

PROGRESS AND ENTREPRENEURSHIP

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Economists have been studying the factors that improve people's material well-being at least as far back as Adam Smith (1776), but the phenomenon of economic progress—or as it is often more narrowly studied, growth—barely predates Smith.¹ Prior to about 1750, economic progress was so slow that people would have to be very observant to see any progress during their lifetimes. Everywhere in the world, the standard of living and the quality of life was much the same in 1750 as it was in 1650, and it was much the same in 1650 as it was in 1550. Indeed, it was much the same in 1550 as it was in 550.² Since then, economic progress has manifested itself partly in income growth, but even more in new methods of production and in new types of output. This article examines the indispensable role that entrepreneurship has had in the production of economic progress. The link between entrepreneurship and progress may seem obvious, yet the connection between the two in economic analysis is tenuous, partly because mainstream economics does not do a very good job of representing entrepreneurship or progress.

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¹Prior to Smith, the mercantilists were interested in this same question and thought that a nation's accumulation of gold and silver increased its wealth, and the physiocrats argued that wealth is the product of the land, so encouraged agriculture. Thus the issue was raised before Smith's monumental treatise was published, and one of Smith's motives for writing *The Wealth of Nations* was to try to correct what he perceived as errors in the views of these earlier economists.

²See Galor and Weil (2000, p. 808) for estimates that per capita economic growth began only after 1500, and was very modest until about 1820.

Economists tend to represent economic growth as growth in the level of income, and one theme here is that economic progress is much broader than that: To focus on income growth is to ignore the most important elements of economic progress. The changes in types of output and methods of production that create economic progress are the result of entrepreneurship, but entrepreneurship is rarely represented in models of economic growth. In the twentieth-century economic theory of the firm, firms are run by managers who choose the optimal levels of inputs and outputs so their firms can produce efficiently. Managers are not entrepreneurs. This article emphasizes the differences between growth and progress, and between management and entrepreneurship, to try to illuminate how entrepreneurship in firms creates economic progress. This, in turn, suggests a promising direction for a further development of the theory of the firm.

If one wants to use economic analysis to understand how human welfare has improved over time, and how it can continue to be improved, then the analysis must focus on progress, broadly defined, rather than narrowly on income growth. Because progress is the result of entrepreneurship, an economic analysis of progress must incorporate entrepreneurship. Economic analysis has often analyzed economic progress only in terms of income growth, so a good place to start is with a discussion of the concept of economic progress.

GROWTH VERSUS PROGRESS

Modern economic progress began in the eighteenth century with the industrial revolution, however economic progress was greater in the nineteenth century than the eighteenth, and greater in the twentieth century than the nineteenth.³ This progress was generated by entrepreneurship, and the economic environment continues to be increasingly favorable to entrepreneurship, so there is every reason to think that economic progress will continue to accelerate in the twenty-first century.⁴ Economic progress is often measured in terms of income growth. In the United States, per capita GDP was nearly seven times greater at the end of the twentieth century than it was at the beginning; yet to summarize economic progress by looking only at the growth in

³See Heilbroner (1970) for a persuasive discussion about the importance of the development of factor markets in the industrial revolution. Landes (1998) also takes an interesting look at the institutional foundations of modern prosperity.

⁴This conjecture about future progress is based on the idea that entrepreneurial actions generate additional entrepreneurial opportunities, as described in Holcombe (1998). There is the threat that growing government could stifle economic growth. For an analysis of this issue, see Ikeda (1997). Baumol (2002) conjectures that innovative activities are labor-intensive, and as the relative price of labor rises that may slow innovation and growth. Yet in the end, Baumol is optimistic about the economic prospects for the future.

the value of economic output seriously misrepresents the nature of the economic progress that took place in that century.⁵

At the beginning of the twentieth century only about 1 percent of American households had cars; by the end of the century 91 percent of households had them. Largely because of advances in medical technology, life expectancy rose from 47 years at the beginning of the century to 77 years by the century's end.⁶ Telephones were rare at the beginning of the century, but commonplace by the end of the century. Information acquisition and entertainment were completely transformed in the twentieth century. At the beginning of the century there were no movie theaters, no radio broadcasts, and no television. By 1900 electricity was available to some, and was used mainly for lighting, but by 1950, electricity powered radios, electric washing machines, and refrigerators. By 2000, most people classified as poor in the United States had indoor plumbing, air conditioning, telephones, and automobiles. The Internet revolutionized communication and allowed business ventures to span the globe. While only a few computers existed in the world in 1950, many people had more than one computer in their homes by 2000. Computers did not become common until the 1980s, and the World Wide Web did not exist until the 1990s. The first airplane had not yet flown at the beginning of the twentieth century, but by the end of the century travel throughout the world in jet aircraft was commonplace. Despite the tremendous GDP growth over the twentieth century, when one reflects on economic progress over the century, it is apparent that the primary component of economic progress is not the amount of income growth, as impressive as it was, but rather the substantial change in the qualitative nature of the economy's output.

At the beginning of the twentieth century the average work week in the United States was about 50 hours, and by the end of the century it had fallen to about 35 hours. Again, this quantitative change in hours worked, while impressive, does not reflect the changing nature of work, which became less dangerous and less physically demanding. People worked more with their minds and less with their bodies by the end of the century, and this is reflected in the fact that at the beginning of the century only 22 percent of adults had completed high school, while by the end of the century 88 percent had at least a high school degree. Accidental deaths, including those on the job, fell from 88 per 100,000 to 34 per 100,000 over the course of the century.

⁵In addition to the concepts of growth and progress, one might also look at the closely related concept of development. Economic development tends to refer to the advancement of an economy from less-developed or developing toward the status of developed, whereas progress suggests the idea that already-developed economies (in addition to less-developed economies) can continue to advance. The same entrepreneurial elements that promote progress also can initiate development. Good examples of work on development along these lines are Bauer (1972) and Osterfeld (1992).

⁶Data in this and the following paragraphs are from Moore and Simon (1999, p. 6). See also Cox and Alm (1998, 1999), who show measures of economic progress beyond just income growth.

Again, while people work fewer hours for more income, the more significant element of progress in the work people do is not the quantitative reduction in work hours or increase in output, but rather the qualitative changes in the nature of work. At the beginning of the century the reward for work was money, and most jobs were mainly manual labor. While money was still a primary motivation at the end of the century, people considered the pleasantness of a job, including intellectual stimulation, challenges, and workplace amenities as significant rewards for employment. Many people enjoy the work they do: something that would have been much rarer in 1900, when work was often physically demanding, dangerous, and tedious. One can look at growth in terms of increased output per hour of work, but the progress in terms of qualitative changes at the workplace is at least as significant as the quantitative growth.

This type of economic progress would only have been visible to people after the Industrial Revolution. The advent of factory production, and the use of steam power in manufacturing, transformed the nature of work, and allowed substantial improvements in productivity. By 1850 the range of manufactured goods available to people was unprecedented, and by 1900 the use of steam power to drive the railroads and waterborne shipping had revolutionized transportation. People's income levels increased throughout these 250 years in nations that had market economies, but even more striking than the growth in income has been the change in the nature of the types of goods and services people consume. The changes in lifestyles of the typical citizen, the types of goods and services consumed, and in the way that goods and services are produced, is progress.

The economic growth over this 250 year period has been remarkable, but the economic progress that has taken place over the same period is even more remarkable. Despite this remarkable progress, economic analysis of these changes tends to focus on the growth in the level of output rather than the changes in the nature of the output.⁷ This results in a limited understanding of both the causes and the effects of economic progress. The effects have already been considered by noting that the changes in the types of goods and services consumed and in the nature of work are more remarkable than the growth in the amount of consumption. The causal factors are more important, however, because the changes in both the nature of output and the processes of production are what have caused this remarkable economic growth. Put

⁷Johnson (2000) gives a good account of the progress made in agriculture over a period of centuries, but still couches economic progress in terms of increases in per capita income rather than changes in the types of goods produced and consumed. Similarly, Galor and Weil (2000) discuss the substantial economic progress after 1700 made possible by technological innovation, but depict that progress as income growth rather than qualitative changes in output. Both of these articles appeared in the *American Economic Review*, typically considered the top academic economics journal, suggesting mainstream economic thinking on the topic.

plainly, the quantity of output would not have grown as it has without changes in the nature of both the processes of production and the type of output being produced.

The growth of the automobile industry in the twentieth century illustrates the importance of changes in both production processes and the types of goods produced. Economic progress meant enhancing people's transportation options by making automobile travel available to a large segment of the population, changing the type of output. Assembly line production allowed a substantial increase in the output of automobiles per worker. But focusing on the growth in output per worker obscures the more important fact that the types of goods produced, and the way they were being produced, had been substantially transformed within that span of a century.

Progress in one area often leads to progress in others, as Holcombe (1998) notes. The widespread availability of the automobile has changed the way people shop. Supermarkets, shopping malls, and large discount stores would not be feasible if people could not drive their own cars to transport substantial quantities of goods. The corner grocery, while just a convenient walk away, was more expensive and had less variety. The supermarket can draw from a larger customer base because more people are within driving distance than are within walking distance. Customers can buy more each time they shop, because they can carry more in their automobiles than they could transport without them. For many reasons, supermarkets can offer a greater variety of goods at lower cost. The same is true of discount stores like Wal-Mart, and these innovations in retailing would not have been possible without innovations in personal transportation.

New modes of shopping include not only larger, more centralized stores but also catalog shopping and now Internet shopping. These innovations have also led to increased product variety by, to use Smith's (1776) phrase, expanding the extent of the market. The advent of long distance telephone calling—and the steep decline in its price—made it feasible for potential customers to call sellers thousands of miles away to order products immediately, and the sharp decline in transportation costs made it feasible to ship individual purchases thousands of miles to buyers. This allows greater variety in the types of goods and services offered for sale, and gives entrepreneurs an incentive to introduce products that might have an insufficiently small market if they were just sold in one town, but have a large enough market if they can be sold nationwide, or even worldwide. Progress in one area leads to progress in others.

There are limits to the utility of consuming increasing quantities of currently-produced goods, which limits potential growth. Although income grew by about seven times in the twentieth century, Americans in 2000 would have found limited utility in having seven times as much food as Americans in 1900. But there are no limits to progress, because there are no limits to the types of new goods and services that people might benefit from consuming.

Growth without progress is self-limiting, whereas progress brings with it growth.

Economic growth is a minor component of economic progress, but the changes that will allow progress to continue are far from obvious. It takes insight to perceive changes that might alter the nature of production processes, or that might lead to the introduction of new goods and services. Without people who have these insights, and who act on them, economic progress would not take place. Perceiving and acting on such a profit opportunity is entrepreneurship, which is the engine of economic progress. Economic analysis has tended to focus on growth—the production of increasing amounts of output—so it is important to see the distinction between growth and progress, and to see that in the long run, progress brings with it growth, but growth does not necessarily imply progress.

ENTREPRENEURSHIP VERSUS MANAGEMENT

The methods of modern economics tend to overlook the significance of entrepreneurship in creating economic progress. Economic theory focuses on the properties of economic equilibrium, and in the theory of competitive markets, actions of firms are completely constrained by the parameters of the market. Firms are assumed to maximize profits, and in a competitive equilibrium, profits are competed down to zero, so firms must choose the optimal mix of inputs and combine them as efficiently as possible in order to minimize costs to remain in business. In a typical formal presentation of the theory of competition, the firm buys inputs of capital, K , and labor, L , which are combined in a production function to produce output, Q , so $Q = f(K, L)$. The firm must pay interest at rate r to hire capital and wages at rate w to hire labor, so the firm's costs are $rK + wL$, and its revenues are the price of its output, p , times the quantity sold, or pQ . The firm's profit, Π , is its revenues minus costs, so $\Pi = pf(K, L) - rK - wL$. Within this framework, the only thing the firm can choose is its levels of K and L , so profit maximizing means choosing the levels of inputs that maximize profit. Profit is maximized by hiring inputs up to the point where their marginal products are equal to their prices.

People who run the competitive firms in this framework are managers who have as their goal producing the optimal amount of output at minimum cost. This entails choosing the right combination of inputs, and as Alchian and Demsetz (1972) note, also entails seeing that inputs are used as productively as possible. Workers need to be kept from shirking, and more generally, inputs must be used effectively to maximize profit. Good management means efficiently combining inputs to produce output. With good management the firm will maximize its profits; with poor management it will not, and will be competed out of business by more efficient firms.

In an economy characterized by economic progress, this type of management will be insufficient for a firm in a competitive market to survive. Over

time, entrepreneurs uncover new and more effective ways of combining inputs and outputs, so the manager who simply prevents shirking and waste will be left behind by firms that adopt new production processes. More significantly, entrepreneurs will discover new types of output that will better satisfy consumer desires, so the manager who keeps producing the same type of output will be left behind by firms that offer more innovative products. Examples can be seen throughout the economy, in instances as varied as changes in fast food restaurant menus and food preparation methods, new styling and features in automobiles, and of course, in the substantial advances in computer and communication devices. As Boudreaux and Holcombe (1989) note, this entrepreneurial theory of the firm is substantially different from the neoclassical model that serves as the foundation for mainstream economics. One key difference can be found in the assumptions underlying these two approaches to analyzing economic competition. Consider two areas of entrepreneurship—finding more profitable methods of production, and discovering better product characteristics for consumers—within the standard competitive model.

The discovery of more profitable methods of production might arguably be able to be represented in the standard competitive model, by noting that there may be alternative methods of production, g , such that $g(K,L) > f(K,L)$. Framed in this way, the shortcomings of the standard approach are apparent. While the firm's management can choose levels of K and L from a continuous scale to solve the maximization problem, there is no menu of production functions f , g , h , etc., that offer alternatives from which the firm can choose. After the fact one might represent a new production technique as a different production function, but the theory offers no hints as to whether an alternative production function exists, and if it does, how a profit-maximizing firm might go about discovering it. Entrepreneurship, represented this way, is exogenous to the model.

The discovery of new and improved products and product characteristics is even further outside the model, because it is assumed away. In the standard model, firms in a competitive industry are assumed to produce a homogeneous product, and any deviation from this assumption is a movement away from competition toward monopoly. In contrast, an entrepreneurial view of product homogeneity sees product differentiation as a competitive strategy designed to try to gain market share and produce a competitive advantage. The managerial view of competitive markets sees product differentiation as anticompetitive, whereas the entrepreneurial view sees product differentiation as an integral part of the competitive process.

People who run firms serve both managerial and entrepreneurial functions.⁸ As managers they try to minimize costs by choosing the optimal levels

⁸Baumol (1993, pp. 2-5) makes this same distinction between entrepreneurship and management, noting that entrepreneurs often also undertake management activities, and emphasizes the importance of entrepreneurship to economic growth. See also Kirzner

of inputs, and try to avoid the inefficient use of resources. As entrepreneurs, they look for new and improved methods of production, and they look for ways to improve the characteristics of their output. For a firm to survive in the long run, good management is helpful, but successful entrepreneurship is essential. When one factors in the impact of economic progress on firms over time, it is apparent that a firm, no matter how efficiently managed, cannot survive by minimizing costs and eliminating waste. It must continually improve its methods of production, and it must continually update its product, or its business will be eroded by other firms that do. This is obvious when one looks at the difference between products in the computer and telecommunications industries now versus 10 years ago. Similar progress, though slower, is also apparent in automobiles, apparel, entertainment, and just about any industry. Even in an industry as basic as food, restaurants continually update their menus and preparation methods, and grocery stores continue to offer new products.

Conceivably, an innovative firm could continue to stay ahead of its competition despite some inefficiency, but an efficient firm will continue to lose ground in the marketplace if it does not innovate. Henry Ford, who implemented the brilliant innovation of using the assembly line to produce automobiles, and who was notorious for monitoring employees to prevent shirking and waste, once said his customers could have any color car they wanted, as long as it was black. But faced with eroding sales to General Motors, which offered a variety of colors, Ford changed his mind. This is one example of a more general observation that firms cannot hope to remain profitable by finding a successful formula and sticking to it. They will be left behind by competitors who discover improved production methods and improved product characteristics.

To emphasize again, for firms to succeed in a competitive market, efficient management is helpful, but entrepreneurship is essential. With this in mind, one must question an economic model of competition that assumes that competition is characterized by firms producing homogeneous products, and that depicts a competitive industry as one in which there are no profits. The first step to take to rectify this is to recognize the distinction between management and entrepreneurship; the second step is to orient the theory of competition to recognize the importance of entrepreneurship relative to management.

PROFIT AND LOSS

All attempts at entrepreneurship are not successful. People often believe they have spotted profit opportunities, and act on them, only to end up taking losses. Mises (1952, chap. 9), in a chapter with the same title as this section,

(1982; 1985, chap. 4) who makes the distinction between entrepreneurship and management, and emphasizes the importance of entrepreneurship to economic growth.

emphasizes the role of profit and loss in directing resource allocation in an economy. Successful entrepreneurship results in profits—by definition, if one defines entrepreneurship as spotting and acting on a previously unrealized profit opportunity.⁹ The profits of the entrepreneur encourage others to imitate the entrepreneur's actions, eventually competing those profits away. Losses signal that what at first appeared to be an entrepreneurial opportunity was, in fact, not profitable, so not actually an entrepreneurial opportunity. People who attempt entrepreneurial actions take risks, as Rothbard (1997, p. 246) emphasizes. Profits give positive reinforcement to successful entrepreneurship, while losses discourage the further pursuit of unsuccessful attempts at entrepreneurship. Market incentives lead entrepreneurial actions to generate economic progress, but limit the negative impacts of unsuccessful attempts at entrepreneurship.

Entrepreneurial opportunities are rarely as simple as arbitrage, and the complexities of production and time may turn what appears to be a profit opportunity into a losing activity. For example, Apple Computer introduced the first handheld computer, the Newton, in 1993, but it was not profitable. Despite the failure of the Newton, 3Com Corporation introduced the Palm Pilot handheld computer in 1996, and it was an immediate success. Similarly, Xerox developed the graphical user interface for computers, including the use of on-screen windows and the mouse as a pointing device, but failed to turn their invention into a commercially successful product. Apple commercialized the idea in their Macintosh computer. Apple failed to spot a true profit opportunity to produce handheld computers, and Xerox failed to spot a true profit opportunity to produce a windows-based computer operating system, not because those general ideas could not lead to profits, as later entrants showed, but because their originators were not able to put all the pieces together to make those ideas profitable.

This is where profits and losses guide entrepreneurial activity, with losses limiting ideas that are not wealth-enhancing and profits reinforcing ideas that are. The result is that the positive impact of successful entrepreneurship is much larger in magnitude than the negative impact of unsuccessful attempts. One can spot those successful entrepreneurial actions in hindsight, by the profits they generate, but it may be impossible to say ahead of time what someone could do to be entrepreneurial. As Baumol (1993, p. 15) notes, entrepreneurial activity is innovative, and if it can be completely described and explained, it can be reduced to a managerial activity. Thus, Baumol suggests,

⁹Mises (1973, pp. 289-94) allows for the possibility that entrepreneurs can take losses as a result of their entrepreneurial decisions, so entrepreneurial acts according to Mises are not always in response to profit opportunities. In this regard, Mises appears closer to Rothbard (1997) than Kirzner (1972) on the issue of what constitutes entrepreneurship.

it may not be possible to completely explain how entrepreneurial actions take place.¹⁰

CIRCUMSTANCES OF TIME AND PLACE

Hayek (1945) emphasized the particular circumstances of time and place that provide knowledge to some people that is unavailable to others. While Hayek was discussing the role of the market system in coordinating the activities of individuals with this type of specific knowledge, his observations are directly relevant to entrepreneurship. Individuals without such knowledge cannot simply rely on their alertness to spot profit opportunities, because information about a profit opportunity may not be sufficient without a context of knowledge which allows individuals to see what actions might result in profits, as Holcombe (forthcoming) notes. For example, it would be difficult for an auto mechanic to spot a profit opportunity in the pharmaceutical industry, and it would be difficult for a dentist to spot a profit opportunity in the automobile industry, even if they might wish for a product with certain currently unavailable characteristics. Some examples can help illustrate the distinction between entrepreneurship and management.

Desrochers (2001), in a very insightful article, offers many examples. One relates a story about a demonstration Steve Wozniak, a cofounder of Apple Computer, saw of a color monitor connected to a computer. Wozniak was so impressed that he decided the Apple II—their first successful commercial product—had to have a color monitor. Wozniak says that had he not seen the demonstration, Apple computers probably would have had monochrome monitors, and probably would not have been as successful. The color monitor differentiated his product from other personal computers at the time, which was the type of competitive action that (1) results in economic progress, and (2) would be called a deviation from competition by neoclassical economics, because of the product differentiation. Desrochers offers many other examples showing how specific knowledge of time and place leads to entrepreneurial activity.

Another example of entrepreneurship is offered by Collins (2002), who discusses changes in production methods for Piper aircraft. Typically, aircraft manufacturers have different assembly lines for different aircraft models. Collins observes,

In the new plan, all the different models go down the line together—a turbo-prop Meridian following a Warrior, for example. . . . The first thought is that the Meridian would take a lot more time at each station, so it would slow the moving of the line. That doesn't happen because if the technicians finish on the Warrior and the Meridian isn't ready, they go to that station to help complete the task. . . . I've been looking at aircraft plants for years, and this is the

¹⁰In a later work, Baumol (2002) suggests that entrepreneurial actions may be responsible for only a small part of economic progress, with routinized research and development within corporate bureaucracies being responsible for most economic progress. The analysis here would take issue with Baumol's assessment.

best-looking system I have ever seen. New Piper estimates that it will result in a significant decrease in the man hours required to build an airplane. (Collins 2002, pp. 24-27)

The end product—the airplane—is the same, but a more efficient production model produces it, yielding an example of the shift from $f(K,L)$ to $g(K,L)$. A profit opportunity like this is not just something that an observant individual could notice. It requires specific knowledge of time and place—in this case, knowledge about aircraft manufacturing—for one to recognize that a different production process might be more efficient.

Adam Smith notes the same thing when he says,

Men are much more likely to discover easier and readier methods of attaining any object, when the whole attention of their minds is directed towards that single object, than when it is dissipated among a great variety of things. . . . It is naturally to be expected, therefore, that some one or another of those who are employed in each particular branch of labour should soon find out easier and readier methods of performing their own particular work, whenever the nature of it admits of such improvement. (Smith 1776, p. 9)

Thus, Smith recognizes how the specific knowledge of time and place leads to entrepreneurial discovery, and why entrepreneurial discovery is necessary for a business to survive. Because competitors will be taking advantage of this type of knowledge to act entrepreneurially, the firm that continues to employ the same methods of production will be left further and further behind others in the industry with the passage of time.

Henry Ford's adoption of the assembly line to manufacture automobiles is an example from the beginning of the twentieth century of innovations in both the type of output, with the Model T differentiated from other automobiles, and in the process of manufacturing. Christensen (1997) gives several examples from the computer industry in the late twentieth century of the same type of innovation. He notes several examples where successful firms retained their successful formulas too long, only to be left behind by the progress of the market. For example, IBM focused on their mainframe computer business as their market was being eroded in the 1970s by companies like Digital Equipment Corporation (DEC) that produced lower-cost minicomputers. DEC in turn stuck with their successful minicomputer line in the 1980s as the market was shifting to personal computers. In both cases, the firms ran into financial troubles as progress in the market made their once-successful formulas increasingly less successful. Even experts in an industry, who see the information about the direction of the market, may find themselves unable to place it in the context of knowledge that shows them the entrepreneurial actions that must be taken for the firm to continue to be successful. When one looks at the march of economic progress, Schumpeterian entrepreneurship that disrupts the existing order is an integral part of the process.

IS ENTREPRENEURSHIP EQUILIBRATING OR DISEQUILIBRATING?

As Holcombe (1999) notes, whether one views entrepreneurship as equilibrating or disequilibrating depends in part on how one defines equilibrium. In Kirzner's (1973) view, an economy is in equilibrium only when there are no unexploited profit opportunities, which by definition requires an economy to be out of equilibrium for entrepreneurship to take place. Hayek (1949, p. 41) defines equilibrium differently, as the condition where "the different plans which . . . individuals . . . have made for action in time are mutually compatible." Similarly, Hahn (1984, p. 44) says equilibrium exists when "the intended actions of rational economic agents are mutually consistent and can, therefore, be implemented." Lewin (1997, p. 245) says "equilibrium is understood to be the consistency of actions and the plans on which they are based." One could envision a situation where everyone's plans are mutually consistent, so are in equilibrium according to the definitions of Hayek, Hahn, and Lewin, yet there are unrecognized profit opportunities so the Kirznerian criterion for equilibrium is not satisfied. This is more than just a terminological issue. Kirzner's description of entrepreneurship evokes the image of entrepreneurial actions leading toward an evenly rotating economy, to use the terminology of Mises (1966) and Rothbard (1962), where nothing changes period after period, whereas Schumpeter's description of entrepreneurship depicts actions that would disrupt the equilibrium of an evenly rotating economy. Kirzner's entrepreneur pulls an economy toward the existing equilibrium, while Schumpeter's (1934) entrepreneur creates a new equilibrium.

The new equilibrium created by Schumpeter's entrepreneurship is actually a preexisting equilibrium the way Kirzner defines the term, which partially resolves the question of whether entrepreneurship is equilibrating or disequilibrating. Kirzner (1992, p. 169) alludes to this as he differentiates two different types of Hayekian knowledge problems. The previously unnoticed profit opportunity implies, following Kirzner's use of the term, that the economy was not in equilibrium prior to the action of the Schumpeterian entrepreneur. Kirzner clearly shows that this is his view with an example:

The truth surely is, we now see with 20-20 hindsight, that the horse-drawn carriage industry, for all its placid, normal-profitability over many decades, was an industry in grave disequilibrium *before* the automobile actually appeared. (Kirzner 2000, p. 250; italics in the original)

While one could look at it either way, depending upon how one defines a state of equilibrium, within the context of economic progress discussed above, the Schumpeterian view of the effect of entrepreneurship on markets better describes the long-run impact of entrepreneurship. In the short run, if the economy is not in equilibrium, entrepreneurship moves the economy toward equilibrium, as Kirzner describes. But in the long run, the creative destruction of entrepreneurship is what generates economic progress.

Kirzner (1992) recognizes that the underlying economic data defining equilibrium are continually changing, so equilibrium is a moving target, but Kirzner notes that he focuses on entrepreneurial action with given underlying economic data and an unchanging underlying equilibrium. However, as Holcombe (1998) notes, one of the factors that causes the underlying equilibrium to change is the actions of entrepreneurs, so Kirzner focuses on one part of the entrepreneurial story but not the part that interested Schumpeter. This is not to say that one view of entrepreneurship is right and the other wrong, but to suggest that Kirzner focuses on the short-run equilibrating actions of entrepreneurs, whereas Schumpeter's sees the actions of entrepreneurs as disrupting the existing equilibrium and producing the changes that create economic progress.¹¹

THE PROCESS OF ENTREPRENEURIAL DISCOVERY

Entrepreneurial discovery is depicted by Kirzner (1973) as the costless act of noticing a profit opportunity, in contrast to Romer (1990) who depicts technological advancement as the result of the intentional investment decisions of profit-maximizing firms. These two views lie at the extremes as models of entrepreneurial discovery. For Kirzner, the entrepreneur just notices a previously undiscovered profit opportunity, whereas Romer does not use the term entrepreneurship at all. Profit opportunities are produced, much like other intermediate goods in an economy. In fact, the process of entrepreneurial discovery is a combination of both of these extremes. There is more to entrepreneurship than just noticing that a profit opportunity exists, as Rothbard (1997) notes.¹² Entrepreneurs undertake many activities to search for entrepreneurial opportunities, and to make it more likely that they, rather than someone else, will be the discoverer. Still, undertaking research activities may produce entrepreneurial opportunities, but does not guarantee that they will be recognized.

An example that brings together the views of Romer and Kirzner is the innovation of the graphical user interface on computers. The concept was

¹¹This issue has been discussed by a number of others, including Kirzner (2000, pp. 239-57). See, in particular, page 246, where Kirzner discusses the contributions of a number of authors who examine the differences between his and Schumpeter's views on entrepreneurship. Kirzner (2000, pp. 253-54) concludes, "The reconsideration here undertaken indeed permits us to see how both the Schumpeterian view of the entrepreneurial role and my own view can both be simultaneously accepted." Yet Kirzner notes that these views are not the same, and suggests insights within his view of entrepreneurship offers beyond Schumpeter's.

¹²Rothbard (1997) emphasizes the risk-bearing nature of entrepreneurial activity. This might be eliminated from the Kirznerian framework by arguing that someone who acts in order to try to seize a profit opportunity but takes a loss was not acting on a profit opportunity after all. To explore this line of reasoning—which is interesting in its own right—would lead away from the line of reasoning developed in this article.

invented at the Xerox Corporation, where research and development activities had been undertaken. Xerox came up with the idea of using windows on the computer screen and the mouse as an input device to navigate the windows operating system, but failed to commercialize their invention. Steve Jobs at Apple Computer saw Xerox's invention as a profit opportunity and created the Apple Macintosh computer with the new concepts at its foundation, followed by Bill Gates who adapted the graphical user interface as Microsoft Windows. Schumpeter (1934) made the distinction between invention and innovation, and using Schumpeter's terminology, the invention was made at Xerox, but the innovators were Steve Jobs at Apple and Bill Gates at Microsoft.

Romer's view, where investment in research and development produces technological change, which then results in economic growth, leaves out the step where invention becomes innovation. In the graphical user interface example, Xerox invested in the research and development, but Xerox was unable to capitalize on the commercial potential of that invention, and without a market economy conducive to entrepreneurship, the story might have ended there. Jobs and Gates, though not the inventors of the concept, were the innovators, who recognized an unexploited profit opportunity and acted entrepreneurially to capture it in the manner described by Kirzner. But those entrepreneurs did not simply happen to notice what nobody before them had seen, they had systematically built up their bases of knowledge, as Holcombe (forthcoming) describes, and were using their knowledge of the computer industry as a base to actively seek profit opportunities from innovations in the computer market. They had invested resources in generating what Hayek (1945) called that specific knowledge of time and place, so that when the profit opportunity presented itself, they had both the alertness and the deliberately acquired stock of knowledge to recognize it.

Entrepreneurship is not produced, but the environment within which entrepreneurial discoveries are more likely can be produced, and entrepreneurs do invest in producing the knowledge base that will allow them to make future entrepreneurial discoveries. Harper (1996) discusses entrepreneurial activity within a growth-of-knowledge framework and recognizes that entrepreneurs do create an environment within which entrepreneurial discoveries are more likely.

When analyzing the entrepreneurial process, the actions of entrepreneurs can be broken down into three components along the lines of the example above. First, entrepreneurs can undertake activities like research and development that may generate profit opportunities. Second, entrepreneurs can build their stock of knowledge so that when a profit opportunity does appear, they will be in a position to recognize it. Third, there is that elusive characteristic of alertness that enables an entrepreneur to spot what others have not recognized.

There is a second aspect to the entrepreneurial process that goes beyond the actions of the entrepreneur and extends to the entrepreneur's economic

environment. Desrochers (2001) discusses the way that knowledge can be tacitly shared and obtained by those who are in close geographic proximity, increasing the overall level of entrepreneurial activity. Holcombe (1998) notes that entrepreneurial actions on the part of some generate entrepreneurial opportunities for others. Some economic environments are more conducive to entrepreneurship than others. These environmental factors might also be broken down into three components. First, there are those aspects of the economic environment that produce profit opportunities; second, there are those aspects of the environment that make it easier to recognize those profit opportunities that exist; and third, there are those aspects of the environment that create the incentive for entrepreneurs to act on those profit opportunities they spot. A complete understanding of the entrepreneurial process requires a recognition of both the way in which the economic environment generates entrepreneurial opportunities and invites entrepreneurs to take advantage of them, and the way that entrepreneurs themselves act to increase the chances that they will make an entrepreneurial discovery.

COMPETITION AND ENTREPRENEURSHIP

Kirzner's (1973) book with the same title as this section offers a theory of the competitive process as an alternative to the neoclassical theory of competition which depicts competition as an equilibrium outcome. The neoclassical model of competition depicts an economy already at equilibrium, with no profit opportunities for firms. The only role for firms is efficient management. If a competitive market is not at an equilibrium, how would it get there? Kirzner answers that entrepreneurs notice unexploited profit opportunities that firms can act on, leading markets to equilibrium. Entrepreneurs serve this equilibrating function in response to any factors that might disturb a market equilibrium. Yet, more along the lines of Schumpeter, entrepreneurs must also be innovators, and must find new and improved types of output, and new and improved ways of producing their output, to survive.

The competitive process is the force that propels economic progress, and because the competitive process generates progress, firms must be entrepreneurial to survive. Firms cannot simply minimize costs and hope to remain profitable in a market where their competitors are offering innovations in output, and are discovering innovative methods of production. Firms must continually innovate to remain profitable. Entrepreneurship might be thought of as arbitrage, where the alert entrepreneur notices that a good can be bought for less in one location than it can be sold for in another, but this greatly oversimplifies the entrepreneurial role. Two complicating factors are production and time. It may be that the arbitrage opportunity involves buying inputs and combining them to produce output in a way that the cost of the inputs is less than the sales price of the output, but this is considerably more complex than simple arbitrage. Also, while it may be that if the inputs were bought today

and the output were sold today, the inputs would cost less than the price of the output, that is no guarantee that in a production process that takes time, the inputs bought today could produce output that could sell for more than enough to cover their cost tomorrow.

In most cases, entrepreneurship is much more complex than arbitrage. It is more than just being alert to price discrepancies in the market. It is spotting alternative methods of production, and spotting ways in which output characteristics can be altered to better satisfy the demands of purchasers. Those entrepreneurial activities will typically require what Hayek (1945) called the specific knowledge of time and place. Simply being alert is not sufficient. One must have the appropriate context of knowledge within which to place new information in order to recognize that a profit opportunity exists.¹³ Because an entrepreneurial opportunity has not been previously acted upon, there is always some uncertainty involved in an entrepreneurial undertaking, to use Knight's (1921) term, so without some reward for entrepreneurship, there would be no reason to accept the uncertainty. There is a tendency to look at successful examples of entrepreneurship and overlook the failures, but entrepreneurial actions almost always entail the likelihood of failure. Entrepreneurial action does not guarantee profits, but in a competitive market, a lack of entrepreneurship assures that profits will be eroded over time until they disappear.

The competitive process can be described briefly as follows. At any point in time, the economy tends toward an equilibrium, and if it is not exactly at that equilibrium, entrepreneurial actions, as described by Kirzner, pull the economy toward equilibrium. That equilibrium is always changing, partly because of changes in preferences, resource prices, and other factors exogenous to the producers in the market. When these factors exogenous to the firms in the market change, Kirznerian entrepreneurship is the equilibrating force, as Kirzner (1992, pp. 39-42) describes. A market's equilibrium will also change because of the entrepreneurial actions of the firms in the market. The process of competition implies innovations in production that lower production costs, and innovations in output characteristics, so competitive firms must always be alert to these innovations and must match them or improve on them to remain in business. Entrepreneurial innovations are always upsetting the previous equilibrium and creating a new one, and each new equilibrium offers consumers lower costs and/or more desirable products. What appears in neoclassical theory as an unchanging equilibrium is in fact a moving target. The neoclassical competitive outcome, where firms produce a homogeneous product according to a given production function, is completely unrelated to the competitive process where firms differentiate their products to enhance their appeal to consumers, and where they change their production processes to lower their costs.

¹³Holcombe (forthcoming) discusses this aspect of entrepreneurship in more detail.

Competitive firms cannot survive over time without being entrepreneurial. If they simply act as the neoclassical theory describes, producing according to a given production function, choosing the optimal levels of inputs, and minimizing input waste (such as shirking employees), they will fall further and further behind as the market adopts new production processes and offers new output characteristics. Entrepreneurship is an integral part of the competitive process, and an essential ingredient in any competitive firm, even though it is not represented in the neoclassical theory of the firm. The competitive process is driven by entrepreneurship that produces continually better products—as judged by the consumers of those products—and that produces those products at costs that continue to fall over time because of innovation in production techniques. In this way, entrepreneurship produces economic progress.

THREE DIFFERENCES

To highlight the significance of this entrepreneurial approach to competition and economic progress, this section considers three aspects that differentiate it from the equilibrium approach to competition and growth that dominated twentieth century economic analysis. Product differentiation is viewed differently in the two approaches, the implications of profit are different, and most significantly, the entrepreneurial approach offers a substantially different view of optimality. There are other differences, but by focusing on these three significant differences, one can see that this approach offers not just a critique of existing theory, but an alternative way of viewing competition and economic progress.

Product Differentiation

The issue of product differentiation really goes back to the distinction between growth and progress. If one proxies progress by growth, as in the standard view, and sees improvement as represented by higher income levels, then product differentiation is a means by which consumers can have more variety. Because differentiated products give sellers some monopoly power and allow them to price above minimum average cost, differentiated products result in an inefficiently large number of producers each producing a sub-optimal level of output, resulting in inefficiency, according to the standard view.¹⁴

¹⁴While there are many complex models of product differentiation, all of the standard models depict product differentiation as the offering of a greater menu of choices, and standard theory continues to depict the cost of this variety as the degree of monopoly power that comes with differentiated products. For a recent overview, see Church and Ware (2000, chap. 11), which is devoted to giving a survey of the product differentiation literature. Shapiro and Varian (1998, chap. 3) provide an interesting analysis of product differentiation in an information economy, where firms have an incentive to provide different products customized to the demands of different customers; for example, different versions of a software program tailored to different markets. Again, however, the model is one of product variety rather than improvements in quality that generate economic

There is a trade-off between benefits of greater variety and the costs of some monopoly power that goes with differentiated products, and whether product differentiation is desirable according to the neoclassical approach depends upon how one evaluates this trade-off.

In contrast, when one sees progress as more than just income growth, product differentiation is a competitive strategy that generates progress. One of the most significant ways in which progress manifests itself is through improvements in the types of output offered in the market, in the form of either new products or improved characteristics in existing products. Improvements in output occur when entrepreneurs see that it would be more profitable to change a product's characteristics, or offer a different type of product on the market. Product differentiation is the route through which innovation expresses itself, and through which progress occurs. The process of product differentiation is the process of improving the characteristics of economic output. Without firms that are continuing to differentiate their products, there would be no improvement in the types of output the market offers.

Cox and Alm (1998) show the substantial increase in product differentiation over only a few decades at the end of the twentieth century. In the early 1970s, they note (p. 4) that there were 140 different types of vehicle models consumers could buy, and 654 different styles of vehicles. By the late 1990s, there were 260 different vehicle types and 1,212 different styles. There were 140 different types of breakfast cereals in the early 1970s, and 340 different types in the late 1990s, and over the same time period the number of nationally distributed soft drink brands rose from 20 to 87, the types of milk offered to consumers rose from four to 19, the styles of running shoes increased from five to 285, and the types of bicycles rose from eight to 31. They offer many more examples of increasing product differentiation to show how the market enhances the availability of consumer choices by offering what they call mass customization. They emphasize the advantages in terms of a greater variety of consumer choices, but as beneficial as the increased number of choices is, the real long-run advantage of this product differentiation is that it introduces improvements in products available to people, yielding economic progress.

Product differentiation is not just an outcome that gives consumers more choices, it is a process that creates improved options for purchasers and generates economic progress. If one takes a static equilibrium view of the economy, product differentiation at any point in time appears to be the variety of choices that is offered to purchasers.¹⁵ When one puts product differentiation within the context of economic progress, new variants of products improve

progress. In this case, product differentiation, while it still confers monopoly power, allows price discrimination and so reduces the monopoly welfare losses to a degree.

¹⁵This in itself is desirable, because it allows people to better find goods and services that satisfy their own particular desires rather than having to accept a product that is aimed at the middle of the market.

upon previous offerings, leading to economic progress. Product differentiation is an essential component of a dynamic economy that increases people's well-being by offering them increasingly better products.

Profit

Another difference between the managerial and entrepreneurial views of the firm's activities is in the role of profit. In the managerial model, there is no profit in competitive markets because all profit is competed to zero. Because the competitive equilibrium is the benchmark for efficiency, profit is a sign of inefficiency and an impediment to welfare maximization.¹⁶ The general equilibrium approach to economics depicts the concept of equilibrium as more than just a state toward which the economy is tending, and represents an economy as always in equilibrium, which means always without profit.¹⁷ But profit is the lure which entices entrepreneurs to innovate. As Schumpeter (1934) notes, without profit there will be no entrepreneurship, and without entrepreneurship, there will be no profit. Do profits enhance economic welfare, or degrade it? From the managerial perspective, profits lower welfare because they raise prices, lowering the quantity demanded, keeping the economy from achieving Pareto optimality. Monopolies are the extreme case.¹⁸ In competitive markets, profits are a sign of disequilibrium which, again, lowers welfare. From an entrepreneurial perspective, profits are the reward for welfare-enhancing innovation. They reward the entrepreneur for improving resource allocation, and create an incentive for further innovations to generate economic progress, so profits enhance economic welfare, and are necessary for economic progress.

Optimality

In the neoclassical framework, optimality means allocating resources such that nobody could be made better off without making someone else worse off. This is the economist's definition of Pareto optimality, which is almost always the concept of optimality that economists use. Pareto optimality is a static concept that judges the way that resources are allocated at any one point in time, but a static criterion for optimality is inappropriate for evaluating the characteristics of an economy that is continually improving its performance over time. Some characteristics of an economy prevent it from attaining Pareto

¹⁶The standard theory does allow for a "normal profit," which is just sufficient to keep the business from leaving the market, but this is a return to a factor of production, not profit as the term is ordinarily used. See Bator (1957) and Graaf (1957) for expositions of the competitive outcome as a benchmark for efficiency.

¹⁷This assumes a competitive general equilibrium. It is possible that some firms would have monopoly power in equilibrium, allowing for monopoly profit, but this profit would not serve the same role as profits in a market process view, because the profits would remain permanently as a part of the equilibrium condition.

¹⁸For a critique of government policy toward monopoly, which is based on an equilibrium approach to markets, see Armentano (1972, 1982, 1986).

optimality, but enhance economic welfare, so a Pareto optimal allocation of resources is not the welfare-maximizing allocation. Two characteristics that fit this description are product differentiation and profit, as just described. Competitive markets allocate resources Pareto optimally when they offer consumers homogeneous products, and when firms are making no profits, but welfare would be reduced in an economy that did not have these non-Pareto optimal characteristics. For economic progress to occur, which improves people's welfare, both profit and product differentiation are necessary. Profit guides entrepreneurs to better satisfy people's wants, and product differentiation is the vehicle that improves the characteristics of the economy's output. An economy that satisfies the static criterion of Pareto optimality is therefore not maximizing people's welfare.

The neoclassical framework, as described by Graaf (1957) and Bator (1957), depicts welfare maximization as the Pareto optimal allocation of resources, and twentieth-century growth theory, built on the foundation of Solow (1956) extends this framework to a dynamic setting so that there is a Pareto optimal growth path. That framework is mathematically elegant and logically correct, but it is flawed because it represents economic progress as growth in a homogeneous measure of output.¹⁹ Because changes in the characteristics of output are more important components of economic progress than income growth, the concept of optimality must be modified, and a Pareto optimal allocation of resources eliminates some of the features of an economy that generates economic progress. If resources are allocated Pareto optimally, the conditions of Pareto optimality take away the incentive to act entrepreneurially.²⁰ The concept applies to a static steady-state economy, but not to one in which welfare improvements are generated by economic progress.²¹

If welfare maximization means making people as well-off as possible, economic progress is crucial to welfare maximization, and aiming for the goal of a static Pareto optimal allocation of resources hinders welfare maximization.²²

¹⁹Holcombe (1989) notes that all models are built on simplifying assumptions, and that simplifying assumptions are a virtue because they enable people to see the essential features of a process by assuming away irrelevant or unimportant features. However, there is a danger that some things may be assumed away that are essential for understanding the issue at hand, in which case the model will be misleading. This is the case with growth theory at the beginning of the twenty-first century.

²⁰Pareto optimality could be redefined so that it means that nobody's lifetime welfare could be increased without reducing someone else's, but this would really be a different concept. To see this, consider the conclusion that monopolies allocate resources sub-optimally as Pareto optimality is applied. If monopoly profits are the result of entrepreneurial activity, those profits are the reward that produces progress, not a deadweight loss as they are represented to be in the Paretian framework.

²¹Rothbard (1956) offers a different and more general critique of neoclassical welfare economics.

²²Examples from a public-policy standpoint include antitrust policy, laws that dictate product standards and specifications, and product quality laws such as those set by the

Welfare maximization is a process, not an outcome, and the process is driven by entrepreneurship, and manifests itself as economic progress.

CONCLUSION

This article presents a description of the competitive process that is based on entrepreneurship, and that produces economic progress. The framework described here differs substantially from the neoclassical competitive framework for two main reasons. First, the neoclassical framework assumes away any role for entrepreneurship, so the people who run firms in that theory are managers, not entrepreneurs. Second, in its dynamic form, the neoclassical framework focuses on growth in the quantity of output, rather than on progress, which consists primarily of changes in the types of output produced. The difference is progress versus growth, and entrepreneurship versus management. One of the key questions in economics, described well by the title of Adam Smith's *The Wealth of Nations* (1776), is how nations become prosperous. The ideas presented here suggest that twentieth-century equilibrium economics missed two key aspects that underlie prosperity. By focusing on income growth rather than progress in the types of goods and production methods, economics has analyzed the wrong indicator of prosperity. By focusing on efficiency in production rather than innovation, economics missed the key factor that generates economic progress.

Progress can be made in economics just as it can in the market economy, and this article suggests that progress in the theory of economic growth can best be made by recognizing that the scope of economic progress is much broader than income growth, and that entrepreneurship is the activity that generates economic progress. This article describes how theories of entrepreneurship can be completely incorporated into a model of the competitive process to show that entrepreneurship is the engine of economic progress, to show that entrepreneurship is necessary for firms to survive in competitive markets, and to show that product differentiation is one of the competitive strategies that produces economic progress. The result is not a steady-state competitive equilibrium, nor would such a result be optimal. The result is a competitive process where firms continually improve their production processes and the characteristics of their output in order to remain competitive, and this process results in continual economic progress.

Food and Drug Administration. All of these types of regulations are designed to make the allocation of resources more closely approximate a Pareto optimal allocation.

REFERENCES

- Alchian, Armen A., and Harold Demsetz. 1972. "Production, Information Costs, and Economic Organization." *American Economic Review* 62: 777-95.
- Armentano, Dominick T. 1986. *Antitrust Policy: The Case for Repeal*. Washington, D.C.: Cato Institute.
- . 1982. *Antitrust and Monopoly: Anatomy of a Policy Failure*. New York: Wiley.
- . 1972. *The Myths of Antitrust: Economic Theory and Legal Cases*. New Rochelle, N.Y.: Arlington House.
- Bator, Francis M. 1957. "The Simple Analytics of Welfare Maximization." *American Economic Review* 67: 22-59.
- Bauer, P.T. 1972. *Dissent on Development: Studies and Debates in Development Economics*. Cambridge, Mass.: Harvard University Press.
- Baumol, William J. 2002. *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism*. Princeton, N.J.: Princeton University Press.
- . 1993. *Entrepreneurship, Management, and the Structure of Payoffs*. Cambridge, Mass.: MIT Press.
- Boudreaux, Donald J., and Randall G. Holcombe. 1989. "The Coasian and Knightian Theories of the Firm." *Managerial and Decision Economics* 10: 147-54.
- Christensen, Clayton M. 1997. *The Innovator's Dilemma*. Boston: Harvard Business School Press.
- Church, Jeffrey, and Roger Ware. 2000. *Industrial Organization: A Strategic Approach*. Boston: McGraw-Hill.
- Collins, Richard L. 2002. "On Top." *Flying* 129 (7): 20-27.
- Cox, W. Michael, and Richard Alm. 1998. "The Right Stuff: America's Move to Mass Customization." *Annual Report*. Federal Reserve Bank of Dallas.
- . 1999. *Myths of Rich and Poor: Why We're Better Off Than We Think*. New York: Basic Books.
- Desrochers, Pierre. 2001. "Geographical Proximity and the Transmission of Tacit Knowledge." *Review of Austrian Economics* 14 (1): 25-46.
- Galor, Oded, and David N. Weil. 2000. "Population, Technology, and Growth: From Malthusian Stagnation to the Demographic Transition and Beyond." *American Economic Review* 90 (4): 806-28.
- Graaf, J. de V. 1957. *Theoretical Welfare Economics*. Cambridge, Mass.: Cambridge University Press.
- Hahn, Frank H. 1984. *Equilibrium and Macroeconomics*. Cambridge, Mass.: Cambridge University Press.
- Harper, David A. 1996. *Entrepreneurship and the Market Process: An Enquiry into the Growth of Knowledge*. London and New York: Routledge.
- Hayek, Friedrich A. 1949. "Economics and Knowledge." In F.A. Hayek, *Individualism and Economic Order*. London: Routledge and Kegan Paul.
- . 1945. "The Use of Knowledge in Society." *American Economic Review* 35: 519-30.

- Heilbroner, Robert L. 1970. *The Economic Problem*. 2nd ed. Englewood Cliffs, N.J.: Prentice-Hall.
- Holcombe, Randall G. Forthcoming. "Knowledge and Progress." *Advances in Austrian Economics*.
- . 1999. "Equilibrium Versus the Invisible Hand." *Review of Austrian Economics* 12 (2): 227-43.
- . 1998. "Entrepreneurship and Economic Growth." *Quarterly Review of Austrian Economics* 1 (2): 45-62.
- . 1989. *Economic Models and Methodology*. New York: Greenwood.
- Ikeda, Sanford. 1997. *Dynamics of the Mixed Economy: Toward a Theory of Interventionism*. London: Routledge.
- Johnson, D. Gale. 2000. "Population, Food, and Knowledge." *American Economic Review* 90 (1): 1-14.
- Kirzner, Israel M. 2000. *The Driving Force of the Market: Essays in Austrian Economics*. London and New York: Routledge.
- . 1992. *The Meaning of Market Process*. London and New York: Routledge.
- . 1985. *Discovery and the Capitalist Process*. Chicago: University of Chicago Press.
- . 1982. "The Theory of Entrepreneurship in Economic Growth." In *Encyclopedia of Entrepreneurship*. Calvin A. Kent, Donald L., Sexton, and Karl H. Vesper, eds. Englewood Cliffs, N.J.: Prentice-Hall. Pp. 272-76.
- . 1973. *Competition and Entrepreneurship*. Chicago: University of Chicago Press.
- Knight, Frank H. [1921] 1965. *Risk, Uncertainty, and Profit*. New York: Harper and Row.
- Landes, David S. 1998. *The Wealth and Poverty of Nations: Why Some Are So Rich and Some So Poor*. New York: W.W. Norton.
- Lewin, Peter. 1997. "Hayekian Equilibrium and Change." *Journal of Economic Methodology* 4: 245-66.
- Mises, Ludwig von. 1973. *Human Action*. 3rd ed. Chicago: Henry Regnery.
- . 1952. *Planning for Freedom*. South Holland, Ill.: Libertarian Press.
- Moore, Stephen, and Julian L. Simon. 1999. "The Greatest Century That Ever Was: 25 Miraculous Trends of the Past 100 Years." *Cato Institute Policy Analysis*. No. 364, December 15.
- Osterfeld, David. 1992. *Prosperity Versus Planning: How Government Stifles Economic Growth*. New York: Oxford University Press.
- Romer, Paul M. 1990. "Endogenous Technological Change." *Journal of Political Economy*. 98, (5) part 2: S71-S102.
- Rothbard, Murray N. 1997. "Professor Kirzner on Entrepreneurship." *The Logic of Action II*. Cheltenham, U.K.: Edward Elgar. Pp. 245-53.
- . 1962. *Man, Economy, and State*. Los Angeles: Nash.
- . 1956. "Toward a Reconstruction of Utility and Welfare Economics." In *On Freedom and Free Enterprise: Essays in Honor of Ludwig von Mises*. Mary Sennholz, ed. Princeton, N.J.: Van Nostrand. Pp. 224-62.
- . Schumpeter, Joseph A. 1934. *The Theory of Economic Development*. Cambridge, Mass.: Harvard University Press.

- Shapiro, Carl, and Hal R. Varian. 1998. *Information Rules: A Strategic Guide to the Network Economy*. Boston: Harvard Business School Press.
- Smith, Adam. [1776] 1937. *An Inquiry Into the Nature and Causes of the Wealth of Nations*. New York: Modern Library.
- Solow, Robert M. 1956. "A Contribution to the Theory of Economic Growth." *Quarterly Journal of Economics* 70: 65-94.