

THE FREE-MARKET INNOVATION MACHINE:
ANALYZING THE GROWTH MIRACLE OF CAPITALISM.
BY WILLIAM J. BAUMOL. PRINCETON, N.J.: PRINCETON
UNIVERSITY PRESS, 2002.

The fundamental idea behind this book, as its title suggests, is that innovation is the driving force behind the remarkable growth miracle of capitalism. Yet, Baumol notes, innovation is at best a peripheral part of the standard theory of the firm and has received only slightly more attention in modern growth theory. In the neoclassical theory of the firm, firms compete based on price, but Baumol argues that in a capitalist economy innovation rather than price is the primary competitive dimension, and less innovative firms will find their markets shrinking as they lose business to their more innovative competitors. Thus, innovation is essential to the survival of firms in a capitalist economy. Baumol argues that innovation belongs at the core of microeconomics, not on its periphery, and he develops some ideas to show how innovation can be incorporated into the neoclassical framework. The book is divided into three parts. Part One lays out Baumol's model of the capitalist growth mechanism. Part Two discusses how his model can be incorporated into the standard microeconomic framework. Part Three looks at the macroeconomic implications of his theory.

Many of the basic ideas in this book are based on Schumpeter's work, and Baumol cites Schumpeter frequently. Baumol also draws on his first-hand experience in consulting work, and discussions with corporate decision-makers, for insights on the way that firms actually do behave in a competitive environment. The result is a theory of economic growth substantially more insightful than the reigning neoclassical growth theory. Still, Baumol is quite reluctant to find fault with contemporary growth theory. He praises the work of Romer, Lucas, and others, but says that he is interested in different questions. Perhaps Baumol is too much of a gentleman to be critical of his fellow economists. It appears to me that Baumol is trying to answer the same questions, and has shown that the neoclassical growth theorists are looking in the wrong places for answers.

Austrian economists will find much to like in Baumol's book, but this is not an Austrian work. Israel Kirzner is mentioned only once in the book, in a footnote, and none of Kirzner's work is cited. Austrians will be sympathetic with the issues and insights that Baumol lays as a foundation, but ultimately Baumol's analysis heads in a neoclassical direction, which results in his theory's bogging down in the same areas as neoclassical growth theory. Even so, this book has much to offer the readers of this journal.

Part One of the book, where Baumol lays out his theory, is the most insightful. Baumol describes a process in which firms compete with each other based on innovation rather than price. He notes that successful firms can be inefficient in the static neoclassical sense and still remain profitable if they continue to innovate, but without innovation, even the most efficient firm (in the static sense) will be forced from the market by its innovating competitors. This analysis seems right on the mark.

Innovation takes place within monopolistically competitive markets where firms are aware of the activities and innovations of their rivals, and are forced by competitive pressures to respond to them. Because innovation is essential to firms' survival, they cannot leave the process to chance, so they routinize innovation, making it a part of their ongoing business activities. In Baumol's view, R&D is run by managers, not entrepreneurs. "This is not the realm of the unexpected, of the unrestricted exercise of imagination and boldness that is the essence of entrepreneurship. It is, rather, the domain of memorandums, rigid cost controls, and standardized procedures, which are the hallmark of trained management" (p. 36). "Thus, corporate R&D has taken over a substantial portion of the field and has transformed it into a bureaucratized activity" (p. 34).

At this point, Baumol's model takes a very neoclassical turn, and innovation is something that is produced, much like other inputs into the production process. The uncertainties of entrepreneurship are displaced by bureaucratized R&D that can be expected to produce innovations on a regular basis. This raises two issues. First, Baumol goes to great lengths to emphasize the Schumpeterian distinction between invention and innovation. Throughout history, many inventions that could have been put to productive use were not, because there was no incentive to do so. Baumol believes that the market mechanism provides sufficient incentive for corporate bureaucracies to turn inventions into profit-making innovations, but I am skeptical and see a much bigger role for entrepreneurial action in corporate innovation. I will go along with Baumol as far as to agree that R&D expenditures create an environment within which entrepreneurial discovery is more likely, but stop short of believing that in modern capitalism bureaucratized R&D activities have displaced entrepreneurship.

This leads to the second issue. Baumol claims that most improvements in economic welfare are due not to major breakthroughs, but rather to routine improvements in existing products and processes. Independent inventors may provide the initial innovation, but that is only the beginning, and often a small part of the total story. Goods such as automobiles, televisions, and computers were not very useful when they were first invented, but subsequent refinement through R&D led them to be better, cheaper, and more useful, and those subsequent refinements are what have produced really large improvements in welfare. For example, Baumol claims that 99 percent of today's computing power is due to incremental improvements in the technology rather than major breakthroughs. Baumol's free-market innovation machine routinizes the process that produces 99 percent of that innovation. Without questioning Baumol's 99 percent figure, I still am not convinced that the real engine of innovation is the corporate R&D that has produced 99 percent of today's computing power rather than the entrepreneurial insight that led to that first one percent. Put differently, is the engine of the innovation machine the original insight that produced the innovation, or is it the incremental improvements that have made the innovation significantly more useful and affordable? I would answer the former, although Baumol answers the latter. Still, Baumol recognizes the importance of entrepreneurship,

saying, "In this process there is no reason to expect independent inventors or innovators to become obsolete any time in the foreseeable future" (p. 57).

Because innovation is essential to a firm's survival, routinization of innovation is an integral part of business. Firms must devote sufficient expenditures to match their rivals' innovation, which leads to what Baumol characterizes as an arms race in R&D expenditures. Such an arms race could lead to a substantial amount of wasted resources if the competitors used their R&D in duplicative ways, or in ways to try to shut each other out of the market, but Baumol persuasively argues that this is not characteristic of the R&D arms race. Firms cannot afford to be put in a position of being leapfrogged by a rival's superior innovation, so firms have an incentive to share their innovations in a number of ways. Baumol devotes two chapters to the sharing of technological advances among firms. He convincingly argues that firms have an incentive to share their technological advances through arrangements such as licensing, exchange agreements, and the joining of technology exchange consortiums.

Firms that engage in such exchange give themselves competitive advantages over firms that attempt to go it alone, as Baumol demonstrates both formally and with a wealth of examples. Many firms then have access to the best technology, but have an incentive to innovate to collect royalties from licensing, and to have valuable technology to trade with other firms. Baumol's discussion of the way in which the results of innovations are distributed among competing firms through market mechanisms presents a persuasive argument that innovation-sharing in the modern market economy leads to efficient economic outcomes.

In Baumol's model, the capitalist economy grows because oligopolistic industries use innovation as their primary competitive weapon, and the routinization of innovation turns it into a reasonably predictable business activity rather than a series of fortuitous events. Incentives within the marketplace force firms to continue the innovation that has produced the growth miracle of capitalism.

In Part Two of the book, Baumol wants to take his ideas and integrate them into the standard theory of the firm. This is a worthwhile endeavor, but conceptually there are problems with the way he has proceeded. By trying to shoehorn a theory of innovation into a theory that is based on prices and quantities, the true nature of innovation seems to have been left behind in Part One. Innovation can shift out the demand curve by making products more desirable, or shift out the supply curve by making them cheaper to produce, but when it is characterized this way, innovation never results in the new products that have so transformed the world. Perhaps this is just how Baumol sees it, because as already noted, Baumol places much more emphasis on the incremental improvements to innovations than to the original innovations themselves.

Baumol argues that innovation is essential to understanding oligopolistic competition. With heavy up-front R&D costs that are necessary for firms to survive, price discrimination is necessary for firms to stay in business. Baumol's argument is plausible, and he tries to put this into the standard neoclassical framework, but the argument reads more like one that was invented to defend the actions of a price-discriminating firm than one intended to advance the state of economic theory. Nevertheless, the plausibility of the argument suggests that Baumol's observations through his consulting work and other first-hand experience can lead to an economic theory more in tune with the realities of the real-world economy.

Ultimately, Part Two of the book is less inspiring than Part One because the discussion of innovation, improvements in product characteristics, and the introduction

of new products, all end up being depicted as shifts of supply and demand curves and not only are the issues about the origins of innovations glossed over, the innovations themselves seem to be left behind, depicted only as changes in costs and demands in the market under analysis.

Part Three of the book, titled "On the Macrodynamics of Capitalism," is the shortest of the three parts, but offers the reader some interesting ideas. Modern capitalism is only a few centuries old, and Baumol wonders whether the free-market innovation machine might slow down and ultimately stop growing. Baumol argues in Chapter 15 that R&D is relatively labor-intensive, so over time its cost can rise relative to the rest of the economy. As the relative cost of R&D rises, firms may do less of it, resulting in slower growth. Thus, Baumol develops a theory for an endogenous end to the industrial revolution, noting, "the explanation for this rise and fall of entrepreneurial activity is grounded in simple dollars and cents—in the changes in the economy's structure of payoffs" (p. 60). This is an interesting speculation, but one wonders, in the computer age, with expensive R&D facilities, whether R&D really is labor intensive. Baumol goes on in Chapter 16 to argue that innovation facilitates more innovation, so growth may not slow after all. On balance, Baumol is optimistic that the free-market innovation machine will continue to produce economic progress, despite his theory about why it might not.

Baumol notes the importance of market institutions and the protection of property rights to provide incentives to innovate, and while he does not suggest that government regulation of business activity be done away with, he does say that regulations must account for the dynamic characteristics of innovative industries rather than being based on neoclassical principles of static efficiency. Baumol notes that entrepreneurial actions can be directed toward profit-making activities, or rent-seeking, so it is important to limit rent-seeking opportunities, but he does not go on to examine the incentives facing regulators to see whether they benefit more from rent-seeking entrepreneurs rather than profit-making entrepreneurs. Baumol recognizes that in some places, such as medieval China, incentives were such that entrepreneurial actions were directed toward rent-seeking activities, so this suggests that to follow through on Baumol's ideas on regulation, more analysis of the political incentives in contemporary capitalism needs to be undertaken. Baumol's discussion of the importance of the institutions of capitalism is surely correct, but is, at best, peripherally related to the main thrust of his argument.

Readers of this journal will surely appreciate Baumol's attack on Pareto optimality as the benchmark for the efficient allocation of resources. Baumol notes that innovation results in many information spillovers, and that following the standard criteria for efficiency, spillovers result in inefficiencies. Yet these spillovers allow the benefits of innovation to be spread beyond the innovators, making everybody better off, and on distributional grounds, Baumol argues that the fact that ultimately everyone benefits is a good thing. If spillovers were completely prevented, innovators would capture all of the benefits of their innovations, leaving most people in the same conditions of poverty that existed at the beginning of the Industrial Revolution. If the distributional benefits are unquestionably desirable, then the spillovers that have allowed them must be desirable too, calling into question the neoclassical criteria for optimality in the allocation of resources.

This book is at its strongest when, mainly in Part One, Baumol shows the weaknesses in standard growth theory and argues that innovation needs to play a central role. It is weaker when Baumol tries to place his insights in a neoclassical framework,

because the insights he argues should be in the model seem to disappear from it at this point. Part of the issue here may be which element of the free-market innovation machine is really responsible for the remarkable economic progress of the past three centuries, and for future economic progress. I do not take issue with Baumol's observation that most of the utility in technological products comes from more routine innovation that takes place after the product has entered the marketplace. Refinements and advances in many products have made them much more useful and affordable now than when they were introduced by their original innovators. And, I would agree that much of this innovation has been routinized through the R&D activities of modern businesses. Yet I believe that Baumol underestimates the entrepreneurial element in bringing the results of R&D to market, and underestimates the importance of the process that first creates the innovation. Baumol wants to describe the free-market innovation machine, but is there any reason why this routinized and bureaucratized R&D could not be undertaken by research labs in a centrally-planned economy?

The fact that refinement has been routinized seems to support the argument that continued progress requires a cultivation of that spark of entrepreneurship that starts the process in motion, and that the spark of entrepreneurship rather than the bureaucratized process of refinement is the real miracle of the free-market innovation machine. The R&D that Baumol emphasizes has become just another part of the manufacturing process, and Baumol deliberately presents it that way, but perhaps the entrepreneurial acts that have not become routinized are those that really separate the miracle of capitalist growth from other types of economic organization. The R&D that took place in the former Soviet Union could be described in the same terms Baumol uses to describe the bureaucratized corporate R&D of a market economy.

One way to look at this issue is to contrast Kirzner's depiction of entrepreneurship with Baumol's innovative process. Kirzner sees entrepreneurship as the recognition of a previously-unnoticed profit opportunity, which is costless and uses no resources. Baumol's depiction of the routinization of innovation through bureaucratized R&D removes that Kirznerian element from innovation, and is costly to undertake. Baumol does recognize the role of Kirznerian entrepreneurship (or something like it) in introducing innovations into the market, but suggests that this is a small part of the free-market innovation machine, and the more he formalizes his ideas, the less that Kirznerian element appears in it. While one might question Baumol for marginalizing the role of entrepreneurial insight, one might be equally critical of Kirzner for minimizing the innovative nature of entrepreneurship to focus on its equilibrating nature. Indeed, Kirzner's criticism of Schumpeter contrasts with Baumol's embrace of Schumpeter's ideas. The point is that without giving up any of Kirzner's ideas, Baumol still has much to offer his readers.

My biggest reservation about Baumol's book is that I think he points readers in the wrong direction by emphasizing the importance of routinized R&D as the engine of economic progress over entrepreneurial insights. I am skeptical that corporate planning and bureaucratized R&D really is the engine of economic growth, despite its undeniable contribution to continual improvements in the standard of living. Baumol's discussion of routinized R&D also leaves some unanswered questions. In this routine R&D that is necessary for firms to survive, where do the good ideas come from, and how do firms identify marketable ideas? Once they do, how do those good ideas get into the marketplace? The apparently small step between R&D and a marketable product is where entrepreneurship enters the picture. Baumol makes reference to ancient China, for example, to show how remarkable inventions do not necessarily

result in innovations that improve the standard of living. In what way are his bureaucratized corporate R&D activities different from inventive ideas in ancient China? Yes, the R&D Baumol describes takes place in a market environment, giving firms an incentive to market their innovations, but Baumol does not delve into how market institutions facilitate firms' ability to respond to this incentive.

Consider Xerox's development of the graphical user interface and computer mouse, which did not result in a marketable product for them, but transformed the product lines of Apple Computer and Microsoft. Consider Apple's failed handheld computer, the Newton, followed by the successful introduction of the Palm Pilot. These examples suggest that the path that leads from R&D to marketable products often is not routine, and that Kirznerian entrepreneurial insight remains a big part of the free-market innovation machine.

Despite my reservations on some points, Baumol has much to offer to economists generally, and specifically to those committed to Austrian theories of entrepreneurship and growth. His analysis of the shortcomings of current theories of growth are on target, and coming from a well-respected mainstream economist may have an influence on mainstream growth theory. Baumol's ideas on how the theory of the firm should be modified to take into account innovation are especially insightful. His attempt to integrate these ideas into the standard theory of the firm is worthwhile, even if not completely successful, and his integration of real-world institutions—especially with regard to technology transfers among firms—connects his theories with real-world institutions in a way that more economists should emulate. This book is an ambitious undertaking, and Baumol has largely succeeded. Baumol's ideas depart significantly from the Austrian tradition, but Austrian economists will benefit from reading this book.

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