ENTREPRENEURSHIP AND ECONOMIC GROWTH

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What causes economic growth? At the risk of some oversimplification, the answers economists have given to this question can be divided into two broad camps, one following the ideas of Adam Smith (1776) and the other following the ideas of David Ricardo (1821). Smith, whose overriding goal was to understand the wealth-creation process, began his treatise with the lesson that the division of labor is limited by the extent of the market. As markets grew, entrepreneurship would lead to innovation, which would lead to an increasing division of labor and increased productivity. Ricardo, in contrast, envisioned economic output as being a function of the inputs of land, labor, and capital. Investment could produce more capital, but because of diminishing marginal factor productivity and the existence of fixed factors such as land, population growth would always dominate economic growth, keeping most of the population at a subsistence level of income. The ideas of Ricardo and his friend and contemporary Malthus (1798) created the view of economics as the dismal science, which contrasts sharply with Smith's view of entrepreneurship and innovation that would lead to ever-increasing wealth.

This characterization of Smithian and Ricardian growth is an oversimplification in the sense that both authors had a deeper understanding of the growth process than the above characterization reveals. In one sense, it is unfair to Smith and Ricardo because it does not take account of the richness of their views and insights. In another sense, however, it is an eminently fair characterization. After all of their analysis of the process of economic growth, Smith ultimately concluded that the potential for economic growth was virtually unlimited, whereas Ricardo viewed the potential for economic growth as limited by the availability of economic resources (and in particular, land). If it is possible to contrast the ideas of various economists at all, it is certainly fair to charaterize them according to their ultimate conclusions.

With hindsight, Smith's vision of economic growth was more accurate than Ricardo's, but the economics profession has followed Ricardo more closely than Smith in developing a theory of economic growth. Part of the reason is that the

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The Quarterly Journal of Austrian Economics 1, no. 2 (Summer 1998): 45–62

comparative static nature of economic modeling has made the production function approach of Ricardo amenable to economic modeling, whereas the innovation that leads to an increased division of labor is more difficult to model precisely. As economics has become more scientific over the twentieth century, economists have been more ready to attack problems that fit into a general equilibrium model of the economy than those that are more difficult to parameterize.[1] In the Ricardian production function approach, investment is the key to economic growth, whereas in the Smithian view, innovation leading to increases in the division of labor is the key. The Smithian answer seems right, but Smith did not explain the process by which that innovation occurs. Kirzner (1973) provides an important insight in this regard, by describing entrepreneurship as the process of acting upon a previously unnoticed profit opportunity. Thus, Kirzner's entrepreneurship can provide an engine to drive Smithian economic growth.

As Kirzner sees it, entrepreneurial insights are profit opportunities that had previously gone unnoticed. Entrepreneurs act upon these insights and the economy becomes more productive because it is able to produce more consumer satisfaction at a lower cost. The connection between entrepreneurship and economic growth is that these previously unnoticed profit opportunities must come from somewhere, and the most common source of profit opportunities is the insights of other entrepreneurs. Entrepreneurial ideas arise when an entrepreneur sees that the ideas developed by earlier entrepreneurs can be combined to produce a new process or output. Entrepreneurial opportunities tend to appear within the context of a specific time and place, so following Hayek (1945), a decentralized economy that allows individuals to act on their entrepreneurial insights, and rewards them for doing so, produces an environment where additional entrepreneurial insights are likely to be produced. Looked at in this way, entrepreneurship is the foundation for economic growth. Entrepreneurial insights lay the foundation for additional entrepreneurial insights, which drive the growth process.[2]

Before discussing the details of economic growth, it is worth drawing a distinction between the process of economic growth and the environment within which growth takes place. After the collapse of the centrally planned economies in Europe beginning in 1989, it is apparent that a market environment is more conducive to economic growth than is a centrally planned environment, and empirical analysis confirms this observation.[3] This issue of the role that markets play in the process of

[1]As one observer has said, "When the only tool you have is a hammer, everything looks like a nail." The economics profession's approach to economic growth reminds one of the old joke about the man who is standing under a streetlight looking for his keys when another man offers to help him. "Where did you drop them," the helper asks. "Across the street," the man answers. "Then why are you looking here?" "The light is better." This article heads where the light is not so good, but where the answer is more likely to be found.

[2]Schumpeter (1934, p. 154), discussing a framework in which all profit is competed away in a competitive equilibrium, and in which profit is the return to entrepreneurship, observed, "Without development there is no profit, without profit no development." While this sentiment captures the way in which entrepreneurship leads to growth, Kirzner notes some differences between his approach and Schumpeter's, which are discussed below.

[3]See, for examples, Gwartney, Lawson, and Block (1996), Scully (1988, 1992), and Knack (1996). See also Olson's (1996) insightful discussion of institutions and economic growth.

growth is relevant to the public-policy question of what institutions foster economic growth, but is peripheral to the more theoretical issues considered here. The question considered in this article is how, within a market setting, economic growth occurs. The answer, in a sentence, is that acts of entrepreneurship create an environment within which innovations build on themselves, leading to continually increasing productivity.

SMITHIAN VERSUS RICARDIAN GROWTH

Perhaps the simplest way to differentiate Smithian from Ricardian growth within the setting of contemporary economics is to use the Solow (1956) growth model as a framework. If output in year t is denoted Y_t, and capital and labor are represented as K_t and L_t, Solow envisioned output as a function of capital, labor, and time,

$$Y_t = F[K_t, L_t, t],$$

with time entering the production function, because over time technology can advance, making a given amount of capital and labor more productive. This simple mathematical formulation allows considerable development by making simple assumptions about the production function.[4] The model can be used to derive the "golden rule" growth path, which implies that there is an optimal amount of investment, and can be used as a foundation for showing "convergence," which is the idea that economies with lower per capita incomes should grow faster than those with higher per capita incomes, so that over time incomes will converge. In fact, convergence has not occurred, casting some doubt on the basic framework of the Solow model, and creating its own strand of literature on convergence.[5]

Within the Solow model it has been relatively easy to formulate mathematical relationships among Y, K, and L, but modeling the effect of t has been more problematic, so it has often been treated as exogenous over time. Often, L is also treated as exogenous, and if one is considering per capita income, it is easy to divide by L, leaving only K and the exogenous t as explanatory factors.[6] The implication is straightforward. By investing, K can be increased, which will increase Y. This provides the foundation for the Ricardian view of economic growth.

The Ricardian model of growth has been taken seriously by both economists and policy makers. As Kreuger (1993) notes, it was at the foundation of world economic development policy for three decades after World War II, and application of the

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[4]Barro and Sala-i-Martin (1995) give a good exposition of the ways that the Solow model has been developed, and the implications that have arisen from the model. Barro and Sala-i-Martin use the production function given here to depict the Solow model, although another specification would have been $Y_t = \lambda_t[K_t, L_t]$. This seems to suggest a constant rate of change over time for λ, however, which is clearly at odds with the evidence.

[5]Quah (1996) presents empirical evidence showing that national incomes are becoming bimodal, with some nations converging at high levels of income while others stagnate at low levels. Quah suggests, based on the evidence, that under the right conditions nations can converge as the Solow model suggests, but that low-income nations do not exhibit the right conditions.

[6]Of course, in the general functional form above, dividing by L may not eliminate it from the right side of the equation, but it would eliminate population growth per se as a factor in income growth.

Ricardian model points out the advantages of central planning over market allocation, because planners are in a better position both to increase a nation's saving and investment rate, and to direct investment toward those sectors that can be most productive. Yet, despite the advice of economic growth theorists, undeveloped economies remain undeveloped even though they have undertaken substantial investment initiatives. Furthermore, the data make clear that only a small part of economic growth can be explained by increases in investment. The answer must lie somewhere else.

The problem with the Solow framework is that the most reasonable alternatives for the causes of growth are K or t, and the effects of capital are easy to analyze, so they have been analyzed extensively, whereas the effects of time are nebulous and hard to analyze, so they have tended to remain exogenous. In fact, it is unlikely that time, by itself, causes growth, but rather something else that changes over time. That something else has been called technological change and, as the other alternative in the Solow framework, has itself come under close scrutiny. There is, for example, a substantial literature on research and development, under the thought that R&D can increase productivity over time.

Other avenues might be taken within the basic Ricardian framework. Jones and Manuelli (1990) find that under different constraints, a Ricardian model need not imply convergence, suggesting that this framework might be able to be rehabilitated to conform more closely with reality. Taking a different tack, Lucas (1988) suggests that the key may be L, not K, and that in particular human capital can play the major role in development. Toward the end of his paper, Lucas discusses the idea of the external effects of human capital, and suggests that a higher population density may result in a finer division of labor and that the human capital of one person may make others more productive. Thus, Lucas begins moving the Ricardian framework toward a Smithian view of economic growth.

The Smithian view of growth focuses less on the quantities of factors of production and more on the processes that are used to combine them into aggregate output. Young (1928) viewed economic growth as occurring because of increasing returns, and explicitly recognized the Smithian foundations of his analysis, but increasing returns does not sit well in the neoclassical framework, as Kaldor (1972) argued. In frequently cited articles, Paul Romer has steered the literature in a neoclassical direction. Romer (1986) shows that growth can be modeled with a factor having increasing returns, and that in such a model growth rates need not converge over the long run, which fits the facts better than the simple Solow framework. Romer (1990) focuses attention on human capital, and argues that additional investment in research could promote more economic growth. Like earlier developments from the Solow model, however, this line of reasoning focuses on the inputs into the production process rather than the process itself.

THE PRODUCTION PROCESS

The most basic facts of economic growth weigh against focusing on the inputs into the production process, and point toward an examination of the process itself. Within the neoclassical framework, changes in the production function have had a bigger

impact on economic growth than changes in the inputs into the production function. The quantity and quality of both human and physical capital are important, beyond a doubt, but they are a product of an economy and not factors given exogenously to it. Both existed in abundance in ancient China, and even today the pyramids of Egypt (physical capital) and the knowledge of Leonardo da Vinci (human capital) inspire awe, yet economic growth, as it is understood today, is a recent phenomenon. Blanchard and Fischer (1989, pp. 1–2) note, "real GNP is about 37 times larger than it was in 1874, 7 times larger than in 1919, and 3 times larger than in 1950. Extrapolating backwards leads to the well-known conclusion that economic growth at these rates cannot have been taking place for more than a few centuries." Land, labor, and capital long predate the transformation to economic growth. It is the process by which they are combined that has created sustained economic growth.

Rather than viewing production in a Ricardian production function setting, Böhm-Bawerk (1959) depicted a structure of production that would become more roundabout as more indirect methods of production were used. Böhm-Bawerk's ideas about heterogeneous capital and more roundabout methods of production have remained an integral part of Austrian capital theory (Hayek 1941), and have, among other things, been applied to explain business cycles (Hayek 1933, 1935) and even to illuminate the process of economic growth (Kirzner 1986). This literature, which focuses on incentives for altering the production process, also has implications for the ways in which entrepreneurs discover new production processes. Within the Solow framework, the new production processes fall within t in the production function, and the effect of t is generally viewed as working through technological change. That still leaves the question of what produces technological change.

ENTREPRENEURSHIP AND TECHNOLOGICAL CHANGE

Within a neoclassical framework, where things are produced by combining inputs in a production function, the most straightforward way to get technological change is to produce it. Research and development can be undertaken by combining land, labor, and capital, to produce technological change. The successes attributable to investment in research and development are indisputable, but research-and-development expenditures cannot be the whole story, because once the research is done, the results need to be applied to make production less costly, or even more mysteriously, to produce goods and services that have never been produced before. This is the role of entrepreneurship.

Kirzner (1973) depicts entrepreneurs as people who are alert enough to spot previously unseen profit opportunities and then act on them. As Kirzner describes it, entrepreneurship involves noticing something that nobody has noticed before. However, some people are in a better position to notice certain profit opportunities than others. Those with training in mechanical engineering are more likely to spot potential profit opportunities in the design of internal combustion engines than those with training in law, for example, and somebody who never goes to the beach will not be in a position to notice the opportunity to open an ice-cream shop or T-shirt shop there. People who travel a lot might notice opportunities because of the amenities they find in one place that might not be available in another. There is, for example, an opportunity for the person who notices that a profit might be made in

Indianapolis by offering a service similar to one already available and profitable in Cincinnati. Thus, there is more of a relationship between Hayek's (1945) view of the use of knowledge in society and Kirzner's vision of entrepreneurship than at first is apparent.

Entrepreneurial alertness is itself unrelated to knowledge, and is costless in the sense that it does not use up resources. However, one's past activities do influence one's ability to recognize an opportunity when one presents itself, as the examples in the previous paragraph suggest. All individuals have knowledge specific to their own activities—knowledge of time and place that others do not share. This specific knowledge of time and place gives some people the chance to notice profit opportunities that others could not possibly see. How does it happen that one can see a profit opportunity that nobody before has noticed? In part, it has to do with the differences in knowledge that different individuals possess. For example, it was not a coincidence that the microprocessor was invented by an electrical engineer and not a poet. Of course, knowledge does not create entrepreneurial insight, but it does create the opportunity to notice things that could not be noticed without that knowledge, which creates a direct connection between Hayekian knowledge and Kirznerian entrepreneurship. Economic theory biases economists against thinking that it is possible to come upon previously unexploited profit opportunities, because in neoclassical competitive equilibrium, all profit opportunities have been competed away.[7]

In fact, most profit opportunities get noticed by entrepreneurs because they are new. This is true whether the entrepreneurial successes are spectacular or more mundane. Consider some great American fortunes. Andrew Carnegie was able to build the foundations of U.S. Steel by capitalizing on the newly developed Bessemer process. John D. Rockefeller's Standard Oil Company developed because he was able to control the distribution network, which at the time relied on the recently constructed railroad infrastructure. Henry Ford's assembly lines were feasible only when there was enough of a mass market for automobiles. The fortunes of Bill Gates rose along with the fledgling personal computer industry. None of these individuals invented the technology that made them wealthy, but they had the insight to take advantage of an entrepreneurial opportunity. Note, however, that in each case the opportunity was newly developed, and the entrepreneurial opportunity did not go unnoticed for long. Entrepreneurial opportunities are not just lying around waiting for someone to notice them. Rather, they appear and then entrepreneurs rapidly move to take advantage of them.

Where do entrepreneurial opportunities come from? Many of them come from the actions of other entrepreneurs. Henry Ford could not have succeeded in mass-producing automobiles until there was a substantial market, including infrastructure such as roads, gasoline stations, and repair facilities. Bill Gates could not have made his fortune had not Steve Jobs seen the opportunity to build and sell personal computers, and Steve Jobs could not have built a personal computer had not Gordon

[7]An economist joke, repeated in Olson (1996), illustrates the point. Two economists, an assistant professor and a full professor, are walking down the street. Assistant professor: "Hey, there's a $20 bill on the sidewalk." Professor: "Couldn't be. If there was, somebody would have picked it up."(In order to retain an air of seriousness, this article has relegated all of its jokes to footnotes.)

Moore invented the microprocessor. When entrepreneurs take advantage of profit opportunities, they create new entrepreneurial opportunities that others can act upon. Entrepreneurship creates an environment that makes more entrepreneurship possible.

INCREASING RETURNS AND KNOWLEDGE EXTERNALITIES

The Smithian view of economic growth is based on the concept of increasing returns, and twentieth-century contributors to the Smithian idea, like Young (1928) and Kaldor (1972), have explicitly acknowledged that they were building on Adam Smith's insights. Yet increasing returns is a problematic concept in an economic framework because it implies that average cost continually declines. Kaldor (1972) notes the problems for general equilibrium models when firms are characterized by increasing returns, but another possibility is that the production functions of firms do not exhibit increasing returns, but firms generate positive externalities that lower the costs of production for other firms in close proximity. Individual firms do not exhibit increasing returns, but the entire economy does. This is easy to visualize as a Smithian idea. The division of labor is limited by the extent of the market, so additional firms in an area enlarge the market and allow all firms to be more productive by becoming increasingly specialized. Increased specialization is but one way in which firms can become more innovative, so a more general way to envision this idea is that the knowledge created by firms benefit other firms in close proximity, so that when one firm innovates, others find themselves in a better position to innovate also.

Romer (1986, 1990) depicts the process as a knowledge spillover. Knowledge, embodied in human capital, is the factor with increasing returns, meaning that investments in human capital make future investments in human capital more productive. Because human capital must be combined with other factors of production, there will be a tendency for productivity increases to be geographically concentrated, which result in some areas manifesting more economic growth than others.[8] This raises two questions, only one of which will be dealt with here. The first is, what conditions cause economic growth to be concentrated in some areas but not in others? A plausible answer, but outside the scope of the present article, is that market institutions make the difference.[9] The second question is, by what process does the productive activity of some result in a positive externality that increases the productivity of others? This is the question that Kirzner's model of entrepreneurship answers.

Kirzner clearly distinguishes between knowledge and entrepreneurship.

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[8]See Krugman (1991) and Audretsch and Feldman (1996) for models in which increasing returns occur in geographically concentrated areas.

[9]Gwartney, Lawson, and Block (1996), Olson (1996), Scully (1988, 1992), and Knack (1996) are some examples of studies that come to this conclusion. Scully uses a measure of economic and political freedom, while Gwartney, Lawson, and Block deliberately confine their analysis to economic freedoms. Barro (1996) and Perotti (1996) present some evidence that economic freedoms are what count, and that democratic political institutions may even have a negative effect on economic growth.

> But as closely as the element of knowledge is tied to the possibility of winning pure profits, the elusive notion of entrepreneurship is, as we have seen, not encapsulated in the mere possession of greater knowledge of market opportunities. The aspect of knowledge which is crucially relevant to entrepreneurship is not so much the substantive knowledge of market data as *alertness, the "knowledge" of where to find market data.* (1963, p. 67, emphasis in original)

Entrepreneurship, in Kirzner's vision, clearly excludes research and development activities, and the accumulation of human capital. These activities can augment factors of production, but by themselves do not provide the insights that lead to new goods and services, or new processes for producing existing goods and services. If this seems like an overly fine distinction, consider the policy implications. Centrally planned economies tried unsuccessfully for decades to produce growth through investment in research and education, but were missing the institutions that enabled entrepreneurship.

THE PROCESS OF ENTREPRENEURSHIP

One might imagine an entrepreneur spotting a profit opportunity in the same way that a pedestrian spots a $20 bill on the sidewalk. Many people might walk by the bill, not noticing it, until one alert individual spots it and reaps the $20 reward. This analogy fits Kirzner's model of entrepreneurship in some respects, but falls short in others. One problem with the analogy is that it is rare to find money on the sidewalk, so there is little incentive to look for it. In contrast, it is not uncommon, for example, to find scavengers with metal detectors on a beach looking for lost watches, rings, and other valuables. If more money were lying on sidewalks, people would become more alert to the opportunity of finding it. The idea that people will be more alert for profit opportunities when they are more likely to exist helps illuminate the reason why more profit opportunities are seized in growing economies. Economic growth creates profit opportunities.

When economies are organized around traditional lines, people's economic roles are given and there is little possibility for capitalizing on innovation. The ancient Chinese economy had more capital than other economies at the time, had a well-developed legal system, had well-defined property rights, and had advanced the state of knowledge further than any other place in the world. Yet the traditional nature of the economy meant that individuals found their employment dictated by historical factors outside their control, and more significantly, found little change in the status quo over the course of their lifetimes.[10] When the status quo changes relatively little, one is not likely to spot an entrepreneurial opportunity today that was not apparent yesterday. Even a substantial opportunity will tend to blend in with the status quo, and because it is familiar, will tend to go unnoticed. This is one reason why economies organized along traditional lines tend not to grow, even when they have substantial endowments of basic factors of production, when they are technologically advanced, and when their population has substantial human capital.

[10]Heilbroner (1962) divides economic systems into traditional, command, and market economies, and that is the distinction used here when discussing economies based on tradition.

This observation holds not only for traditional economies, but for market economies too, if they are unchanging. Consider the neoclassical concept of general equilibrium in which all firms are pricing at minimum average costs and there are no economic profits to be had. By definition, entrepreneurs have no profit opportunities to find; they have all been exploited already. Starting from this situation of general equilibrium, one can see that if an innovation occurs that disturbs the equilibrium, it opens profit opportunities in other areas of the economy. If a new good is introduced, consumers will shift their purchases toward that good, creating profits for some and losses for others. Those who sell complementary goods have a profit opportunity, and once a new good is produced, it may produce the opportunity for others to introduce new complementary goods for which there would not have been a market before. New production processes can be developed for the new goods, and the innovative opportunities go on.

This example points toward two shortcomings of analyzing economic growth in a general equilibrium framework. First, the models are not well suited for depicting the process of introducing new goods into the economy. In the neoclassical framework, growth occurs by producing more of the old goods. Second, because they are equilibrium models, they do not depict the profit opportunities that entice innovation. Thus, innovation tends to be depicted as research-and-development activity that is produced by applying inputs in a production function, rather than as an entrepreneurial discovery process. If one imagines the activities of those who run the black boxes that are firms in such models, they must be imagined as managers, whose job it is to combine pre-specified inputs into pre-specified outputs in a Pareto-efficient manner, rather than being entrepreneurs who innovate by undertaking production in a previously untried manner, producing goods that have not previously been produced, aiming at markets that do not yet exist.

There is some merit to considering research and development as a component of innovation and entrepreneurship, in the same way that one considers the purchase of a metal detector as a method for finding objects on the beach.[11] If there are not very many entrepreneurial opportunities, it does not pay to look for them, but when entrepreneurial opportunities abound, it makes sense to invest in the search for entrepreneurial profits. But focusing on research and development as the main component of innovation and technological advance misses the point. In most cases, a metal detector will not help people find lost objects, so one rarely sees people with metal detectors searching for lost objects in shopping centers, apartment buildings, or schools. On the beach, however, lost objects are more likely to be hidden from view in the sand, and because beachgoers do lose objects with some regularity, using a metal detector on a beach may turn up valuable objects. Similarly, research-and-development activity takes place in those areas where entrepreneurial profits seem promising. Research and development expenditures are not the cause of entrepreneurial opportunities, they are the result of entrepreneurial opportunities. More

[11]Note, however, that Kirzner (1973, p. 40) would make the distinction between the entrepreneurial insight that a metal detector might be used to discover previously undiscovered profit opportunities, which requires no resources, and the investment in the metal detector, which is the employment of capital in the production process.

research and development occurs in the electronics industry than in the garment industry because there are more potential entrepreneurial insights to be found in electronics than in garment manufacture.

Thus, while it is reasonable to consider research and development to be a factor pushing technological change, research and development is not the cause of growth, it is a response to growth opportunities. The question is, what creates such opportunities? The answer is: entrepreneurship. In a static setting, where there is little change, there will be relatively little in the way of entrepreneurial opportunities. Those that might be lying in wait must be relatively obscure to have remained unnoticed, and the static environment precludes the creation of new opportunities. Furthermore, with few opportunities, there is little incentive to devote any resources toward seeking them out. In an environment of economic change, new opportunities will continually be presenting themselves. When entrepreneurs take advantage of some opportunities, the economic environment changes, creating with it additional opportunities. Thus, entrepreneurship leads to more entrepreneurship.

Several factors lead entrepreneurial insights to build on one another. First, the changes that result from entrepreneurship alter the economic environment, creating new profit opportunities. This is easy to see even within a comparative static general equilibrium setting. If the equilibrium is upset, the equilibrium condition that eliminates profit opportunities is removed, and profit opportunities arise to lead the adjustment to a new general equilibrium. Second, entrepreneurial activity generates wealth, and thereby increases the extent of the market, to use Adam Smith's phrase. The increase in income alone will generate new market opportunities, but an increase in the volume of goods also produces the opportunity for greater specialization. Third, entrepreneurial insights create new market niches that go along with innovation. This third factor, the creation of market niches, is the key link between entrepreneurship and economic growth.

Consider, for example, one innovative insight in the rapidly developing computer industry. Somebody had the idea that if a computer mouse communicated with the computer via an infrared connection, the mouse could be used without a cord. It is a small development, to be sure, but it is a good example of an entrepreneurial insight and the capitalization of a previously unnoticed profit opportunity. The profit opportunity arose solely because of a previously nonexistent market niche, and once that market niche appeared, it did not take very long for an entrepreneur to seize on the idea. Notice that this entrepreneurial insight did not arise for either of the first two reasons listed in the previous paragraph. It did not arise because of a profit opportunity created by a temporary disequilibrium in the market. Before personal computers used mice (which also is an example of an entrepreneurial insight), there would have been no possibility for the insight, regardless of how far the market was out of equilibrium. It did not arise because of the second reason either, which is a bigger market. The division of labor has nothing to do with the insight that a mouse could communicate with a computer through infrared technology (although it might have something to do with what type of firm produces the technology). An increase in wealth could not create the demand for infrared mice without the innovation of the mouse as a computer input device. This entrepreneurial insight capitalized on a new opportunity, which was created by other entrepreneurial insights.

One can go through a chain of events, seeing that the entrepreneurial insight that led to infrared mice could not have been made without the insight that a mouse could be used as a computer peripheral, and the insight that a mouse could be used to control a computer could not have been made without the insight that there was a market for personal computers. As is well known, the major computer manufacturers of the 1970s completely overlooked this market, leaving it to entrepreneurial start-ups. And the insight that there is a market for personal computers could not have been made without the development of the microprocessor, a result of yet another entrepreneurial insight. The computer industry provides a good example of the way that entrepreneurial insights lead to additional entrepreneurial insights. The economy does not simply offer a fixed set of entrepreneurial opportunities which then can be harvested. Rather, new entrepreneurial opportunities continually arise as the result of past entrepreneurial activity.

This does not imply that one cannot invest in looking for entrepreneurial opportunities. Research and development, and the production of human capital, can be systematic ways of producing additional opportunities, and of finding those that already exist. That specific knowledge of time and place that Hayek emphasized can play a role in revealing entrepreneurial opportunities. However, if one focuses exclusively on investment in human capital and technological advance, the mechanism by which innovation occurs is left out of the picture entirely. Such investments can produce a more fertile environment within which to search for entrepreneurial opportunities, but it is the entrepreneurial act of seizing those opportunities that produces the engine for economic growth, and that lays the foundation for more entrepreneurial discoveries.[12]

To see that this is true, one need only look at the centrally planned economies of the twentieth century. Those economies placed a big premium on the development of both human and physical capital, and on the production of advances in technology. Their collapse at the end of the twentieth century shows that it is not the advancement of human capital, physical capital, and technology by itself that leads to economic growth, but rather the environment within which these advances take place. Hayek (1945) emphasized the specific knowledge of time and place possessed by every individual in the economy, and when the economy allows every individual to take advantage of this knowledge and become entrepreneurial, economic growth is the result. Centrally planned economies failed because central planning precludes entrepreneurship, which is necessarily decentralized in nature.

The market system produces this setting, and entrepreneurship within the market setting that makes the process work. Innovations produce profit opportunities which are then seized by entrepreneurs, and those entrepreneurial activities create more profit opportunities.

IMPLICATIONS FOR KIRZNER'S MODEL OF ENTREPRENEURSHIP

The linking of entrepreneurship with the environment of economic growth helps to illuminate the process by which entrepreneurial opportunities arise, and the process

[12]Weitzman (1996) outlines a theory of growth along these lines.

by which they are observed and acted upon. While, in a sense, profit opportunities lie unseen until entrepreneurs observe them and capitalize on them, profit opportunities are not like a fixed stock of resources waiting to be claimed. Rather, they arise in the course of economic activity, and in many cases are seized shortly after they appear. Most entrepreneurial opportunities are created as a result of past entrepreneurship. Seeing entrepreneurship within the context of economic growth helps clarify the origin of entrepreneurial ideas, and the way in which entrepreneurs are able to spot them and act on them.

A view that opportunities for entrepreneurial insights are produced exogenously and lie in wait for entrepreneurs to notice them is fundamentally misleading. Furthermore, it would be misleading to think that at any moment in time there is an abundance of entrepreneurial opportunities that are unnoticed, waiting to be discovered. Entrepreneurial opportunities constantly arise in a growing economy, and when they do they are, except in rare circumstances, rapidly acted upon. Entrepreneurial insights are produced in the process of economic advancement. More rapid advancement brings more entrepreneurial opportunities, and more entrepreneurial opportunities produce greater incentives for potential entrepreneurs to become more alert to them. Entrepreneurship generates more entrepreneurship. In contrast, a stagnant economy blunts the incentives for entrepreneurial activity, and can remain stagnant because of the lack of entrepreneurial opportunities.[13]

If one wanted to focus solely on the activities of entrepreneurs, then entrepreneurial opportunities might be viewed as exogenous creations that entrepreneurs act upon. However, when one extends Kirzner's model of entrepreneurship to examine its results, it is a straightforward conclusion that entrepreneurial activities create more entrepreneurial opportunities. This has the advantage of endogenizing the creation of entrepreneurial opportunities, so that Kirzner's model then explains the origin of entrepreneurial opportunities as well as the competitive process that results from their existence. When one sees that entrepreneurial insights build upon one another, the creation of entrepreneurial insights is endogenized and the Kirznerian model of entrepreneurship becomes more complete.

Kirzner (1973, pp. 72–75) distinguishes his view of entrepreneurship, which he envisions as equilibrating, with Schumpeter's (1934), which he depicts as disequilibrating. "Schumpeter's entrepreneur acts to *disturb* an existing equilibrium situation. . . . The entrepreneur is pictured as *initiating* change and generating new opportunities" (pp. 72–73, emphasis in original). Kirzner then quotes Schumpeter as concluding that entrepreneurship is at odds with equilibrating activity. Kirzner, in contrast, argues that the entrepreneur "*brings into mutual adjustment* those discordant elements which resulted from prior market ignorance" (p. 73, emphasis in original). Kirzner takes issue with Schumpeter because his discussion of entrepreneurship is "likely to generate the utterly mistaken view that the state of equilibrium can establish itself

[13]Young (1993) develops a model along these lines. Mokyr (1990) classifies technological advances as "macroinventions" and "microinventions." The idea is that major inventions like the steam engine and the microprocessor create entrepreneurial opportunities for microinventions that further drive economic growth.

without any social device to deploy and marshal the scattered pieces of information which are the only source of such a state" (pp. 73–74).

When Kirznerian entrepreneurship is considered within the framework of economic growth, however, there may be more common ground between Kirzner's and Schumpeter's views on entrepreneurship than Kirzner implies in the above passages. Kirzner's entrepreneurs explicitly begin their activity within a disequilibrium situation.

> It is necessary to postulate that out of the mistakes which led market participants to choose less-than-optimal courses of action yesterday, there can be expected to develop systematic *changes in expectations* concerning ends and means that can generate corresponding *alterations in plans.* (1973, p. 71)

In such a situation, entrepreneurial insights would bring individuals closer and closer to their optimal courses of action, eventually causing entrepreneurial opportunities to vanish. However, new opportunities could arise from Schumpeterian entrepreneurship, which would create a disequilibrium situation with new profit opportunities for Kirznerian entrepreneurs to act upon.

In fact, there is no difference between the actions of Kirznerian and Schumpeterian entrepreneurs. Both are seizing unexploited profit opportunities, and in both cases the market environment will be different for all market participants in the future. One must note, however, that in any developing economy, the equilibrium toward which the economy tends changes from day to day, and when the Kirznerian model is expanded to recognize this, the tendency toward equilibrium in a static sense is less important than the exploitation of new profit opportunities which implies greater gains from trade and economic growth. The difference that Kirzner emphasizes between his and Schumpeter's views largely arises because of the different objectives of the two writers. Schumpeter was discussing directly the role of entrepreneurship in economic growth, while Kirzner was interested in showing how entrepreneurship is an essential but underrecognized element in the allocation of economic resources.[14]

Schumpeter's discussion of entrepreneurship flows from his vision of economic growth as a spontaneous, revolutionary, and discontinuous process,[15] implying that the motive forces of growth are exogenous to his model of growth, if not to the economic process itself. From an initial equilibrium, entrepreneurial activity disturbs that equilibrium, leading Schumpeter to the idea that entrepreneurial activity is disequilibrating. Kirzner begins from a disequilibrium condition to show how entrepreneurial activity helps equilibrate an economy. Neither view is complete, because in Schumpeter's model some force must equilibrate an economy before entrepreneurial

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[14]Kirzner (1979, ch. 7) argues that there are important differences between his and Schumpeter's ideas, and takes Schumpeter to task for not discussing the equilibrating role of entrepreneurship. Elsewhere, however, Kirzner (1985, ch. 4) develops the idea of entrepreneurship in a manner that encompasses the spirit of Schumpeter's ideas, and in private correspondence Kirzner has told me that he believes Schumpeter's ideas on entrepreneurship are important, and that they can be reconciled with his ideas.

[15]Schumpeter (1934, p. 63) discusses the revolutionary nature of economic growth, and later (1934, p. 65) describes the motive forces as "spontaneous and discontinuous."

activity can disequilibrate it, and that force is Kirznerian entrepreneurship. Likewise, in Kirzner's model, if entrepreneurial activity continually works to equilibrate an economy, some force must push it away from equilibrium to allow the equilibrating process to operate, and that force is Schumpeterian entrepreneurship. Both forces have the same origin, however, which is entrepreneurs acting on previously unrecognized profit opportunities.

Kirzner is justly concerned that Schumpeter ignores the equilibrating role of entrepreneurship, but at the same time Schumpeter does correctly note that entrepreneurial activity is essential for growth. But Kirzner's theory of entrepreneurship gives no indication of the origin of entrepreneurial opportunities, and when Kirznerian entrepreneurship is depicted as an integral part of the process of economic growth, entrepreneurial opportunities can be seen as originating from past entrepreneurial activity, making Kirzner's theory of entrepreneurship more self-contained and complete.

IMPLICATIONS FOR GROWTH THEORY

While growth theory has become far more formalized in the last half of the twentieth century, the fundamental ideas behind the engine of economic growth can be traced back to Adam Smith. As noted in the earlier review of the literature, current theorists are focusing on the role of human capital, knowledge externalities, and increasing returns. These insights certainly are not wrong, but at the same time they do not go very far toward illuminating the process by which knowledge externalities produce growth, or by which increasing returns can be manifested in the production process. The recognition of entrepreneurship's role in the market process fills this gap. Knowledge externalities occur when the entrepreneurial insights of some produce entrepreneurial opportunities for others. Increasing returns occur because the more entrepreneurial activity an economy exhibits, the more new entrepreneurial opportunities it creates.

When one recognizes that entrepreneurship gives rise to knowledge externalities and increasing returns, it then becomes apparent that growth theory should focus less on the Ricardian production function approach where inputs are combined in a black box to produce outputs, and more on the process by which production processes are determined. The engine of economic growth is not better inputs, but rather an environment in which entrepreneurial opportunities can be capitalized upon. As Kreuger (1993) notes, for decades after World War II, the production-function approach dominated economic thinking, and economic policy advisors, applying state-of-the-art growth theory, advised nations to industrialize, to save and invest, and to develop their human capital. The result has been that many third-world nations have inefficient industries that require constant subsidies to keep them running, further draining their economies. They have tried educating their citizens, but because of lack of opportunities, many of their better minds have emigrated to other countries. The biggest beneficiaries of the whole process may have been the high-priced consultants who recommended these inefficient growth strategies.

When entrepreneurship is seen as the engine of growth, the emphasis shifts toward the creation of an environment within which opportunities for entrepreneurial activity are created, and successful entrepreneurship is rewarded. Human and physical capital remain inputs into the production process, to be sure,

but by themselves they do not create economic growth.[16] Rather, an institutional environment that encourages entrepreneurship attracts human and physical capital, which is why investment and growth are correlated. When the key role of entrepreneurship is taken into account, it is apparent that emphasis should be placed on market institutions rather than production function inputs. The importance of market institutions has now been generally recognized in practice, but has not been integrated into the mainstream theory of economic growth.

Contemporary growth theory, built on complex mathematical models, must make simplifying assumptions to keep the models tractable. In the process of simplifying models to make them more manageable, it is easy to assume away the institutional details that provide the foundation for economic growth. The temptation to assume away these institutional details is increased because often institutional details are hard to measure. One can come up with plausible measures for capital and labor, but it is more difficult to measure the degree to which property rights are protected in an economy, or the degree to which government regulations hamper economic activity or push it underground.[17] By recognizing entrepreneurship as the foundation for economic growth, the emphasis then must be turned toward those features of the economy that foster entrepreneurial activity. Surely research-and-development activity and investment in physical and human capital provide inputs that make growth possible, but by focusing on these inputs, contemporary mainstream growth models look past the process by which growth occurs. Research and development and investment do not cause economic growth, they take place in response to growth opportunities, and those opportunities are created by entrepreneurship.

Recent work that focuses on human capital as the engine of economic growth is just as misleading as the growth theory of decades ago that focused on physical capital investment as providing a "golden rule" for economic growth. Human capital is correlated with economic growth because a growing economy provides a greater return to human capital. The direction of causation is from an environment conducive to growth of human capital, not the other way around. This becomes apparent when entrepreneurship is viewed as the engine of economic growth. The existence of institutions conducive to entrepreneurship creates the profit opportunities which increase the return to education and lead to an increase in human capital. Human capital is important because it is a component of the production process, but entrepreneurship, not capital of any kind, is the underlying cause of growth.[18]

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[16]In an interesting bit of speculation, Weitzman (1996) argues that the former Soviet Union took neoclassical growth theory as the foundation for economic policy, and when their continual efforts at increasing output by increasing inputs into their production functions failed, the Soviet economy and government collapsed. The prediction of collapse goes back to Mises (1922), but the underlying faulty model to which Weitzman refers was not developed until decades later. It is interesting to conjecture that the Soviet Union may have collapsed because its leaders took neoclassical growth theory too seriously.

[17]de Soto (1989) presents a fascinating study of the way in which government restrictions have pushed a substantial fraction of Peru's economic activity into what he calls the informal sector of the economy, and the way in which this impedes economic development.

[18]Academic economists may have an incentive to overstate the importance of human capital because they receive their incomes from the production of education. If academics can convince

CONCLUSION

The incorporation of entrepreneurship into the framework of economic growth contributes both to growth theory and to Kirzner's theory of entrepreneurship. Each framework helps enlighten the other. The growth framework furthers Kirzner's model of entrepreneurship by helping to illustrate where entrepreneurial opportunities originate, why more opportunities arise in some sectors of the economy than others, and what factors can provide incentives for entrepreneurs to more intensively search for new entrepreneurial insights. Entrepreneurial opportunities are not just exogenously delivered to an economy; in large part they are produced by entrepreneurial activities in the recent past. This expansion of Kirzner's framework explains the origins of entrepreneurial opportunities as well as the process of entrepreneurship.

Incorporating entrepreneurship into the framework of economic growth adds to growth theory by showing the nature of increasing returns to scale, knowledge externalities, and the role of human capital. These processes appear as a black box in mainstream growth theory, but when they are depicted as a part of the entrepreneurial process, it becomes apparent that the engine of economic growth is entrepreneurship, not technological advance or investment in human capital per se. This focus on entrepreneurship pushes growth theory in a direction that emphasizes the institutional setting within which growth occurs, and away from a neoclassical growth theory that focuses on inputs into the production process. The incorporation of entrepreneurship into the framework of economic growth not only fills in the institutional details to help make the growth process more understandable, but also points toward more promising economic policy recommendations for fostering economic growth.

In the latter half of the twentieth century a production function approach to economic growth has led both growth theory and growth policy to conclude that increases in output could best be produced by increasing the inputs into the production process. Policies were aimed at increasing both the quantity and quality of inputs through investment, incorporation of modern technology, and education. In many less-developed economies, the results have been disappointing. In contrast, this Austrian framework for viewing economic growth shows that the key element in economic growth is the production of entrepreneurial opportunities. When such opportunities are available, individuals have the incentive to invest in human and physical capital without government intervention. Mainstream growth theory has seen the problems with the mechanistic application of the production function approach to economic growth, but has responded by incorporating increasing returns and knowledge externalities into formal models in a way that obscures the way in which these factors might actually manifest themselves in the real world. The answer is the type of entrepreneurship that Kirzner described, and the straightforward prescription for economic growth is to create an institutional environment that encourages markets and rewards productive activity.

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the population at large of the importance of education, their incomes will rise. Thus, as Holcombe (1997) notes, one must be inherently suspicious of academics who argue the importance of education.

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