is not so much the agent of others as others are his agents." Subsequently, the policy innovation literature (Kingdon, 1984; Polsby, 1984) characterized political entrepreneurs as individuals "who put forward new ideas and, through the skills of brokering and coalition building, succeed in building the requisite support to get new policies adopted" (Sheingate, 2003:188).

Motivating others to participate in collective action to further large-scale rule-making projects, such as the efforts in building the European Union, demands a high level of skill at institution building. The task of an institution builder is to produce shared agreements and to "frame stories that help induce cooperation from people in their group that appeal to their identity and interests, while at the same time using those same stories to frame actions against various opponents" (Fligstein 2001: 113). In doing so, political entrepreneurs rely on a repertoire of tactics, including the use of legitimate authority, agenda setting, and brokering. Policy entrepreneurs innovate by joining problems, policies, and politics (Kingdon, 1984:182). Thus, entrepreneurs shape the terms of political debate by influencing agendas and constructing cultural frames, which are "representations of collective problems and solutions that help other actors to link their own interests and identities to a collective purpose" (Stone Sweet et al. 2001: 8-9).

Fligstein has applied his notion of social skill to the case of the integration of Europe, notably to the European Union's Single Market Program (Fligstein and Mara-Drita 1996). The European Commission, under the leadership of Jacques Delores, played the role of institutional entrepreneur. The "completion of the single market" functioned as a cultural frame, one that was sufficiently open so that many parties could see their agendas as associated with it. In the early 1980s, many European states were experiencing severe political and economic crises, often dubbed

"Eurosclerosis." Political entrepreneurs often exploit uncertainty or crises to engage in creative acts of political innovation (Schneider and Teske, 1992; Sheingate, 2003). The European Commission's Single Market Project came to be seen as an encompassing plan for Europe-wide institutional change, appealing to numerous stakeholders in the European Union. Both businessmen and supporters of deregulation who wanted to break down trade barriers, as well as nation states looking for cost-effective solutions to ameliorate political and economic malaise, joined in support.

Successful political entrepreneurs are able to consolidate innovations, producing political or social change that has enduring effects in the form of new programs, policies, or organizations. Carpenter (2001) analyzed the process of state formation in the United States, where small pockets of professional autonomy existed within the larger realm of 19th century political patronage networks. Entrepreneurial professionals helped carve out bureaucratic autonomy in the post office, agricultural extension programs, the Food and Drug Administration, and other executive agencies. In so doing, these political entrepreneurs generated endogenous institutional change that transformed the early 20th century federal government.

Not all entrepreneurial activity stems from such explicit acts of creativity, however. In other circumstances, windows of opportunity can be the unintended result of rule-making. Legal or political change can provide opportune moments for entrepreneurs to act in ways completely unanticipated by the rule makers. Several dramatic changes in recent U.S. history stem from the unintended consequences of federal legislation.

In 1965, Medicare and Medicaid were added to existing employment-based forms of insurance. But the Medicare and Medicaid programs were beset with real problems concerning the price of health care services, which varied widely across states and providers. In 1983, Medicare replaced its cost-based reimbursement with a per-case methodology. These new tools were designed to standardize health care pricing and usher in cost controls. Prior to the early 1980s, there was limited for-profit involvement in health care, and those commercial entities that existed were locally owned. The primary providers of health services were public and non-profit organizations. But standardizing prices had the unintended effect of creating a stampede by investor-owned corporations into the health care field (Gray and Schlesinger, 2002; Scott et al, 2000).

The reimbursement changes rendered an unpredictable market much more rationalized and calculable, and for-profit firms quickly moved into selected areas of health care where they saw the opportunity to deliver high volume services at a lower cost than the fixed price of government reimbursement. The new investor-owned corporations, which had little contact with and no personal knowledge of the facilities owned by their companies, became the dominant force in dialysis centers, rehabilitation

hospitals, home health delivery, and outpatient mental clinics. In attaining this market dominance, the for-profit entrepreneurs crowded out local commercial proprietors, public services, and nonprofit service providers, and transformed health care from a professional service into a business. Scott et al (2000) capture this change beautifully in their linguistic analysis of health care journals. The doctor-patient relationship has been replaced by a health care provider-consumer relationship, and a stable professional field was transformed, for better and worse, by entrepreneurial for-profit interests.

A similar story characterizes legislation passed in the 1980s to encourage the construction of low-income housing. In the omnibus 1986 Tax Reform Act, a small error in the legislation afforded investors a double tax credit for investing in inner-city housing (Guthrie and McQuarrie, 2003). With this opening, major banks reorganized their lending programs and made low-income housing projects a significant and profitable part of their portfolios. Over time, community organizers, philanthropic institutions, local politicians, and construction companies joined with the banks to create a powerful lobby that was able to both persuade Congress not to close the tax loophole and to generate a half-private/half-public constituency for community investment. Again, the unexpected effects of legislation spurred new types of activity. Entrepreneurs rushed in to construct new housing units in inner cities, which were very much in need of this infusion of resources. Community activists choose not to contest the extremely generous tax breaks these entrepreneurs received, and instead allied with them in the cause of urban revitalization. More abstractly, both the housing and health care cases represent a growing trend toward the privatization of public services in the U.S., a broad societal change in which institutional entrepreneurs have had a major hand.

We turn now to cases where the efforts of activist entrepreneurs to transform the political landscape produced unexpected outcomes. Clemens' (1997) study of the early origins of interest group politics in California, Washington, and Wisconsin during the Progressive Era (1890-1925) provides a vivid case of a profound, but unintended, transformation of American political life. Farmers, labor unions, and women's groups were all actively engaged in efforts to influence politics. On the surface, labor seemed to hold all the cards - - strength in numbers and resources. Agrarian groups, while less numerous, were well connected to both legislators and the federal bureaucracy and had strong champions in the Department of Agriculture. Women, on the other hand, did not even have the right to vote.

Clemens deftly shows, however, that precisely because women were disenfranchised, they were "insulated from cooptation by the predatory system of party politics" (1997:13). This insulation afforded space for experimentation, a kind of organizational and cultural autonomy that allowed them to develop a repertoire of political tactics that were both highly effective

and regarded as non-partisan. The use of novel tactics - - luncheons, lobbying, evaluation, close ties to state social service agencies, and public education - - eventually lead to women's enfranchisement, child labor laws, prohibition, and widespread adoption of maternalist social policies. As one Washington state suffragist explained, "We worked for our vote in womanly ways, for we weren't men and we didn't want to be men, therefore, we didn't propose to try to get our vote in the way that men would" (Clemens, 1997:185). Seen from the viewpoint of the early 20th century American political landscape, the accomplishments of the suffragists and the failure of labor is best described in biblical terms - - the last was first, the first last. The seemingly least powerful political groups accomplished the most.

Yet viewed through jaded 21st century political eyes, the accomplishments of the women's movement look rather different. Indeed, once women gained full standing as citizens, they promptly lost political power. The political innovations they introduced were quickly adopted by imitators. Moreover, the non-partisan "business model" of political engagement that women developed proved to be a profound innovation that transformed political life from involvement in party politics to professionalized interest group politics. The very reforms and non-partisan innovations that women introduced became the staple of organized special interests. Thus, the energetic actions of political entrepreneurs to avoid the corrupt world of party politics had the unintended effect of creating a new, more contentious, interest group politics.

A comparable case of institutional change as unintended consequence is illustrated by Rao's (1998) historical research on the origins of nonprofit consumer watchdog organizations (CWOs) in the United States. Numerous factors, including rising disposable income and expenditures on consumer goods, growing product choices, an increase in advertisements appealing to emotion, and the lack of product liability laws, created a window of opportunity for the emergence of CWOs in the early decades of the 20th century. Taking advantage of this opportunity was a group of institutional entrepreneurs who engaged in classical Schumpeterian entrepreneurship of combining previously unrelated elements: rational and scientific testing practiced by standards organizations and trade associations with the idea of consumer service, which had been gaining legitimacy among increasingly professionalizing businesses and advertisers. Consumers Research (CR), the pioneering CWO, "...sought to reform the system of production so that waste was reduced and producers served customers by making goods needed by customers and charging fair prices. The tools of control were product standards and scientific tests" (Rao 1998: 930). Consumers Research adopted a definition of the consumer as a rational decision maker; thus, the purpose of CWO was to be an impartial tester that would help consumers get the best value.

While CR successfully carved out a niche, it soon became riddled with an internal debate about its role, eventually culminating in the founding of the Consumer Union (CU) by a splinter group. The main point of contestation was the definition of the consumer, and the scope and boundaries of CWOs. CU, in stark contrast to CR's focused approach to impartial scientific testing, "sought to provide information to consumers, to improve standards of living, to rely on testing and boycotts, and to serve two constituencies—consumers and workers" (Rao, 1998: 937). Further, inspired by labor issues, CU viewed socially responsible buying and collective action as tools to improve working conditions and create decent living standards for consumers, and saw its mission to promote social justice as an engine of radical social change.

CR and CU represented two clear alternative frames of CWO - - the former blending features of standard-setting organizations, and the latter elements of trade unions. Neither CR nor CU had a clear technological advantage over the other; hence, competition between the two hinged on the endorsements by powerful groups. CU's radical frame proved to be difficult to sustain as its social change orientation came under heavy attack from politicians, the media, and rival entrepreneurs. By the 1950s, CU gradually dissociated itself from its radical agenda and embraced a scientific view. During the post-war period, CU reconstructed itself as a paragon of impartial scientific testing, adopting the frame initially put forth by its rival, CR. Moreover, CU proved to be better than CR at its own game. By the mid-1950s, CU's ratings could make or break a company. At the onset of the rivalry between CU and CR, it would have been difficult to predict which organization would emerge victorious. When CU eventually triumphed, it was with the strategy of its rival. Thus, CU became the leader in the consumer's movement by retreating from its social change agenda.

We see abundant entrepreneurial activity in circumstances of rule-making and institution building. Political entrepreneurs have both championed causes and seized opportunities to bring about institutional change. The outcomes of such institutional transformations can, however, be surprising and unexpected, and may lead to changes that far exceed the goals or expectations of those who initiated these efforts.

THE EMERGENCE OF NEW INSTITUTIONS

Much of the extant research attends to questions of institutional change, much less work examines how entrepreneurs contribute to the creation and emergence of new institutions. Consequently, our survey is briefer here, but we hope to contribute by outlining several key processes that

inform how new institutional logics and identities emerge and displace older logics.

Theorization and Elaboration

Ferguson's (1998, 2004) analysis of the emergence of French gastronomy in the 19th century and Rao, Monin, and Durand's (2003) analysis of the nouvelle cuisine movement in the late 20th century provide rich examples of the rise of new institutional logics and identities, and the decline of established orders, which have lead to the emergence of new institutions. The former study looks at the creation of the gastronomic field and the nationalization of a standard of French cuisine that came to dominate the French culinary culture, and become the global standard for grand cuisine. The latter study analyzes how the rise of the nouvelle cuisine movement, based on a different institutional logic and role identities, replaced the established order whose emergence and consolidation Ferguson documented so well.

Ferguson (1998: 602) traces the origin of gastronomy as "the systematic, socially valorized pursuit of culinary creativity" to 19th-century France. Gastronomy as such meant a fundamental break with the older culinary tradition that preceded it and wholesale changes in the practices, ideas, rules, and institutions surrounding the production and consumption of food. This movement eventually led to the rise of gastronomy as a self-reproducing cultural field, which marked French cultural life and established French cooking as one of the world's major culinary styles.

A combination of factors provided the opportunity for the emergence of this new culinary field. The collapse of the ancien regime and the end of cyclical famines in the 18th century cleared numerous constraints. The surplus of trained chefs after the monarchy's downfall, abundant food from the countryside, and a marked increase in a mobile middle-class, bourgeois population in urban areas led to an active restaurant life in the early 19th century. But these material conditions did not, in and of themselves, create a world of gastronomy and high culinary standards. More directly important were the activities of influential chefs and gastronomic journalists who gave shape to new standards of cooking and eating. In particular, it was culinary discourse that provided the primary vehicle for this transition into a cultural field. Ferguson (1998: 610-612) argued that given the ephemeral nature of culinary products, the gastronomic field's reliance on texts or writing was almost absolute: "If words turned food into culinary texts, these texts inserted gastronomy into a field. They set the culinary agenda and instituted the cultural debates that defined the gastronomic field as well as the logic that determined relations within this field."

By actively engaging in culinary discourse, these influential individuals defined the gastronomic field. The critics systematized culinary knowledge, prescribed manners for diners, and specified professional standards for chefs. For example, Grimond de la Reynière laid down the theory or law of gastronomy for consumers. Antonin Carême "legislated for the practitioner" (Ferguson 1998: 613) through his culinary treaties that systematically examined the bases of French cuisine from pastry and soups to sauces, thereby cementing the methodological basis for professional practice. While Grimond and Carême addressed diners and chefs, respectively, Brillat-Savarin's contribution was to reach out to the readers who were not directly involved in the production or consumption of culinary products. In this sense, the readers consumed gastronomic commentaries and texts not to learn how to cook but to learn how to appreciate the act of eating. Put differently, culinary discourse became a meal in itself. Further, by advocating for the science of gastronomy and the sociology of taste that established correlations between the social and culinary attributes of taste, Brillat-Savarin's vision of gastronomy was a distinctively modern social practice. In doing so, he placed gastronomy within a larger French cultural and intellectual context. Gastronomy's place in this larger context was further buttressed by the writings of writers located outside the field. For example, Fourier's writings "intellectualized gastronomy ... by making connections to established intellectual enterprises of unimpeachable legitimacy—philosophy and political science" (Ferguson, 1998:627). Balzac, on the other hand, in his realist novels depicting French society of his time, gave great significance to the consumption of food as a social and psychological indicator of modernity, thereby linking literature and gastronomy.

The French gastronomic field became the archetype of a grand cuisine, and was widely institutionalized world wide in cooking schools, restaurants, and cookbooks. But in the 1970s, a counter-movement known as nouvelle cuisine emerged, energized by various "antischool" movements such as *le nouveau roman*, *la nouvelle vague*, etc., and more generally by the protests of May 1968 (Rao, Monin, and Durand 2003). The classical cuisine in France, developed after the 1789 Revolution by the writers and chefs discussed above and further codified later by Auguste Escoffier around the turn of the 19th century, "...emphasized the restaurateur, long menus requiring huge inventories and little freshness, rituals outside the plate, flambé, and a long consumption process. By contrast, nouvelle cuisine emphasized the autonomy of the chef, with short menus requiring fresh ingredients and low inventories, service through the plate, and a short consumption process" (Rao et al. 2003: 798). In sum, nouvelle cuisine arose as a critique of the "old school" and marked a clear break with it.

Unlike the other French protest movements of the 1960s, nouvelle cuisine was promoted by culinary elites who had advanced to the center of the

French culinary world. In other anti-school movements such at theater, film, and literature, new entrants were at the forefront in challenging the established order. With cooking, however, established chefs took the lead, due to the lengthy and arduous process of professional training. Rao et al (2003) suggest that the elite underpinnings of this "protest" movement in the gastronomic field accounts for the failure of the traditionalists to launch a successful counter mobilization. Indeed, the nouvelle cuisine movement displays several significant similarities to the rise and institutionalization of the French gastronomic field and its classical cuisine.

First, the emergence of gastronomy in the 18th century in France involved a process of articulation through which cooking came to be linked to other near-by cultural fields. Similarly, the anti-authoritarian movement, which had been brewing and visible in various forms of anti-school movements, finally culminating in the events of May 1968, indirectly precipitated nouvelle cuisine (Rao et al. 2003). Second, in both classical and nouvelle cuisine, the established order afforded considerable legitimacy to the new cooking style. For example, Antonic Carême's professional success during the ancient regime and continued association with the royalties of various European monarchies cemented his status as the leading chef of his time. Similarly, it was the conversion of three-star chefs such as Paul Bocuse from classical cuisine to nouvelle cuisine that facilitated the emergence of the latter. Not only were these early converters accomplished chefs, they were also prominent in the professional society of French chefs, occupying key positions in powerful committees. Therefore, early converters or activists brought "sociopolitical legitimacy" to the nascent movement and were able to control access to political resources and influence the professional society's agenda (Aldrich and Fiol, 1994). Finally, as with the rise of the classical cuisine, the propagation of nouvelle cuisine in culinary discourse by sympathetic journalists helped popularize the new style.

The French culinary tradition is an example of entrepreneurial efforts that defined novel standards that created the field of gastronomy. In turn, these culinary standards came to be widely accepted and broadly identified as a key element of French culture. The culinary tradition was further refined and theorized, enabling its broad diffusion worldwide. Ferguson (1998) suggests that French and Chinese cooking have become the two major cuisines in the world, in large part because of the surrounding practices and texts that support and elaborate them.

The preceding two episodes of institutional change in French gastronomy underscore the role of theorization in the rise and decline of institutional logics. Theorization refers to "both the development and specification of abstract categories, and the formulation of patterned relationships such as chains of cause and effect" (Strang and Meyer 1994: 104). Theorization makes possible cultural understandings that certain entities

belong to a common social category, and facilitates diffusion among comparable actors by enhancing perceived similarity among them. For example, modern nation-states are perceived to be equivalent, which, in turn, enhances the diffusion of practices across nation-states, despite extreme variation in their level of development (Meyer et al. 1997).

Theorization not only aids diffusion, it is of paramount importance in the emergence of a new institution. Theorization by influential French chefs and culinary journalists defined the role and identity of chefs and the eating public, thereby giving rise to the pursuit of culinary creativity and consumption as an identifiable field. Moreover, with the professionalization of French gastronomy, further theorization and elaboration by the elites of the field made possible a seamless, almost resistance-free, transition to a new institutional logic and culinary style.

The Transposition of Institutional Logics

Large-scale creation of de novo institutions is not commonplace. Cases like the emergence of a French gastronomic field represent profound societal changes. A more typical mechanism for institutional emergence is refunctionality, by which we mean the transposition of institutional logics from one domain where they are common and accepted into a new, unfamiliar domain. Friedland and Alford (1991) noted that the core institutions of modern society - the family, the market, the polity, organized religion, etc. - have taken-for-granted schemas associated with them. These mental cognitions are closely linked with external rituals and practices. Thus, institutional logics are typically distinctive, even rivalrous. To act like one does when buying a used car at the family dinner would draw scorn from other family members, while treating a used car salesman like one would treat a family member would lead to being exploited. Consequently, most transpositions of logics are punished, but when logics from an existing domain are imported into a new, open domain, such a move may be successful and create new opportunities.

Let us return to cooking for an example. Unlike France, the United States does not have a distinguished or elaborated culinary tradition. To be sure, there are regional schools and various distinctive regional dishes. But there is no highly theorized American school of cooking, and cooking and dining in the U.S. have few of the rituals or romance of French or Chinese cuisine. Indeed, if the U.S. is known for anything around the world, it is fast food, the antithesis of a grand culinary tradition. But over the past few decades, a distinctive American style has emerged that emphasizes fresh, high quality organic ingredients, taking the garden into the kitchen.

This culinary school had its origins in the 1960s counter-culture movement, and its phrase "you are what you eat." The 1960s political logic of opposition to large corporate interests and American capitalism was nowhere more pronounced than in Berkeley, California. Thus, it is not surprising that in the 1970s the political logic was transposed from the world of protest into a lifestyle. Berkeley, California is today known for its restaurants and shops, most notably Chez Panisse and the Cheese Board. The founder of Chez Panisse, Alice Waters, has trained hundreds of apprentices and chefs who have gone on to start their own restaurants around the country, propagating her style. The Cheese Board has become the purveyor for high-quality California cheeses and baked goods, and helped create a mini-industry in Northern California for distinctive food products.

Our point is not to pique the reader's appetite for food, however. The analytical point is how radical protest that was actively repressed and policed found an opening in the empty American culinary field. The "small is beautiful" political phrase converted in the new culinary universe into support for family farms, organic foods, and all manner of heretofore unknown vegetables, fruits, spices, and types of seafood. The Berkeley entrepreneurs successfully transposed politics into food that was natural and sensory, and in so doing, politicized eating.

Other comparable illustrations of the process of refunctionality can be found in Renaissance Florence or in contemporary American research universities. For example, in early Renaissance Florence, transpositions might entail the use of a family tie (e.g., a father-son relationship) in a business partnership, or a family member (e.g., a daughter) could be married off to cement a political alliance (Padgett, 2000). In such cases, family linkages became the medium through which financial or political opportunities were pursued. By utilizing family or polity connections in business, entrepreneurial Florentines were able to create multi-product enterprises, combining wool, silk, and banking in ways that other businessmen had been reluctant to pursue (Padgett and McLean, 2005). In the contemporary field of the life sciences, an invisible college of research scientists might be activated to pursue a business opportunity, as when a group of prestigious researchers at several universities, who are making progress understanding the mechanisms of a specific disease, join together to found a science-based company (Powell, 1996). To some faculty and at a few universities, these acts of academic entrepreneurship have been unwelcome as they bring about an unholy marriage of science and property. But at many research universities, a focus on the commercial application of high-impact science has been warmly embraced (Powell and Owen-Smith, 1998; Owen-Smith and Powell, 2001; Mowery et al, 2004). In both cases, the coin of the realm in one domain - - family or science - - becomes the entry ticket into a new domain.

Transpositions such as these commonly disrupt established arrangements; hence they are actively resisted, sometimes harshly, by incumbents. Occasionally, however, existing institutions can be perturbed to the point where transposed logics are amplified through feedback loops. Consider, for example, the current unraveling of the welfare system in many industrial democracies, and the creation of "markets" for various social services formerly provided by the state, most notably in education and health care. When such profound transpositions do occur, entire fields can be reshaped, and new organizational models and practices are adopted. Moreover, the transposed logics that initiated this chain reaction (e.g., consumer choice in health care or running schools like a business) acquire heightened legitimacy.

SUMMARY AND IMPLICATIONS

The goal of this chapter has been to survey the neoinstitutionalist literature on entrepreneurship, with special attention to the idea of institutional entrepreneurship. We have taken a reflexive stance that the growing interest in the idea of institutional entrepreneurship, in a theoretical tradition that has emphasized the relative fixity of institutions and treats change as an exception rather than the rule, represents a fundamental theoretical shift in the collective understanding and conception of an actor. This shift is not limited to this particular theoretical tradition alone, and represents a more general trend in society at large. In this vein, we have contrasted the historical and anthropological description of entrepreneurs as outsiders or strangers with the modern western conception of empowered actorhood, which locates agency in individuals and legitimates them as the primary unit for action or "entrepreneurship." Individuals and organizations—as collections of individuals—are assumed to have the capacity to engage in creative activities. Further, more domains of activities are increasingly (re)framed in this light. To wit, small businesses are recast as start-ups and as sources of innovation, value, and jobs; and elements of the counter-culture are transformed as social entrepreneurship. What is more, it is assumed that all these activities can be taught and learned, as evidenced in the rapid rise in entrepreneurship courses and publications. Taken as a whole, this movement represents an institutional change of significant proportion and should be taken up as a dependent variable to be explained by any enterprising institutional theory.[5] Consequently, why and how this particular essentially modern and western conception of empowered individuals gains legitimacy over time and expands to various settings is a crucial, under-analyzed question. With this trend in mind, we have reviewed several strands of research that address the issue of how changes in existing institutional arrangements can be considered

entrepreneurial acts. We have maintained a constructivist persuasion and viewed entrepreneurial activities that lead to institutional changes as often purposive, but not directly intentional, thereby paying close attention to existing institutional structures, historical contingencies, and unintended consequences.

Although we have organized the section on institutional entrepreneurship in two broad parts, many themes cut across both. So we summarize the major themes that are common in the studies discussed so far, and in the general institutional literature.

Professionals and Socially Skilled Actors

In much contemporary research professionals and experts are identified as key institutional entrepreneurs, who rely on their legitimated claim to authoritative knowledge or particular issue domains. This view is most explicit in the role of lawyers and personnel professionals in the promulgation and diffusion of various employment practices. Similarly, the standardization literature points out how experts, on the basis of scientific and technological knowledge, espouse and proselytize standards that are thought to improve various aspects of human conditions and how readily their advice is followed voluntarily. Professional groups are highly stratified with regard to their claims to legitimate authority, and this ranking is conditioned by existing institutional arrangements. Personnel professionals, unconstrained by professional orthodoxy, innovated and experimented with novel practices, but it was the credentialed and more mature professionals, particularly lawyers, that sealed a stamp of approval for novel practices. Further, as in the case of nouvelle cuisine, when the field reached a certain level of professionalization, the conversion of the elites of the profession legitimated a new style of cuisine and led to a field-wide conversion.

While professional authority is important ammunition in the sovereign professions' arsenal, proselytizers often employ significant social and political skills to persuade potential converters. The case of Sun Microsystems illustrated the difficulty of sponsoring a technological standard. The main problem, largely stemming from Sun's attempt to juggle the dual role of innovator and sponsor, was that licensees increasingly came to view Sun Microsystems as self-interested, changing the rules of the game for its own advantage at the expense of licensees. Standards and practices are adopted voluntarily because actors are persuaded to see the benefits—real or not—in doing so. Similarly, when personnel professionals advocate for particular employment practices, they present their solutions as serving the interests of the employer, although those practices may advance their professional standing within the organization. Indeed, the world is filled with

these kinds of "disinterested" actors and their advice and recipes that purport to improve human conditions.

Studies on policy innovation and large-scale institution building discuss elements of social and political skills more explicitly. The main task for institutional entrepreneurs is to forge shared frames that bring together actors with disparate interests in institution building projects. The European Union's Single Market Project was one such instance in which the EU leadership provided solutions to similar problems faced by European states, while advancing their goal of the development of a larger collectivity. Institutional changes can occur when institutional entrepreneurs transpose an existing frame from one sphere to another (e.g., Chez Panisse, the Medici in early Renaissance Florence, or the field of life sciences) and or recombine an existing frame or cultural materials in a novel way (e.g., consumer watchdog organizations).

Theorization

Professional authority breathes legitimacy to what professionals advocate, and persuasion is supported by the abstract elaboration of ideas. At the most general level, the grand theorization of modernity has been to specify human beings as the fundamental unit of social action, and to construct the universal and abstract category of an "actor," underscoring the celebration of entrepreneurship and the recent expansive interest in institutional entrepreneurship. In this sense, theorization, by creating abstract categories and facilitating perceived similarity, constructs roles and identities and makes social action possible. In the various studies we discussed, theorization is a significant part of institutional change. In some cases, theorization purports to connect solutions to problems; in other cases, theorization involves defining identities and roles.

Employment practices were theorized and prescribed as remedies to deal with legal changes, and, at the same time, these practices would, personnel professionals argued, rationalize human resource management, thereby improving productivity while protecting employees and employers from discrimination and legal liability, respectively. In other words, professionals' theorization persuaded employers to see the multiple benefits of proposed employment practices. Consequently, theorization is often couched in the language of efficiency and equity, or more broadly progress and justice. And successful theorization of ideas or models relies on one or both pillars of the modern western cultural account. As such, theorization serves as a functional analysis, explaining why various rules and standards help achieve collective goals.

Theorization also defines identities and roles. In the case of French gastronomy, theorization in the form of culinary discourse defined the proper role of chefs and diners, as well as the eating public in general. Further, writings by outsiders such as novelists and philosophers defined the gastronomy in relation to other cultural fields. The case of consumer watchdog organizations suggests that there may be competition between different conceptions of a new organizational form, with each deriving its legitimacy from one of two pillars of modernity - - Consumers Research from efficiency or progress and the Consumer Union from equity or justice.

Unintended Consequences

Finally, several studies in our discussion suggest that institutional changes may result as an unanticipated consequence of unintentional, but purposive activities. For example, privatization of health care was partly an unexpected effect resulting from changes in Medicare's pricing tool from cost-based reimbursement to a per-case methodology. Similarly, the 1986 Tax Reform Act had the unintended consequence of giving rise to a new industry of low-income housing in which an unlikely partnership among community activists and banks developed to revitalize inner-city housing. In these cases, the resulting institutional changes were surprises, and not the intended goals of those who campaigned for them. This outcome is most vividly shown in Clemens' study of the origins of interest group politics. Women, as a disenfranchised group, successfully fashioned novel tactics to achieve enfranchisement, which was the intended goal of the movement. When successful, these novel tactics were copied by others, fundamentally reshaping the American political landscape.

More generally, the literature we have surveyed suggests the need for a more nuanced understanding of institutional entrepreneurs and institutional change, a view which acknowledges that actors play, directly or indirectly, a role in institutional change. In this spirit, Sahlin-Andersson and Engwall (2002: 294) argue for the "importance of involving more actors in field analyses that aim at exploring and explaining institutional change." Actors—many of them discussed here as professionals, carriers, standardizers, others, etc.—can precipitate and indirectly affect institutional change as part of their routine professional activities, as jurisdictional expansion, or as a matter of survival.

NOTES

[1]We thank the Center for Social Innovation, Stanford GSB for research support and Olav Sorenson for comments on an earlier draft.

[2] See Swedberg (2000) and Fagerberg (2003) for useful examinations of Schumpeter's ideas on entrepreneurship.

[3] In the early part of the 20th century, a model of international standards organizations emerged. The model was that these international nongovernmental standardized organizations would only accept national standards organization as members. On the other hand, individuals, associations, government agencies, as well as organizations could become members of national standards organizations (Boli and Thomas 1997: 184-185).

[4]Sahlin-Andersson and Engwall (2002) caution against the current usage of the concept of institutional entrepreneur, which privileges the ideas of agency and instrumentalism, and observe that much institutional change is either indirect or unintended. They call for more a contextual consideration of the role of actors, interests, and action in institutional change.

[5] In this regard, Meyer and Jepperson's (2000) discussion of cultural devolution has made a pioneering attempt to explain the relocation of agency onto individuals.

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10. Social Networks and Entrepreneurship

INTRODUCTION

A central tenet in sociology holds that positions in social structure influence the attitudes, behaviors, and outcomes of the actors occupying those positions. Though this proposition underlies much sociological thinking, perhaps the clearest instantiation of it appears in the literature collectively referred to as 'social network theory'. Research in this area investigates both the structure of the relations between social actors and how patterns in those relations influence a variety of outcomes. To the extent that network theory has a central idea, it is that locations in social structures determine the opportunities available to, as well as the constraints binding, actors. In other words, actors' positions in webs of relationships determine the level of social and economic benefit they attain.

This chapter reviews some of the mechanisms through which social networks might influence the entrepreneurial process and some of the implications of these processes. Our review of this literature divides the challenges facing the entrepreneur into two basic tasks: the identification of a promising opportunity and the mobilization of resources to exploit it. Social networks influence both of these stages of the entrepreneurial process: they shape information flows and trace the ties through which financial capital flows. If one thinks of ideas, knowledge, and capital as the central ingredients entrepreneurs must assemble in new venture creation, social relations provide the connections required to unite these ingredients to form new organizations.

Though many consider a broader set of activities to fall under the rubric of entrepreneurship, we focus on the act of founding a firm. We do so because delineating the boundaries of entrepreneurship within existing firms strikes us as fraught with difficulty. Moreover, while the most common form of entrepreneurship involves a transition to self-employment, our own research for the most part has considered the formation of technology- and capital-intensive firms. As we lay out the arguments in this chapter, we have in mind the formation of firms with these characteristics. Despite this focus,

in principle the application of social network theory to a broader definition of entrepreneurial activity would draw on roughly the same set of ideas. After all, entrepreneurship within firms (often referred to as "intrapreneurship") involves analogues to the same two critical steps in forming new companies: identifying valuable opportunities and then mobilizing the requisite resources to realize them.

OPPORTUNITY IDENTIFICATION

An early step along a prospective entrepreneur's path to beginning a new business is the identification of an opportunity to pursue. In essence, the would-be entrepreneur must recognize that society currently deploys resources in a sub-optimal manner, so that a benefit exists to mobilizing and then reconfiguring them for use in a different capacity. In many instances, opportunity recognition results from an entrepreneur's creative insight into a new way to fulfill an unmet need. But even in well-established and highly visible industries, much of the information that serves as a necessary input to the creative process is available only to those with extensive industry experience. In part for this reason, considerable evidence reveals that nascent entrepreneurs most likely develop new ventures in domains in which they have broad work experience (for an early statement of this argument, see Brittain & Freeman, 1986).

In a second and less common set of cases, entrepreneurship can involve the discovery of an entirely new means of creating value. One can view the creators of companies of this sort as bringing together previously disparate ideas or pieces of knowledge in such a manner as to exploit complementarities between them (Schumpeter, 1934). Sometimes this involves the creation of an entirely new class of product – for example, the computer workstation brought together a set of existing computer components to create a fundamentally new type of machine. But entrepreneurs can also innovate in terms of processes or business models. Netflix, for instance, has challenged traditional video retailers (e.g., Blockbluster) by recognizing that the DVD, weighing only an ounce and hence inexpensively transportable by post, changes the economics of distribution. The same could be said for internet-based stock brokerages, book retailers, and other types of web businesses that substitute for traditional means of distribution. Recognizing entrepreneurial opportunities of this nature requires detailed information about the potentially complementary domains: nascent entrepreneurs must become aware of these disparate bases of knowledge and connect them before too many others seize the available opportunity.

One reason why social networks shape the entrepreneurial process so importantly is that they provide the conduits through which private information flows. To the extent that individuals occupy heterogeneous positions in networks, they vary in their access to this information. And to the degree that the recognition of entrepreneurial opportunities hinges on access to private information, differences in network positions can thus explain much of the inter-individual variance in access to the knowledge required to discern attractive opportunities for new ventures.

A substantial literature on diffusion and social influence attests to the importance of social networks as pathways for the transmission of private information. One stream of the literature in this area examines the diffusion of innovations. Classic studies include Ryan and Gross's (1946) pioneering investigation of the spread of the usage of hybrid corn and Colman, Katz and Mendel's (1957) examination of the adoption of a new drug. These path-breaking inquiries revealed that the pattern of social connections among individuals strongly predicts the sequence of adoption of an innovation in a focal population (Rogers, 1995, reviews this research stream in detail). In general, this body of work establishes that private communications occurring across the links in a social network provide much of the information that actors use to make sense of new products and processes.

Sociological investigations have evolved beyond the simple observation that networks matter—the preponderance of the work in the area now considers the specific social structures most beneficial to or efficient at providing the resources necessary to perform the task(s) being considered. Studies to date have for the most part examined *egocentric* networks, which consist of the set of relations that surround a chosen set of individuals or firms. One stream of this literature emanates from Granovetter's (1973) classic study, which asserted that *weak ties*–think of an acquaintance, rather than a friend–prove most important for accessing information leading to job (and other) opportunities. The typical individual maintains close ties to only a small number of friends and family. By contrast, some people maintain weak relations with dozens or even hundreds of others. As a matter of sheer quantity, these weak relations may lead to knowledge about more opportunities than do our close friends and family. Moreover, relative to close connections, weak ties more frequently serve as bridges across otherwise disconnected social groups. Granovetter argued that the importance of bridging ties lies in the fact that they expose actors to new information and opportunities—information they would not have encountered in the absence of a relationship with a socially distant actor. In subsequent work, Burt (1992) has extended the notion of bridging ties into a general statement of the advantages available from ties, regardless of strength, that span "structural

holes" (the lacunae between groups of disconnected actors). If access to non-redundant information is the objective, Burt observed that the strength of a tie matters less than the magnitude of the social distance that it spans.

Most of the studies that seek to relate systematically egocentric network structure to entrepreneurial activity examine aggregate data that do not allow the researcher to distinguish whether certain structures affect opportunity identification or resource mobilization. With this important caveat, the most prevalent argument in network-based entrepreneurship studies directly parrots the broader work on the importance of weak or bridging ties: nascent entrepreneurs with structurally diverse networks more likely encounter promising opportunities, and hence more likely engage in entrepreneurship. For instance, studying female graduates from a prestigious MBA program, Burt and Raider (2002) found higher rates of transitioning to self-employment among those with structurally diverse networks. Similarly, Rezulli, Aldrich, and Moody (2000) demonstrated that would-be entrepreneurs with networks that spanned "multiple domains of social life" founded new firms with greater frequency. And in a detailed case study, which *can* disentangle the opportunity recognition from resource mobilization, Elfring and Hulsink (2003) find evidence that weak ties do facilitate opportunity identification.

RESOURCE MOBILIZATION

Following the identification of an attractive opportunity, nascent entrepreneurs must assemble a variety of resources to begin operations. In emerging industries, those hoping to found firms generally require financial capital and skilled labor. As industries develop, selection processes, capital investments, improvements in human capital specific to the business and the accretion of tacit knowledge increase the average production efficiency of firms in the industry. For new entrants to compete in mature markets, founders likely require access to each of these inputs.

Sociologists refer to the process of gaining access to the inputs required to start a viable business as resource mobilization. Because uncertainty regarding the likelihood of profitable exchange typically makes resource holders reluctant to part with them, the poor life chances of most new organizations stand as a primary obstacle to resource mobilization. Social scientists have offered numerous explanations for the high failure rate of new firms: New organizations often lack the commitment of their employees, knowledge of their environments, and working relationships with customers and suppliers necessary to operate successfully (Stinchcombe, 1965).

Similarly, unseasoned enterprises possess little production experience, and so operate under the guidance of immature and unrefined routines (Hannan & Freeman, 1984). Moreover, new organizations start small. In part because they lack the resources to withstand a sustained period of poor performance, small organizations suffer from a high rate of disbandment (Levinthal, 1991). These perils have led organizational sociologists to argue that young (small) organizations are highly vulnerable to environmental selection, a notion succinctly portrayed as a liability of newness (smallness). All of the factors that conspire to reduce the life chances of new firms also impede resource mobilization.

As with opportunity identification, social networks play an important role in facilitating resource mobilization. The backdrop of low survival prospects among new firms makes the role of networks all the more important. The literature has elaborated a few critical tasks that nascent entrepreneurs appear to accomplish with greater success when they have rich social networks: (1) attracting financial capital, (2) recruiting skilled labor, and (3) accessing tacit knowledge. The mechanisms thought to account for the role of social networks in resource acquisition prove to vary somewhat by the type of resource, so we consider each of these in turn. In the following sections, we argue that when entrepreneurs have rich social networks, they enjoy considerably greater success in overcoming some of the obstacles to resource mobilization.

Access to Financial Capital

Since fledgling firms in many fields must either make upfront capital investments and/or incur variable costs for some period before achieving sales, most entrepreneurs must attract financing before starting a firm. Though the exact degree to which capital constraints limit entrepreneurship remains unknown, telling evidence comes from studies of the sensitivity of rates of entrepreneurship to unexpected gains in personal wealth. For example, Evans and Javonovic (1989), analyzing the National Longitudinal Survey, found that gains in personal wealth through inheritance accelerated the transition to self-employment. In fact, they concluded that financial constraints restrict entrepreneurship more than any other single factor. These findings pertain to the transition to self-employment across all types of firms; as one considers capital-intensive businesses such as technology-based companies, capital constraints can loom very large.

Financing for companies originates from many places, but four sources account for the majority of startup capital: (1) personal wealth, (2)

loans and investments from friends and family, (3) bank loans, and (4) venture capital. Two primary factors account for why founders' social networks affect their ability to raise capital. First, much as entrepreneurs recognize opportunities by aggregating information available in their networks, investors identify promising investment candidates in part by searching across their networks. Better-connected founders therefore more likely reach the attention of investors looking for options. Second, investors often prefer to finance companies in which they enjoy a cohesive relation with company principals because, for reasons discussed below, such social structures may safeguard investor interests.

Though an entrepreneur seeking capital can make potential investors aware of the opportunity to invest in his firm, investors tend only to commit funding when they feel confident in their understanding of hard-to-assess qualities of potential opportunities. As researchers in the areas of finance, economic sociology, transaction costs economics, and entrepreneurship have observed, a set of uncertainties and information asymmetries encumber the evaluation of new ventures and complicate the process of contracting between resource holders and fledgling firms. One problem is that entrepreneurs may provide unreliable information. In addition to the fact that entrepreneurs often hold overconfident assessments of the prospects of their endeavors, they also may have an incentive to convey misleading information to potential investors in an attempt to secure funds. Indeed, Amit, Glosten, and Muller (1990) argue that investors in early-stage companies face a variant of the classic 'lemons' problem. At a minimum, an 'information asymmetry' between entrepreneur and investor exists because entrepreneurs have better knowledge of their own capabilities and intentions than do investors. This increases the risk borne by investors in new companies because entrepreneurs may exploit their superior knowledge of their company to gain concessions from investors, for example, by extracting a higher valuation or larger resource commitment than a fully (or more) informed investor would provide. And in many cases, no amount of search of public sources would help the would-be investor to redress the information asymmetry.

When investors and entrepreneurs share overlapping social networks, however, the investor can acquire otherwise difficult-to-discover information about an entrepreneur, including assessments of the entrepreneur's reliability and integrity. Moreover, when an investor's trusted contacts offer assessments of an entrepreneur, these evaluations lack the perception of bias that discredits information provided directly by the entrepreneur. In the venture capital industry at least, one sees strong evidence of these effects. Venture capitalists appear to prefer to invest in fledgling firms that they learn of through referrals by close contacts, including entrepreneurs they have previously sponsored,

fellow venture capitalists, family members, or other professional contacts (Fried & Hisrich, 1994; Shane & Stuart, 2002; Hsu, 2004). These close contacts have an incentive to provide accurate and complete information about entrepreneurs, as well as to bring high quality ventures to the attention of the venture capitalist, because they enjoy an ongoing exchange relation with the VC from which they derive some benefit. Conveyance of inaccurate information or referrals of unreliable individuals will ultimately undermine the credibility of the referrer, and thus the continuance of the relationship (Coleman, 1990).

In addition to exploiting their networks to obtain information about entrepreneurs, investors can also sometimes use them to minimize post-investment problems. Noting that entrepreneurs might shirk or misallocate resources provided by investors, a large body of work in corporate finance discusses the optimal design of contracts between investors and entrepreneurial ventures (for a review, see Kaplan & Strömberg, 2003). Particularly among savvy investors, one sees extensive use of contractual terms aimed at curtailing opportunistic behavior – for instance, early investors typically stage their investments to limit their risk (Amit et al., 1990; Gompers, 1995), retain rights to replace management (Hellman, 1998), and purchase convertible securities that yield control to investors in the event that the company fails to meet pre-specified performance milestones. Despite the prevalent use of formal controls, contracts between investors and entrepreneurs nevertheless remain 'incomplete,' meaning that the contracts do not protect against all possible types of opportunistic behavior that entrepreneurs might undertake.

In the presence of these incomplete contracts, cohesive social ties connecting potential investors and entrepreneurs may increase the chance of an investment by offering an additional defense of investor interests. First, a tighter relation between the investor and the firm increases the ease with which the investor can evaluate the entrepreneur's activities. Knowing more about the business and being in contact with it on a regular basis allows a skilled investor to catch potential problems early. Second, beyond their own observations of the company, cohesive relations also allow the investor to call on others to assist in monitoring the firm. Through mutual contacts investors may learn of problems before they notice them firsthand. In this sense, monitoring need not involve simply the prevention of self-interested action on the part of the entrepreneur; it can also serve to alert investors to when they should assist the entrepreneur to protect their own investments. Coleman (1990) discusses this issue in the context of parents monitoring the activities of their children; if parents also know the parents of their children's friends, they may become aware of a need for their intervention sooner. Third, in

cases where enforcement becomes necessary, cohesive relations augment the ability of the investor to sanction the entrepreneur: Investors can ask mutual contacts to assist them in influencing the entrepreneur (or punishing him should he resist influence).

Recruiting Skilled Labor

New ventures in many areas must recruit highly skilled employees that often belong to established organizations. For example, upstart biotechnology firms frequently compete with universities and established biotechnology and pharmaceutical firms to attract Ph.D.-level scientists and executives with experience in the biopharmaceuticals industry. At least three drawbacks of employment at young companies, however, interfere with early-stage companies' efforts to recruit scarce labor. First, as previously noted, all new enterprises face uncertain life chances. Hence, one might expect potential employees to regard an employment prospect at a new and unknown venture with suspicion when compared to the job they currently hold. Exacerbating this problem, prospective employees face the very same information asymmetry problems that investors do when considering an offer to join a nascent venture. And once again, a potential employee cannot simply accept all of the claims of the entrepreneur, since company principals have a clear incentive to provide incomplete or misleading information to convince a prospective hire to sign on.

Given the uncertain survival prospects of new ventures, entrepreneurs must be very persuasive to succeed in recruiting highly skilled individuals who hold secure positions in well-established organizations. Through a variety of mechanisms, the more extensive the social networks of a young firm's founders, the more success the firm likely enjoys in recruiting highly qualified individuals. For instance, one consequence of an entrepreneur having direct relationships with many of the friends and colleagues of a potential recruit is that the entrepreneur has a disincentive to overstate the prospects of his firm. Relaying inaccurate information to a potential recruit who belongs to the entrepreneur's network risks jeopardizing the entrepreneur's credibility and integrity with friends and/or professional contacts. In addition, though the very nature of a new firm precludes the track record that informs quality assessments, individuals typically do have established reputations among their direct and indirect contacts. And insofar as the entrepreneur's personal and professional contacts respect him highly, individuals socially proximate to the entrepreneur are likely more sanguine

about the future of the new company because of their high regard for the founder.

These network-based arguments apply as well to the investors that finance young firms. As Sorenson and Stuart (2001, p.1554) note, "an oft repeated industry adage [is]: It isn't getting the money, it's who the money comes from." Having the backing of prominent investors benefits new ventures well beyond just the money they bring to the table. As stakeholders in a young firm, investors have a strong interest in the success of the venture. In addition to providing entrepreneurs with advice on operating issues and participating in the governance of the firm, investors typically loan their reputations and their contact networks to the companies they support (Bygrave & Timmons, 1992). Since a large number of investors have themselves been successful entrepreneurs and because many participate regularly in the financing of young companies, investors often have extensive ties in the professional communities from which firms recruit senior technical staff and executives. Beyond their immediate contact networks, the very act of making the investment serves as an endorsement of a young company, thus improving the resource holders' perceived prospects of a young company (Stuart, Hoang & Hybels, 1999). For these reasons, one might expect young companies with prominent investors to recruit more successfully.

In concluding this section, we should note that an abundance of theory and a surfeit of anecdotes exist regarding the influence of networks on recruiting at early-stage companies. The storied venture capital firm Kliener Perkins serves as a frequent example in the popular press: Kliener considers the companies in which it invests members of a "Kieretsu", and it has a reputation for rehiring entrepreneurs from companies it has sponsored in the past to work for recently funded ventures (Kaplan, 1996; Warner, 1998). The prevalent examples and widely held assumption in the academic literature, however, belie an almost complete absence of systematic research on the relative importance of and the mechanisms by which networks shape senior management recruiting at new firms. Additional empirical work in this area is obviously needed.

Access to Tacit Knowledge

Existing social relations also influence resource mobilization through the connections to tacit information they provide. By definition, tacit knowledge eludes codification. Despite (or perhaps as a result of) this, the sustained profitability of firms in a variety of industries depends on access to this valuable knowledge (Rivkin, 2001). Fledging enterprises that can

mobilize this tacit knowledge therefore enjoy a substantial advantage over rivals that cannot (Liles, 1974; Klepper & Sleeper, 2000).

Nascent entrepreneurs can generally only access this valuable knowledge through their existing relations. Though some types of businesses have attempted to package and sell such valuable information – franchising, for example, would fit in this category – tacit information resists efficient market-based exchange. Potential buyers likely question the value of the information, and sellers cannot easily address their concerns without revealing the valuable information. Cohesive social relations – those where two individuals not only know each other but also share a large number of friends – can overcome this market failure by engendering the trust necessary for exchange to take place (Coleman, 1990). Absent the incentives on the part of the knowledge holder to release the information, the transfer of tacit information also typically requires a strong social relation between the holder and the recipient of the knowledge. Ethnographic accounts of science and industrial R&D, for example, frequently note that individuals acquire research capabilities through hands-on experience and apprenticeships with skilled researchers (Latour, 1989). Complex, tacit knowledge resists transfer in the absence of this high bandwidth face-to-face contact because knowledge transmission nearly always occurs with minor errors and gaps. Strong ties to the knowledge source both reduce the magnitude of these transmission errors and allow recipients to confer with the knowledge source in correcting them (Sorenson, Rivkin & Fleming, 2004).

In many cases, nascent entrepreneurs in mature industries may find it difficult to access this knowledge without working for one of the existing firms in the business (Sorenson & Audia, 2000). Through the course of their operations, organizations in many industries build valuable knowledge through learning-by-doing. Though some of this knowledge appears in operational manuals and becomes incorporated in machinery, much of it remains tacitly incorporated in the unwritten routines that workers follow. Though companies might allow outsiders to tour their facilities, absorbing these routines typically requires more intensive observation. Hence, individuals that do not work for one (or more) of the incumbent firms in an industry have little opportunity to acquire this valuable knowledge.

IMPLICATIONS

The arguments we have made to this point have a number of implications for patterns we can expect to observe in analyses of entrepreneurial activity. We develop two ramifications below, one concerning

the career trajectories of high potential entrepreneurs and a second addressing the geography of entrepreneurial activity. Though many have documented the phenomena we discuss below, only recently have researchers sought to link explicitly their occurrence to the influence of network structures on entrepreneurial activity.

Spin Offs

There are a number of reasons to expect that high-level employees at established companies comprise the set of individuals best equipped to launch new ventures in the field of their current employer: they possess the organizing know-how, necessary technical expertise, and – most relevant to the assertions of this chapter – the contact networks necessary to recognize opportunities and mobilize the financial and human resources to create new firms (Freeman, 1983; Romanelli, 1989; Aldrich, 1999; Sorenson & Audia, 2000; Burton, Sørensen & Beckman, 2002; Stuart & Sorenson 2003b). In the course of performing their work roles, senior-level employees at established firms typically build extensive networks relevant to their domains of work. Such individuals naturally build connections inside their workplaces, and they participate in conferences, professional associations, and business transactions that lead to a broadening of their networks within their professional community.

Because of the extensive networks they develop, executives and senior technical staff at existing organizations encompass high potential entrepreneurs, particularly in businesses that entail technically sophisticated products and production processes (Brittain & Freeman, 1986). We can expect that individuals with extensive work histories in an industry have built a commensurately rich set of professional contacts, which facilitate entrepreneurial activity in that industry (Sorenson & Audia, 2000; Stuart & Sorenson, 2003a, 2003b). As a result, we anticipate that established organizations within an industry form the primary source of entrepreneurs that create new firms in that industry. Put differently, one implication of the arguments in this chapter is that spinoffs (founders departing from ongoing firms) will constitute a significant proportion of the entrants in many businesses. Among technology-based industries, empirical evidence consistent with this now exists in automobiles (Klepper, 2002), biotechnology (Mitton, 1990; Stuart & Sorenson, 2003a), microelectronics (Brittain & Freeman, 1986), and telecommunications (Dahl, 2003).

Geography of Entrepreneurial Activity

In a related vein, we believe that one of the most significant implications of the influence of social network structure on opportunity identification and resource mobilization concerns the geography of entrepreneurial activity. Beginning with Bossard (1932), many studies have established the importance of spatial propinquity in marriage and friendship—consistently finding that the likelihood of a relationship declines rapidly with the physical distance separating two parties. Business interactions similarly show evidence of spatial influence: Kono, Palmer, Friedland and Zafonte (1998), for example, find that corporate board interlocks occur most frequently among firms with headquarters in close geographic proximity, and Baker (1984) shows that options traders exchange with those located near to them on a trading floor. Studying the relationships between venture capitalists (VC firms) and the target companies in which they invest, Sorenson and Stuart (2001) demonstrate that VC firms rarely invest in companies located far from them, and only do deviate from this behavior when they can invest together with a trusted partner that does reside near the target.

Because entrepreneurs utilize the contacts in their social networks to found firms, because individuals' contact networks concentrate in the region in which they work and live, and because established firms produce many of the resources consumed in new venture creation (tacit knowledge and skilled labor), new firms in an industry tend to arise in the same locations as existing ones. The concentration of a prospective entrepreneur's network contacts in space, together with the multifaceted influence of networks on the entrepreneurial process, implies that those individuals most able to enter an industry reside in the regions that have concentrations of those businesses already. For example, those most able to recognize an opportunity and mobilize resources to start a new film business most likely live in Los Angeles and work in film or a related industry. Those most likely to found a biotech venture in the United States reside in Boston, San Diego or the San Francisco Bay Area, and so on. As a result of this process, entrepreneurial activity in a field tends to follow the current geographic distribution of industrial activity in that field. Sorenson and Audia (2000) provide strong evidence for this process in the United States shoe industry. Klepper (2002) identifies the same dynamic among U.S. automobile manufacturers. And Stuart and Sorenson (2003a) demonstrate that the same patterns appear in the biotechnology industry.

Interestingly, the geographic constraints on entrepreneurial activity may lead to overcrowding among firms of like kind. The localization of entrepreneurship within an industry happens despite the fact that a high spatial

density of firms can intensify competition, thereby lowering the average performance of the firms within a geographic cluster. Evidence of this dynamic comes from at least two industry studies: footwear and biotechnology. Sorenson and Audia (2000) find that in the U.S. footwear industries new plants continue to enter cities with concentrations of footwear plants at a higher rate than more remote regions, though these same regions exhibit far higher exit rates. Along similar lines, Stuart and Sorenson (2003a) demonstrate that regions with a large number of biotech firms experience higher biotech founding rates. These crowded regions, however, offer firms the lowest odds of going public, an important indicator of success in the biotech industry. Beyond these studies, however, research has yet to document the breadth of this phenomenon.

Though these findings challenge economic interpretations of the existence of regional industrial clusters, which typically assume that clusters must represent some efficient form of industrial organization, the book remains open on whether policy should seek to encourage a greater degree of spatial dispersion within industries. Economic theory on the value of agglomeration refers to the social returns to such a distribution, rather than its benefits to the owners of a firm. Hence, some other stakeholder might benefit from this arrangement—most notably, workers in industrial regions may benefit from higher wages thanks to a combination of productivity gains in these regions as a result of economies of agglomeration (returns to co-location with rivals) coupled with strong labor market competition.

EMERGING STREAMS

Social Influence

Another line of sociological investigation contends that social networks not only provide pathways for information and resource flows, but also act as conduits through which social influence operates (e.g., Friedkin, 1998). This stream brings an extensive literature at the interface of sociology and social psychology to bear on entrepreneurship. Since entrepreneurship necessarily involves doing something different, one might think of it as a form of deviance. In professional work settings, this interpretation appears particularly salient. For example, Stuart and Ding (2003) investigate entrepreneurial activity in a large sample of academic (i.e., university-employed) life scientists. Though the attitudes toward commercializing research produced in universities have significantly changed over time, the

decision to found or join a commercial venture once represented a clear violation of strongly held norms in academia, which prescribe that scientific findings belong in the public domain (rather than for the benefit of the individual responsible for the breakthrough). Stuart and Ding (2003) find that individual academic scientists' propensities to transition to entrepreneurial activity in the early academic life sciences depended to a large degree on the extent to which their networks and work settings included pro-entrepreneurship scientists. Though most settings lack taboos against commercial enterprise (for an exception, consider entrepreneurial activity in the early period of economies in transition), in any situation in which entrepreneurial activity either violates norms or rarely occurs, one might expect that network-based social influence processes will underlie the diffusion of new venture formation in a population.

Interaction with Institutions

Another interesting direction of recent research combines the insights of the importance of social networks with an understanding that institutions may interact in important ways with these processes.

In another recent piece, Stuart and Sorenson (2003b) investigate the importance of labor law to the entrepreneurial process. Labor law matters for at least two reasons. As noted above, entrepreneurs frequently come from the ranks of existing employees. To the extent that labor law binds them to their current employer, these laws may severely restrict entrepreneurship. In addition, restrictive labor laws bind the skilled labor that entrepreneurs require to start their firms to their current employers. Gilson (1999), in fact, argued that one type of labor law in particular plays an important role in limiting entrepreneurship: covenants not to compete. These agreements, typically signed at the time of initial employment, restrict employees from either starting or seeking employment with firms that would compete with their original employer. States vary, however, in the degree to which they will enforce these agreements. Some states, like California, will not enforce them at all, interpreting them as an illegal restraint on trade. Others, such as Massachusetts, enforce even relatively comprehensive agreements that severely limit employees' future options. Stuart and Sorenson (2003b) find strong evidence that these differences in labor law explain a substantial portion of the state-to-state variation in entrepreneurship rates. Though this study provides evidence of the potential importance of one particular type of institution, labor law, much work remains on specifying the ways in which

institutions moderate the role that social relations play in the entrepreneurial process.

Biased Information Flows

On the whole, theoretical accounts of the relationship between social networks and opportunity recognition have focused on the positive aspects of access to private information through interpersonal relations. Social networks, however, may not always provide more accurate information regarding the opportunities in a local area. One problem concerns the transmission of extreme events. For example, in the classic study, *The Search for an Abortionist*, Nancy Lee (1969) found that women managed to locate doctors to perform abortions despite both the rarity of these doctors and their inability to advertise (due to the illegal nature of their services at the time). Perhaps as a result of the unusual nature of this information, it appears to have dispersed more widely than more mundane information. For nascent entrepreneurs, this selective transmission may lead to systematic mistakes in their evaluation of the attractiveness of the market. Information on successful founding attempts may diffuse more widely than that of failures. Sørensen and Sorenson (2003), for example, discovered that nascent entrepreneurs in the television broadcasting industry in deciding whether to attempt entry appear far more sensitive to successful entries than to the failure of existing firms, despite the fact that both provide information on the attractiveness of the market. Moreover, prospective entrants also appear to misinterpret the information provided by entry, perceiving them as signs of a munificent environment rather than as increasing the intensity of competition.

The Shape of Global Social Networks

The substantial majority of prior, sociologically based research on networks and entrepreneurial activity considers how the structure of actors' egocentric networks affects opportunity recognition and resource mobilization. A growing literature – as yet unconnected in any significant way to work on entrepreneurship – examines the shape of very large social networks in entire communities of actors. Rather than evaluate the opportunities and constraints that arise from the relations that embed a focal individual in a social circle, this work addresses the overall structure of relations in a community. Clearly, a link exists between these levels of

analysis: the macro network aggregates the discrete ties that connect all individuals in a population. If our general assertion holds – that the incidence of entrepreneurial activity hinges on the structure of individuals' social networks – it is quite likely that knowledge of the overall shape of social networks could enhance our understanding of the entrepreneurial process at an aggregate level. At a macro level, cross-regional, cross-cultural, cross-ethnic, and inter-temporal variation in the incidence of opportunity recognition (and thus entrepreneurial activity) may depend on differences across these units in the structure of macro networks.

In the sociological literature, the most influential research on global network structures has been Watts' (1999) work on the "small worlds" phenomenon. Watts portrays an image of social structure in large communities in which most individuals do not share direct connections (obviously true in any sufficiently large group); the majority of relationships cluster locally (consistent with a great deal of empirical evidence); and a relatively small number of ties randomly interconnect the many disparate clusters of relations. These ties – akin to the bridges discussed in Burt's work – serve to increase dramatically the distance and speed with which information can travel in a network.

Though we do not know of any systematic attempt to link macro social structures empirically to the incidence of entrepreneurial activity, it stands to reason that many cultural, social, economic, and historical factors produce different patterns of connectivity across groups in different times, places, and regions. For example, Saxenian's (1994) widely influential qualitative analysis of the history of Silicon Valley assumes that a set of cultural and historical factors produced a density of social relations in Silicon Valley that differentiated the region from other parts of the country. Her argument thus concerns the relationship between a macro network structure and the incidence of entrepreneurial activity. Though not directly concerned with entrepreneurship, Fleming, Juda and King (2004) attempt to establish a more systematic link between global network structure and innovation. In a large-scale study of inventors' networks, they find that regions characterized by small world properties (e.g., short average distances between individuals) produce new inventions at a faster rate, The long term value of this approach, however, remains to be seen.

CONCLUSION

Network-based arguments clearly have significant potential to enhance our understanding of two critical tasks comprising the entrepreneurial

process: the discovery of new business opportunities and the mobilization of resources. Though we believe that firm theoretical grounds justify this conclusion, much of the work in the field of entrepreneurship *per se* merely invokes the *metaphor* of a network—very little of this research systematically deploys the theory and methodology that has been developed in sociology. In this regard, we see a tremendous opportunity for research on networks and entrepreneurship more directly grounded in the insights from the sociological literature. The overview in this chapter should also make it apparent that in many areas our theories remain unconfirmed. Thus, we perceive a compelling need for empirical tests of network-based explanations, as well as for the collection of data sets and implementation of research designs that support valid causal inference.

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11. Entrepreneurship and Disciplinary Scholarship: Return to the Fountainhead[1]

INTRODUCTION

As I write this chapter, an incredible sense of anxiety and apprehension overcomes me. Entrepreneurship, as a scholarly discipline, is at another crossroad. Over the past 10 years, I have seen the phenomenal growth and evolution of scholarship in the field; the proliferation of academic programs, journals and faculty positions; and the widespread acceptance of the importance of entrepreneurship among public policy makers the world over. Many have come to believe that if capitalism has won the ideological war, the roots of this victory lie clearly in the powerful forces of entrepreneurship. Entrepreneurship has revived ailing Western economies, infused energy and life into newly independent Eastern block countries, and given hope to millions in transitional economies that successful transformation will soon enrich their lives. Entrepreneurship has also been touted as the key pathway to economic development, technological progress and growth in developing economies.

Tremendous energies have gone into institutionalizing entrepreneurship as an academic discipline, in the US and other parts of the globe. New programs have been built, attracting experienced and young students alike. New journals have been created to advance scholarship in this young but thriving field. Conferences about entrepreneurship have also proliferated. A new generation of scholars has entered the field full of enthusiasm. Senior and more established researchers have revised their research agendas and honed their skills, focusing on doing research in entrepreneurship.

A look at Table 1 reinforces the continued growth of scholarship in entrepreneurship over the past two decades. *Journal of Business Venturing* (JBV) alone has published 532 papers on various entrepreneurial topics since its inception. *Small Business Economics* has published 617 papers. Our top

management journals have also published more and more entrepreneurship papers. Both *The Academy of Management Journal* (AMJ) and *Academy of Management Review* (AMR) have published 36 papers on entrepreneurship each over the past two decades. *Journal of Management* has published 36 papers, while *Journal of Management Studies* has published 47. *Management Science* has published 117 entrepreneurship papers, where nearly half of them have appeared in the past five to six years. *Strategic Management Journal* has published 86 entrepreneurship papers, over 50 percent of which have appeared in the past 10 years. These statistics do not fully capture the extent of publication in the field of entrepreneurship, especially in specialized and newly created journals in the US and elsewhere. But even these incomplete statistics show the intellectual vitality and ever growing rate of publication in the field.

These monumental achievements have been made against the backdrop of an intense debate about the scope, boundaries, and potential contributions of entrepreneurship as a scholarly discipline. Recently, some of the leading academic programs created a few years ago to advance research in entrepreneurship, have been drastically retrenched or even have folded. Other programs have been subsumed under existing disciplinary units, hoping to integrate them. The debate about the distinctive contribution of entrepreneurship as a field has overshadowed the overwhelming energy being devoted to studying entrepreneurial issues and phenomena.

The debate about the domain and scholarly contributions of entrepreneurship has persisted for nearly three decades now (Davidsson, 2004; Gartner, 1990, 2002; Low, 2002; Low & MacMillan, 1988). Some have already conceded the impossibility of having a well articulated, widely accepted statement of the domain of the field (Gartner, 2002). These scholars have, instead, accepted the proposition that there are different subfields that are loosely connected, forming a mosaic of issues to be explored. Others have taken the opposite view suggesting that a focus on the conception and recognition of opportunities offers the basis for a general definition of the field. Concerned by this debate and discouraged by the lack of progress, some researchers have come to see entrepreneurship as field without substance. Even the ardent supporters of the field have expressed discouragement about the lack of systematic and thoughtful scholarship in the field, noting that entrepreneurship researchers have not been creative or insightful in their analyses of the complex issues that perplex their field.

TABLE 11-1 *Disciplinary Bases of Citations in Key Entrepreneurship Journals*

Journal	Pre'90	Citing	90-94	Citing	95-99	Citing	00-04	Citing	Total	Citing
Journal of Business Venturing	**81**		**158**		**141**		**152**		**532**	
Economics	17	21%	56	35%	85	60%	99	65%	257	48%
Sociology	24	30%	68	43%	76	54%	95	63%	263	49%
Strategy	35	43%	89	56%	90	64%	105	69%	319	60%
Psychology	17	21%	45	28%	52	37%	66	43%	180	34%
Academy of Management Journal	**8**		**4**		**7**		**17**		**36**	
Economics	2	25%	3	75%	3	43%	12	71%	20	56%
Sociology	3	38%	3	75%	6	86%	11	65%	23	64%
Strategy	2	25%	4	100%	5	71%	17	100%	28	78%
Psychology	4	50%	2	50%	5	71%	9	53%	20	56%
Academy of Management Review	**5**		**2**		**11**		**18**		**36**	
Economics	1	20%	2	100%	3	27%	11	61%	17	47%
Sociology	4	80%	2	100%	3	27%	10	56%	19	53%
Strategy	3	60%	1	50%	5	45%	11	61%	20	56%
Psychology	4	80%	0	0%	4	36%	2	11%	10	28%
Journal of Management	**6**		**8**		**5**		**17**		**36**	
Economics	3	50%	7	88%	4	80%	11	65%	23	64%
Sociology	5	83%	6	75%	4	80%	13	76%	28	78%
Strategy	4	67%	7	88%	5	100%	15	88%	31	86%
Psychology	5	83%	6	75%	3	60%	8	47%	22	61%
Journal of Management Studies	**7**		**11**		**16**		**12**		**47**	
Economics	1	14%	7	64%	11	69%	6	50%	25	53%
Sociology	3	43%	6	55%	13	81%	10	83%	33	70%
Strategy	4	57%	8	73%	12	75%	9	75%	34	72%
Psychology	1	14%	5	45%	5	31%	3	25%	15	32%
Management Science	**6**		**20**		**28**		**49**		**117**	
Economics	4	67%	10	50%	14	50%	33		67	57%
Sociology	6	100%	4	20%	8	29%	31		53	45%
Strategy	4	67%	4	20%	8	29%	28		48	41%
Psychology	2	33%	0	0%	2	7%	12		16	14%
Small Business Economics	**0**		**118**		**247**		**210**		**617**	
Economics			118	100%	247	100%	210		617	100%
Sociology			36	31%	85	34%	79		219	35%
Strategy			22	19%	62	25%	78		171	28%
Psychology			4	3%	5	2%	13		24	4%
Strategic Management Journal	**10**		**17**		**20**		**30**		**86**	
Economics	6	60%	9	53%	17	85%	22		58	67%
Sociology	4	40%	12	71%	15	75%	23		59	69%
Strategy	10	100%	17	100%	20	100%	30		86	100%
Psychology	1	10%	11	65%	7	35%	12		34	40%

Whether one accepts the existence of a single definition of the field or the polarity of its subfields, the field has to face yet another formidable challenge. How can we best study entrepreneurial phenomena, however we define them? What theories should we invoke in studying these phenomena? What distinctive theoretical lens should the field use? Should entrepreneurship develop its own theories or should it continue to borrow from other disciplines? These are among the persistent questions that have been raised by supporters and critics of entrepreneurship research alike (Amit & Glosten, 1993; Bull & Willard, 1993). These questions reflect a persistent concern that, despite years of study, towards developing a coherent theory of entrepreneurship has proven to be a major challenge (Amit & Glosten, 1993; Phan, 2004; Rumelt, 1984).

One source of my anxiety about the debate surrounding the future stems from the growing polarization of opinions about the merits and shortcomings of disciplinary vs. interdisciplinary research. This is a false dichotomy, as we need to borrow *and* invent. We need to make use of the best theories, regardless of their disciplinary base, and enrich the discussion by sharing our findings with "home" disciplines. Marketing and strategy scholars have done this with some success. But we need also to develop our own theories. We cannot be a scholarly field without having our own legitimate theories that define and explain distinctive phenomena in ways that theories from other disciplines cannot possibly articulate. Though difficult to attain in the short term, this is an important standard to have and hold. We cannot claim distinctiveness without demonstrating the uniqueness of the issues we examine and the theories that we use to examine them. If we agree with this proposition, then we must revisit the call for interdisciplinary research in entrepreneurship.

INTERDISCIPLINARY ENTREPRENEURSHIP RESEARCH

Since its inception, entrepreneurship has been widely viewed as an interdisciplinary field—one that draws on the best thinking, ideas and theories from other well established disciplines. Proponents of this view see entrepreneurship phenomena as being complex, demanding the use of multiple theoretical lenses. Researchers, therefore, can draw heavily on well known theories and integrate them as they seek to define their research questions and develop their studies (Amit & Glosten, 1993). Eclecticism that characterizes this integration can fuel creativity in scholarship and promote a fruitful exchange of ideas with interested researchers without fear of territoriality.

Reviewing the data in Table 1, one cannot escape the fact that entrepreneurship research relies heavily on research conducted in economics, sociology, strategy and psychology. The percentages listed in the columns labeled "citing" in Table 1 refer to the articles appearing in a given publication citing journals from another discipline. For example, Table 1 shows that before 1990, JBV published 81 papers. Authors of these papers have cited articles that have come from economics (21 percent), sociology (30 percent), strategy (43 percent) and psychology (21 percent). The same journal published 141 papers between 1995 and 1999. Journals cited in these papers came from economics (60 percent), sociology (54 percent), strategy (64 percent), and psychology (37 percent). Finally, the last two columns in Table 1 show that over the course of the 532 papers published in JBV, authors have emphasized journals from economics (48 percent), sociology (49 percent), strategy (60 percent) and psychology (34 percent). In fact, the percentages in the last column show that citations of these disciplinary journals have increased substantially as compared to the percentages for the pre-1990 period. These trends appear to hold for other journals listed in Table 1, showing the continuing and increasing effect of other disciplines on the craft and research in entrepreneurship.

I have always viewed entrepreneurship from an interdisciplinary perspective and advocated interdisciplinary research in this young field (Zahra & Dess, 2002). Having said this, I must admit that the creative integration and synthesis that I had hoped would emerge has not materialized thus far. Journals routinely publish papers that cross multiple levels of analyses and time periods without adequate recognition of the unique analytical challenges with these practices. Researchers pick and choose variables for analysis without attention to their theoretical relevance, leading to confusion about the causal chain that connects these variables. When questioned, authors argue that their models are integrative and their research interdisciplinary. As a result, models sometimes appear to be a hodgepodge of variables that have been chosen more because of data availability than theoretical relevance. Perhaps, this assessment of the current state of entrepreneurship research is harsh. Yet, as the rate of publications in the field continues to rise, it is imperative that we pause and critically look into the findings that are reported in the field, findings that do not form a coherent body of informed theory.

One unintended consequence of the acceptance of an interdisciplinary approach to entrepreneurship research is the lack of clarity about the field's boundaries. Looking at patterns of citations of papers published on entrepreneurship quickly reinforces the belief that our field suffers from a chronic case of fragmentation. There are very few discernible patterns of core works that serve as the foundation for the field. Reading the Academy of Management's Entrepreneurship Division's domain statement clearly reflects the "pre-paradigmatic" state of the field. (Fortunately, as of

this writing, a committee has been established to revise this statement). Reviewing the papers published in the Division's Best Papers Proceedings further reinforces the conclusion that the field lacks a coherent theoretical framework. This is also the case with the Babson-Kauffman Entrepreneurship Research Conference (BKERC) that I now direct and the papers published in *Frontiers of Entrepreneurship Research* (FER) that I edit. In fact, when I reviewed the 1994-2003 issues of FER, I quickly noticed a marked improvement in the methodological rigor of the studies reported. However, there remains a clear void in theorizing about the field. More serious perhaps is the fact that the studies were loosely connected, without a dominant organizing framework. There are multiple explanations for this, one of which is that BKERC and FER have been created to nourish and showcase empirical research in its formative stages, aiming to improve the quality of research in the field. Still, equating interdisciplinary research with *atheoretical* search for empirical observations is surely one of causes of the lack of progress in interdisciplinary research. This belief has led me to propose and gain the support of Board of Reviewers' for departing from the 23-year old policy of including only empirical research in BKERC. Time has come for us to give attention to theory development and building, especially as we contemplate the progress of the field.

DISCIPLINARY RESEARCH IN ENTREPRENEURSHIP REVISITED

As I reviewed the preceding chapters in this volume, I was instantly reminded of the valuable contributions of discipline-based research in entrepreneurship scholarship. A key advantage is that this research is better grounded in well crafted and tested theory. Disciplinary research in sociology, economics and psychology has advanced because of decades of accumulated efforts dedicated to theory building. The truth be told, almost all entrepreneurship theories owe their origins to these three disciplines. Thus, it stands to reason that some scholars favor the use of theories already in use in other disciplines to better ground research in entrepreneurship. Scholars studying venture capital syndication or alliances formed by start-ups have found various social networks theories of particular value in framing their research and analyzing the web of relationships they have examined. Researchers seeking to understand entrepreneurial intentions, growth motivation, and new venture teams have found psychological theories to be useful in developing and refining their own research agenda. Researchers studying the way new ventures position themselves in their markets have gained invaluable insights from applying economic and sociological theories. Scholars of family business, an increasingly important area of research in entrepreneurship, have made use of economic, sociological, psychological and

political theories in an effort to understand how these firms develop their competitive advantage.

A discipline-based approach to research in entrepreneurship has the added advantage of potentially shortening the evolutionary cycle of the field. Using existing theories from other disciplines could reduce the need to reinvent the wheel. Discipline-based research often provides important insights about the boundaries of the theory, offering a foundation for richer analyses by contextualizing one's research. Knowing when the theory applies and does not apply, the premises underlying its key propositions, and its track record can allow researchers to draw inferences about how they can craft their research to make use of this theory. Accumulating research findings can allow researchers to understand the limits of the theory in explaining or predicting important phenomena. Knowing the origin, evolution and empirical findings related to a theory can help entrepreneurship researchers conceive and develop well crafted research.

There are several dangers associated with using a discipline-based approach in conducting entrepreneurship research. Researchers might "recycle" existing theories in new contexts, fostering replication and extension studies. Research questions and phenomena might be new but resultant findings might serve only to reinforce (or refute) the original propositions of the theory. Imaginative and creative theory building would thus be replaced by extending existing and well known theories. When this happens, researchers might overlook the big issues in the field. Exploratory research that defines the boundaries of the field might be overlooked, stifling the growth and maturity of scholarship. This exploratory research entails considerable trial-and-error learning but helps to identify the building blocks of the field. Overlooking this type of research can retard the development and evolution of entrepreneurship as a scholarly field.

Insights gained from disciplinary research grounded in psychology have been influential in shaping our thinking about, and research, on the entrepreneurial personality; entrepreneurial motivation and self efficacy as well as managerial cognition. These variables have been important in understanding a wide range of issues that include: why certain people choose careers as entrepreneurs; how entrepreneurs search for opportunities in related and unrelated fields; entrepreneurial opportunity identification and development; competencies and their role in the new venture founding process; and the effect of CEO competencies and motivation on new venture growth. This research has also influenced our thinking about the differences that exist between men and women entrepreneurs. Psychology-based research has also helped to delineate the differences that might exist in the way entrepreneurs and non-entrepreneurs see their worlds and make decisions and seek venture capital. This research has also clarified how personality variables have influenced environmental scanning, which is key to opportunity

recognition. Researchers have also investigated the effect of entrepreneurial personality characteristics on new venture performance. This research has also explored how social skills might influence entrepreneurs' success. Psychology-based research has been insightful also in explaining what might exist among entrepreneurs from different countries in terms of their work role interactions. Researchers have also investigated the key determinants of satisfaction among entrepreneurs.

Sociology-based research has enriched the field by examining the background and influence of early childhood on the choice of entrepreneurial careers; the role of social capital among nascent entrepreneurs; formal and informal resources that entrepreneurs have; and entrepreneurs' formal and informal networks and their effect on venture creation, funding, success and survival (Stuart & Sorenson, 2005). Researchers have also studied the dynamics of new venture top management teams and how their conflicts and cohesion might influence new venture performance. This research has been especially influential in shaping scholarship on network formation among new ventures in emerging industries and how these networks might influence these firms' future strategic choices. Sociological theories have also inspired and shaped research on the role of organizational embeddness in fostering entrepreneurial activities (Zahra, 2004). Another contribution of sociology-based research is the area of ethnic entrepreneurship where researchers have examined the unique resources these individuals have and use.

Strategy-based research has been influential in shaping entrepreneurial research on the role of the environment in the founding of new ventures (Bhide, 2000) and how new ventures analyze their competition. Researchers have also studied the potential differences between start-ups and adolescent firms; the various competitive strategies new ventures use; and the effect of these strategies on new firm growth. This research has also sought to isolate high growth firms, especially in high technology industries. Researchers following this approach have also investigated the effect of the environment on new venture performance. This research has been useful also in identifying different types of business start-ups and linking these different types to firm growth. Strategy-based research has been useful also in linking firm resources to differences in performance. This research has also documented the strategic importance of different types of resources, especially knowledge, at different points in an industry's life cycle (Zahra & Flatotchev, 2004). Results from this research are useful in delineating the conditions under which firms need to assemble resources internally versus using external sources of organizational competencies.

Strategy-based research has compared independent and corporate ventures in their resources, strategic choices, and financial performance. These analyses have enriched our understanding of the sources of variations among these firms' performance and the advantages of each type of new

venture. In a broad sense this research has been informative with regard to the conditions under which well established companies gain advantages from having ventures, rather using other modes of entry into new markets and industries. These discussions are useful in understanding the boundary decisions firms have to make.

A final area where strategy-based research has been influential in shaping entrepreneurship research is the area of top management teams and the governance of the young firm. Research using the upper echelon perspective has been influential in thinking about the composition and diversity of new ventures' top management teams (TMTs), balancing their skills, and rethinking their composition as the venture progresses through the various stages of the life cycle. Agency and stewardship theories have been influential in thinking about differences in the incentives of founders and owners versus managers and how these investments might influence investment in building organizational capabilities over time. These theories have been useful in thinking about the effective balance between formal (contractual) and relational governance.

One of my key concerns about a disciplinary-based approach is that it could prematurely limit the scope of inquiry in entrepreneurship. My fear stems from a belief that entrepreneurship scholars have not devoted enough energy to ask "the big questions" that could define the field and its distinctive domain. In fact, looking at key entrepreneurship journals and conference proceedings, I cannot escape the fact that most of the research topics, issues, theories and designs have been "imported." One reason for this is the constant arrival of researchers from sister disciplines, attracted by growing opportunities in entrepreneurship. Another important reason is the field's obsession with gaining academic acceptance and legitimacy by appearing rigorous through empiricism. As an empiricist, I often wonder if we are studying the critical issues that give substance to the field. But empiricism is only one route to gaining this legitimacy. It is equally important, if not more important, to agree on what matters and why it matters and to whom.

Nearly two decades ago, Daft and Buenger (1990) observed a similar pattern in the strategy literature. Researchers were seeking legitimacy through empiricism, without much agreement on the boundaries of the field. Moreover, entry barriers to the field were low, given that most of what was being published was an extension of the research that has its roots in other disciplines. Scholars from other disciplines easily enter the entrepreneurship field, maintaining their original frameworks and making only minor adaptations in their assumptions about the field. To be sure, I welcome this entry and believe it can enrich scholarship in entrepreneurship assuming that it sparks creative synthesis and integration. This integration, however, has been lacking. Daft and Buenger, rightly, warned that strategy as an academic field was "hitching a train ride to no where." Many of the concerns Daft and

Buenger identified then about the field of strategy ring true today of entrepreneurship research: mobility barriers are low as specialized and codified, systematic knowledge in the field is limited, boundaries are elastic, findings are not cumulative, and theory development remains at its rudimentary levels. A field cannot continue to thrive when its key building blocks are not clearly articulated, its theories have been imported from other disciplines, and its fundamental research issues are addressed by several other disciplines.

THE DISCIPLINE OF ENTREPRENEURSHIP AND ENTREPRENEURSHIP SCHOLARSHIP

Progress in a field is governed by the development and application of theory to generate, test and refine fundamental research questions. Given that we do not have a unique theory of entrepreneurship, it is quite easy to question the research issues that we explore and cherish. Indeed, Saravarthy (2004) has eloquently questioned the focus of recent entrepreneurship research, suggesting that we are not asking the right questions. I agree with her assessment and add that, absent theory, we will continue to pursue dead end research avenues and our contribution will not be cumulative.

But, how can we develop a good theory of entrepreneurship? Mahoney and Michael (2005), suggest that we can combine neoclassical economic theories with resource based arguments to propose a "subjectivist theory of entrepreneurship." Such a theory would highlight the role of individuals and their knowledge. Mahoney and Michael moreover suggest that this theory "would also consider how entrepreneurs add to their learning from the actions and activities of market processes" (p. 10). Clearly, such as theory would provide invaluable insights into the creative aspects of the human agent as it pertains to discovery as well as opportunity recognition and exploitation (Shane & Venkataraman, 2000). The focus on learning from and during the entrepreneurial process is an important but often overlooked dimension of a theory of entrepreneurship. We do not know how well entrepreneurs learn, what they learn, or how they use what they have learned from their interactions with other entrepreneurs, the market, competition or simply by going through the process of discovery and exploitation. Only recently, some attention has been given to these issues but research is sporadic and its results are far from conclusive. A subjectivity theory that accounts for this learning, of course, would be an important and welcome contribution to the literature.

One of the important insights in Mahoney and Michael's (2005) contribution is its recognition and integration of the resource-based theory. Building on Penrose (1959), they posit that a theory recognizes differences in

resources could explain differences in the economic performance of individual entrepreneurs. These resources include "creativity, information, judgment, and perceived possibilities" (p.21). These are important insights that go a long way toward demystifying the individual entrepreneurs and setting the stage for rich examinations of the differences that might exist in economic performance among them. Still, differences in learning rates and ability to exploit this learning would be another important resource, one that could be nurtured by training or accumulated experience. On a boarder level, recent analyses by Alvarez and Busenitz (2001) and Alveraz and barney (2004) show the great strides that could be made by creatively building on established theories from econbomics, a field that has a great deal to say about the contributions of entrepreneurship (Baumol, 1993; Schumpeter, 1934).

As I reflect on Mahoney and Michael's interesting contribution in this book, I can readily see the importance of creatively connecting neoclassical economic theories with entrepreneurship; this connection has been lacking in recent years (Mahoney & Michael, 2005). I can quickly see the richness of the theorizing that could be done to further develop a 'subjectivist theory of entrepreneurship.' One question to ask is: what connects the individual entrepreneur to his/her firm? What roles do institutions play in this process, question that Hwang and Powell (2005) have raised elsewhere in this book? To be sure, Mahoney and Michael's proposals for theory development in entrepreneurship also highlight the dynamic interplay between the entrepreneur's resources and the external environment.

Other questions emerge from Mahoney and Michael's (2005) chapter. Specifically, can we predict different types of entrepreneurial actions and processes based on the combination of entrepreneurial resources that Mahoney and Michael identify? If entrepreneurship is not a 'one-time' deal, how do entrepreneurs replenish, upgrade and add to their resources? What do these activities mean to firms and how do they influence economic performance? Finally, Mahoney and Michael seem to hold a positive view of entrepreneurs and their personalities, consistent with the common conception of the entrepreneur. Yet, some entrepreneurs have volatile personalities, are prone to dysfunctional conflicts (deVries, 1996), may have rigid belief systems, are authoritarian and controlling, and are unwilling to learn. A subjective theory of entrepreneurship should also consider these aspects and the various resources that influence entrepreneurs' ability to see, define, and profitably exploit opportunities.

WHAT CAN WE LEARN FROM DISCIPLINARY PERSPECTIVE ON ENTREPRENEURSHIP?

Reviewing the various chapters in this volume, it becomes evident that a framework for entrepreneurship research requires attention to three interrelated areas: (a) recognizing the centrality of the human agent in the entrepreneurial process; (b) understanding and incorporating social and other institutions in theorizing about the field; and (c) capturing the variety of entrepreneurial activities.

The centrality of the human agent in the entrepreneurial process. A theory of entrepreneurship cannot be useful if it ignores the human agent. Indeed, reading through the various chapters in this book, I am pleased that the role of the individual entrepreneurs is being restored. The heroic, if not mythical, qualities that some attach to individual entrepreneurs have been cast aside in favor of a greater and clearer focus on the entrepreneurial act and its manifestations (Miller, 1983). Entrepreneurs might be heroes of economic progress and agents of social and economic change but, in the end, they are people with conflicting goals, complex need structures, lofty ambitions and less lofty human qualities. What the past 20 years of research have done is to reveal a more complex picture of the entrepreneurial personality, one that is less heroic but more realistic and more amenable to scholarly analysis (Gartner, 1988). Along these lines, the shift from examining entrepreneurial traits to leveraging entrepreneurs' resources could be profound and holds considerable promise. I applaud Mahoney and Michael (2005) for their creative analysis of these issues.

I have spent several years studying corporate entrepreneurship, focusing on examining the best ways companies can organize themselves to foster and promote entrepreneurial initiatives of various types. Though my research has focused on organizational level issues, it acknowledges the crucial role champions play in the entrepreneurial process even within well established companies. Individuals define and recognize opportunities; they build and create support for these opportunities; they lobby for their ideas with their senior managers; they position them to meet the strategic imperatives within their own units, companies and industries; and they integrate the various initiatives hoping to achieve coherence among them. Yet, despite these contributions, the role of the individual within corporate entrepreneurship remains a relatively unexplored issue.

The importance of social and other institutions. Entrepreneurial activities should be studied and understood in their context (Mahoney & Michael, 2005; Hwang & Powell, 2005). Context provides resources and meaning to the entrepreneurial act. What is new, novel or entrepreneurial is socially defined and constructed—and this should be incorporated in our description and analyses of entrepreneurial activities. It is not sufficient to

simply control for institutional forces in our analyses; rather we can and should capitalize on the rich mosaic of cultural, political, economic, technological, geographic and historical variables in conceptualizing, measuring and examining entrepreneurship. Carroll and Khessina (2005) make a compelling argument for considering the broader ecology of entrepreneurship. As these authors make clear, considering the "ecology of entrepreneurship" has important ramifications for theorizing not only about the rates of organizational founding and evolution of various organizational forms but also understanding the various activities that precede and follow organizational founding.

The same could be said about corporate entrepreneurship, where there is a growing recognition of the importance of organizational systems in creating and fostering these activities. However, research on corporate entrepreneurship has failed to fully capture the richness of the industry and institutional settings in which these activities occur; missing a golden opportunity to link the context to the entrepreneur and, ultimately, the outcome of these activities. Though Powell and Hwang (2005) discuss the relevance of institutional forces at the individual level, much of their discussion could be extended to corporate venturing activities—where the powerful forces of institutions might be most visible, prompting companies to follow the practices of their peers within and outside their industries.

Capturing the variety of entrepreneurial acts. Another area that deserves attention is the nature of the entrepreneurial act itself. I have always been puzzled by the fact that most studies in entrepreneurship have opted to measure the extent of certain practices ("how many new products has your company has introduced to the market over the past three years?"), instead of capturing the range of entrepreneurial variety. True, entrepreneurs are creative people and their work is very hard to classify. Still, overlooking the variety of entrepreneurial activities—whether individual or corporate—limits our insights. In corporate entrepreneurship research, for example, there have been several attempts to capture the range of activities that fall under this label. Yet, these efforts have been overshadowed by the need to be consistent with tradition in the area by measuring the extent to which companies focus on certain activities. The same applies to individual-level research, where there is a similar tendency to "count" things (e.g., how many businesses has a person created in the course of his/her career). These measures do not account for the level of difficulty, form, or the track records of these ventures.

For the entrepreneurship field to move forward, researchers should relate the context to the variety of entrepreneurial activities being examined. As noted already, there is a great disconnect between the setting in which entrepreneurial activities occur and the types of these activities. It would be useful also to look into the setting-individual nexus to determine why certain people are more willing to take types of risks in certain situations but not

others. Entrepreneurs, corporate and individual, also appear to have very different track records in different settings. We need to do a much better job in theorizing about, establishing and examining these important links.

CONCLUDING REMARKS

Concern about the direction and quality of entrepreneurship research is real, deep and well justified. Time has come for us to expect more of each other in terms of theory building and testing, showing the distinctiveness of the contribution our research makes, and demonstrating the importance of entrepreneurial phenomena that we study. This is not much to ask or expect from each other if our work is to be taken seriously. I do worry, however, that our romance with our home disciplinary research might lead us stray. Strategy, as a discipline, has evolved by adopting a more coherent definition of its domain; its research has continued to grow in scope, sophistication and rigor. I wonder, however, if this research has been as impactful as it could have been in shaping the thinking about the future of competition and guiding public policy decisions. Economics, a field that has enriched our thinking and understanding of important and complex phenomena has been described—unfairly, I believe, as a "dismal science." Sociology and psychology theories have provided much guidance and rigor about the conduct of scientific inquiry. Yet, some continue to question their net effect and contribution. Both disciplines appear to suffer from a chronic identity crisis. I worry that entrepreneurship research might have a similar fate: becoming more rigorous but less influential and less interesting. My fear has been somewhat alleviated by my reading of the papers in this volume; each of which shows an insightful spark of creativity while tackling important and perplexing issues. Each of these contributions adds richly to our effort to better find a more inlusive definition of the domain of the field and how to stimulate serious scholarship in it. This is a monumental task, one that we cannot escape if we truly want entrepreneurship to become a discipline in its own right.

NOTES

[1] I appreciate the help of Francis Nilsson in collecting the data used in this chapter. I acknowledge with appreciation the helpful comments of Patricia H. Zahra.

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Index

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