

Review Article: Economic Development from the Beginning to Rostow*

By ROBERT DORFMAN
Harvard University

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THE STUDY OF ECONOMIC DEVELOPMENT has had its ups and downs, like most special fields of economics. If you will accept that economics emerged from its embryonic state and was born with the publication of *The Wealth of Nations*, then you'll agree that the field of economic development¹ originated with the

* W. W. (Walt Whitman) Rostow. *Theorists of Economic Growth from David Hume to the Present: With a Perspective on the Next Century*. (Including mathematical appendix by Michael Kennedy and the author) NY: Oxford University Press, 1990. Pp. x, 712. ISBN 0-19-505837-2.

¹ I should state at the outset that both Rostow and I use the terms *economic growth* and *economic development* interchangeably. When an economy grows it does not merely become larger; it is changed, or transformed, in many respects. In part these changes result from economies and diseconomies of scale that affect different sectors of the economy differently. In part they result from the circumstance that the various resources available to the economy do not increase proportionately with one another or with the economic activity. In part they are the consequence of cumulative experience and understanding, that is, learning by doing, and of innovations. If the changes increase per capita output or raise levels of per capita consumption, we regard them as development. Because economic growth and development are so closely linked, and because all the theories

subject itself, for *The Wealth of Nations* was preeminently an essay on what had to be done to promote the economic development of England.

Economic development remained a leading concern, if not the leading concern, of economists for the following 75 years. The major economists from A. Smith to J. S. Mill devoted most of their attention to explaining the long-run course of the economy. For about a century after Mill's *Principles*, however, the center of economists' attention shifted to business cycles, the distribution of income, the growth of trusts and monopolies, and other short-run problems. Immediately after World War II, a second shift of focus occurred. The colonies of the Europe-based empires were transformed into about a hundred new nations, a "third world" as they came to be called. The poverty and instability of these new countries promoted economic development once more to a place near the top of economists' agendas.

of economic growth are intended to promote increases in per capita consumption, distinguishing between the two concepts does not seem worthwhile.

All this history is covered in Walt Rostow's new treatise, *Theorists of Economic Growth from David Hume to the Present: With a Perspective on the Next Century*. In spite of his training and excellent credentials as an economic historian, and in spite (or maybe because) of his long and active involvement in the task of developing the new "third world countries," Professor Rostow has chosen to tell his story from a special and peculiar point of view which, I believe, obscures the concerns and achievements of most of the contributors and prevents readers from perceiving the humane and practical concerns that generated the development of development economics.

To make clear the themes that Professor Rostow obscured, I shall devote the first part of this review to a rapid sketch of a more conventional and orthodox interpretation of the history of development economics. In the second half, I shall try to show how and why Rostow's version falls short, and constitutes a less informative and intelligible account of how development economics evolved than the usual one.

I

I have already mentioned that development economics and the basic structure of the economics we know originated together in *The Wealth of Nations*. It is worthwhile, however, to start a few years earlier, with an immediate precursor. By the middle of the eighteenth century, the economy of France was well along the road to the bankruptcy that occurred in 1789. The farmers were overburdened with taxes, agricultural output was stagnant, and the royal revenues, largely dependent on farm taxes, were exiguous. Among the courtiers in Versailles, Francois Quesnay (physician to the Madame de Pompadour) and Victor Riqueti, the Marquis de Mirabeau, foresaw the impending disaster. In the vain hope of averting it, they produced what is surely the first dynamic planning model (Mirabeau 1764).

They, the leading physiocrats, attributed the low agricultural productivity to the primitive farming methods in use, and those methods to a scarcity of farm capital resulting from heavy taxes that discouraged farm investment. Investment in farming was also deterred by mercantilist restrictions that obstructed both foreign and

domestic trade in agricultural and other products. They therefore recommended that the tax burden be shifted from the farmers to the land-holding nobility and that the traditional internal tariffs and other obstructions to trade be relaxed. (This advocacy did not enhance their popularity around the royal court.) They constructed a dynamic, time-sequenced model to show how, relieved of onerous taxes, the farmers would plow their net revenues back into the farms, doubling their yields in ten years or less and increasing accordingly the rents that the nobles could collect and the taxes that the king could levy. The model was probably devised by Quesnay but published in the Marquis de Mirabeau's *Philosophie Rurale*² (1764).

The Contrôleur Général des Finances, A. R. J. Turgot, was greatly influenced by the physiocrats and tried to implement some of their recommendations, but crop failures frustrated his efforts and the nobility was so strongly opposed that he was dismissed from the cabinet. Thus ended the first effort at development planning.

Adam Smith followed immediately, publishing his epochal *Wealth of Nations* in the year of Turgot's fall, 1776. I hope that you will not mistake the adjective for hyperbole. I have already mentioned that *Wealth of Nations* was primarily a treatise on economic development. It was, but along the way it laid out rounded theories of how a market economy operates and of how the cooperating factors of production are rewarded. In all these areas, *The Wealth of Nations* set forth the basic conceptual frameworks, or paradigms, that discussions of those topics have employed ever since. Naturally the substances of the doctrines erected on those frameworks have changed enormously since. People who lament that economics has never had its Newton do not appreciate the achievement of *The Wealth of Nations*.

To analyze the operation of a market economy and the process of economic development, Smith divided all the factors that participate in production into three classes: land, labor,

² The well-known *tableau économique* is not dynamic. It is Quesnay's portrayal of the balanced equilibrium pattern of intersectoral exchanges that France would enjoy with an adequately financed and modernized agriculture.

and capital. It is no accident that the three classes of factors correspond to the three great social classes in the England of Smith's day: the landed gentry, the propertyless workers, and the emerging commercial-entrepreneurial class. One of Smith's major objects was to see how economic development affected the welfares of those social classes, especially the welfare of the workers. Today's studies of the functional distribution of income are descended directly from Smith's analysis of the class distribution.

The "wealth" in Smith's title corresponds closely to national income or product in today's vocabulary. Its amount is determined by the quantities available of the three factors and by the efficiency with which they are applied. Smith assumed that changes in the quantity of land are negligible. He took changes in the quantity of labor to be endogenous,³ specifically Malthusian, though Malthus was only ten years old when *Wealth* was published. That is, he believed that the poor propagated about as fast as their meager incomes permitted, and that their rate of population increase was limited largely by heavy child mortality, which fell when real wages increased. Finally, he held changes in the capital stock and in production efficiency to be at least partly exogenous. The last two, therefore, were the strategic factors on which economic growth depended.

Smith regarded increases in production efficiency as so important that he devoted the first chapters of *Wealth of Nations* to them. He wrote at the very inception of the industrial revolution, and therefore could have no idea of how violently manufacturing and transportation were about to be transformed. But he could see, and explained vividly, the great advantages of suitable division of labor over traditional artisan-guild methods. He saw also the advantages of economies of scale—that the division of labor could be carried further the greater the rate of output. One of the advantages of removing tariffs and other trade restrictions would be the increased efficiency of production that it would induce by increasing the size of markets and thereby permitting finer division of labor.

Smith laid even more emphasis on increasing the rate of capital accumulation. He was at least

as concerned to increase the welfare of the laboring class as to accelerate the economy's rate of growth, and held that the welfare of the workers depended on capital accumulation. Competition in the labor market assured that the real wage was determined by size of the labor force and the quantity of capital available to employ it. On Malthusian grounds, the growth of the labor force depended simply on the real wage: At a subsistence wage, by definition, the size of the labor force would be constant; at higher real wages the labor force would grow, faster the higher the wage; and at lower wages it would shrink. Therefore, for wages to rise above subsistence, capital had to be accumulated faster than the labor force grew.⁴ Much of *The Wealth of Nations*, including the notorious distinction between productive labor (labor that produced goods that could be added to the capital stock) and unproductive labor (labor whose results, however useful, were evanescent), was devoted to analyzing the forces that determined the rate of capital accumulation and to extolling practices, mainly the parsimony of the emerging bourgeoisie and economy in government, that tend to increase it. There was a kind of race that the "labouring poor" won when the capital stock grew faster than their numbers.

Sooner or later, though, each country would attain "its full complement of people and capital," its capital stock and its rate of output would cease to rise, and the real wage would fall toward the subsistence level. In the resulting inevitable stationary state, the rate of profit would be low, the fate of the laboring class would be barely tolerable poverty, and the landed gentry would reap the benefits of the scarcity of land.

The next major advances in the theory of development were made by Smith's followers, Thomas Robert Malthus and David Ricardo. I introduce them together because they were so closely associated that they were collaborators in all but name.

Malthus was catapulted into fame (or notoriety) by his *Essay on the Principle of Population* ([1798] 1960), which was intended to dispel the vision of human perfectibility that William Godwin, the Marquis de Condorcet, and other ex-

³ By no means Smith's word.

⁴ In Smith's words, "The wages of the labourer . . . are never so high as when the demand for labour is continually rising" ([1776] 1937, p. 249).

treme optimists were promulgating at the time. In the first edition of his *Essay* Malthus held that human populations grow rapidly to the greatest size their economies can support at a tolerable level of misery, so that, inevitably, most of a population lives at bare subsistence.⁵ Measures intended to relieve the misery, even charity, only exacerbate it by inducing increases in population.

Under some pressure from friends, Malthus softened his harsh prognostication in the later editions of the *Essay* conceding that "prudential restraint" might reduce the rate of population growth to a level where living standards could rise. Later, he softened his grim forecast still further in his work with Ricardo on economic theory.

Malthus' other main contribution to development theory was achieved in such close association with Ricardo that it is often called the Ricardian theory of rent. The Malthus-Ricardo theory of rent was a large advance over Smith's vague notion that as an economy grew, it gradually reached its "full complement of population and capital." According to Malthus and Ricardo⁶ (Malthus [1815] 1903a) rents are determined by the margin of cultivation, the least fertile land, and the least productive units of other natural resources that are used. The rents for supramarginal units of resources are the rents for marginal units plus differential rents, which capture for the landowner the excess profits that would otherwise be earned by capital employed on the supramarginal unit rather than at the margin. Thus, much of the fruit of economic growth is plucked by the landowners, that is, in early nineteenth century Britain, by the landed gentry.

Malthus and Ricardo accepted Smith's theory of wage determination and shared his concern about the oppressive poverty of the workers, but they were somewhat less pessimistic about the long-run outlook. They believed that the long-run standard of living could be raised if capital accumulation could run ahead of popula-

⁵ These ideas were more nearly commonplace than original when Malthus published his *Essay*. We have already seen that Smith took them for granted, and they had appeared repeatedly in the literature throughout the eighteenth century.

⁶ And also James Anderson and Edward West, who were independent discoverers.

tion. growth for long enough to accustom workers to the higher standard, so that the increase in their numbers would stop at a higher level of real income than before. Note that this concept was at least a small concession to the idea of human perfectibility that initially raised Malthus' ire.

Ricardo's principal prescription for attaining the high rates of capital accumulation and income growth needed to push up the long-run standard of living was to rescind the laws that discouraged the importation of cheap grains from the European continent, the Corn Laws. He justified this recommendation by the theories of economic growth and of income distribution on which his fame primarily rests.⁷ These theories rested on two insights contributed by Malthus: the theory of population and the theory of rent.

The reasoning begins by concentrating attention on grain production, grain being the mainstay of the English workingman's diet, and particularly on production on the marginal land, the land that is barely worth cultivating at current prices and profit rates, assuming wages at the subsistence level. The subsistence annual wage would be $w = qp(1 + k)$, where q is the number of bushels of grain per year in the subsistence diet, p is the price of a bushel, and k reflects the proportion of the subsistence budget spent on commodities other than grain. Now let m be the amount of grain that a worker grows on a unit of marginal land in a year. Assuming that no rent is paid for using marginal land, the gross value produced on such land, mp , is related to the wage by $mp = w(1 + r)$, where r is the gross markup covering nonwage costs and normal profit. Eliminating w between these two relationships:

$$1 + r = \frac{m}{q(1 + k)}$$

Regarding q and k as given "technical data," this equation shows that the gross markup at the margin, and hence the rate of profit there and throughout the economy, is directly related to m , the productivity of a worker on marginal land. The rate of profit and the price of corn

⁷ This argument also exemplifies his skillful use of bold simplifications, which has influenced economic theorizing ever since.

relative to the wage follow immediately, and the rent on any supramarginal land is determined so that capital invested in cultivating that land earns just the same rate of profit as capital used on marginal land.

Everything then depends on m , the productivity of labor on marginal land, or, in effect, on the fertility of that land. Now enter the Corn Laws. They restrict the imports of corn, and thereby require that poorer land be cultivated in order to feed the population. This reduces m and therefore the rate of profit and therefore both the amount of profits available for investment and the incentive to invest them. Consequently, capital accumulation is reduced and economic progress is impeded. At the same time that pushing out the margin reduces profits, it increases rents by increasing the differential between the productivity of supramarginal farms and marginal ones, but rents are used primarily to support the landed gentry and are not invested. The equilibrium real wage is always bare subsistence, and changes only when wages are bid up during a period of rapid capital accumulation, habituating workers to a higher level of subsistence.

The foregoing is the essentials of Ricardo's theory and its intended application as an argument for rescinding the Corn Laws.

Ricardo's colleague Malthus accepted the reasoning but did not accept the policy conclusion, feeling that the strategic advantages of food self-sufficiency and the moral advantages of rural as against urban employment were worth the economic costs entailed. The two collaborators argued their conflicting viewpoints in pamphlets and books, with vehemence but good humor. Though most economists sided with Ricardo, twenty-five years had to elapse before the Corn Laws were abolished and free trade established in Great Britain.

Neither Ricardo nor Malthus took account of the industrial revolution going on just outside their windows. To be sure, Ricardo included a chapter "On Machinery" in the third edition of his *Principles*, conceding that investments in machinery might reduce the demand for (and therefore wages of) labor. But he did not integrate the consequences of mechanization into the body of his theory.

The next generation was dominated by John Stuart Mill. He followed Ricardo's doctrines

faithfully, up to a point, and carried forward the classical view of economic growth as a race between increases in population and the capital stock (See his *Principles of Political Economy with Some of Their Applications to Social Philosophy* ([1848] 1923, passim). His innovation was to turn attention to the population side of the race and, indeed, to make substantial concessions to the vision of perfectibility. Mill asserted that no one could increase the living standards of the poor except the poor themselves, and that they could do so only by reducing their rate of procreation below the rate of capital accumulation. The government and the well-off had the obligation of providing the understanding and incentives that the poor needed to moderate their fecundity.

Mill's program depended heavily on education. The ignorant and illiterate certainly cannot appreciate the advantages of family planning; universal education is a prerequisite of population control. Along with education of men and women equally, Mill advocated a general improvement in the social status of women. He was an early proponent of women's liberation, and pointed out that liberated women would contribute significantly to limiting family sizes. As a step toward raising living standards drastically for a generation in order to make them stick permanently, he recommended dividing the remaining common land into family-sized farms and distributing them to poor families who would undertake to cultivate them and who would be provided with seed capital. He also recommended encouragement of and assistance to emigration.

These measures, he felt, would abate the pressures of population, raise the standard of living, and foster a well-educated, civilized, and slowly growing population. Real wages would rise, rents, interest rates, and profit rates would decline, and the rigors of capitalist competition would be softened by a spread of producer and consumer cooperatives. In short, England's future could be a happy and prosperous stationary state.

Mill had mixed feelings about the industrial revolution, in full roar at the time he wrote. On the one hand he complained that while the new machines produced unprecedented comforts for the middle class, "it is questionable if all the mechanical inventions yet made have

lightened the day's toil of a single human being" ([1848, Book IV, Chapter VI] 1923). On the other hand, he applauded the enormous outpouring of commodities available to the workers. Still, he believed that the power of population growth, unless abated, would inevitably overwhelm any plausible increase in productivity. Population control remained his key to improving the lot of the working class, which was his overriding concern.

The last major classical figure was Karl Marx. Marx qualifies as a classical economist, despite his dissident views about the social desirability and future of capitalism, because he espoused a cost of production theory of value inherited from Ricardo. But he rejected Malthusian population theory with vehement contempt, thereby rejecting the entire classical theory of the distribution of income and its implications for the fates of the classes in the course of economic development.

In lieu of Malthusian population theory, Marx explained that wages are inexorably at the subsistence level because of the competition of an "industrial reserve army" of the unemployed, constantly replenished by workers whose jobs were obliterated by machinery, and reinforced in the periodic crises that occur when increases in wages reduce the rate of profit thus choking off investment.⁵ According to this diagnosis, it's the capitalists' behavior, not the workers', that explains why wages are chronically at bare subsistence. There is nothing that the workers can do about it as long as the capitalist regime flourishes.

Economic growth in Marxist theory consists of the constant elaboration of labor-displacing machinery, and progresses in a sequence of cycles punctuated by crises, instead of following a steady upward trajectory. Thus Marx introduced the idea that cycles and crises were inherent in economic development. The crises, moreover, would become increasingly severe and, in the end, would bring the capitalist system crashing down. "The expropriated [then] would expropriate the expropriators."

Marx took a more sweeping and profound

⁵ This explanation was evidently based on Friedrich Engels' observations of the English cotton industry during the Hungry '40s. See Marx' *Capital*, Volume I (1867), ch. XXV.

view of economic development than any of his predecessors (and most of his successors). Main-line economists took for granted the class structure and economic institutions of eighteenth-nineteenth century Europe as if they were enduring and unalterable. But Marx regarded economic development as inseparable from changes in political and social institutions. Capitalism had its place and time in society's evolution from the feudalism of the Middle Ages to the classless society of the not very distant future. Marx thus injected the notion that economic development, political development, and social development are causally connected aspects of an inexorable historical process driven by economic conditions.

The foregoing sketches the evolution of the main line of the theory of economic growth during the classical period. In the writings from Smith to Mill, the accumulation of capital played the central role. A growing capital stock supplied the means to employ a population that grew automatically to fill the jobs provided. The welfares of the social classes depended on the relationship between the growth rates of capital and labor. Thus the encouragement of saving and investment was all-important to Smith. Malthus, Ricardo, and their followers. Mill introduced a new note: the possibility of moderating the growth rate of the labor force. From the modern, that is, twentieth century, point of view, only Marx seems to have paid adequate attention to the idea that technological development might be an important secondary, or even primary, impetus to economic growth.

II

While the classical line was developing, two competing theories of economic development emerged which, while never dominant in economic theorizing, are too persistent and important to be ignored. Oddly enough, they both have roots in American experience.

The first of these minority theories of growth was a drastic modernization of mercantilism formulated by Alexander Hamilton, who is less well remembered as an innovative economist than as one of the American "founding fathers" and first secretary of the treasury. In Hamilton's version, the mercantilist concern with accumulating bullion and silver was replaced by advo-

cacy of commercial, financial, and, especially, industrial development, to be fostered by a combination of protective tariffs, governmental investment in infrastructure such as canals, unification of the 13 former colonies into a single market without internal tariffs or other obstructions to trade, and establishment of a unified, credit-worthy financial system. The program was motivated by the belief that the future of the country lay with manufacturing, but that a protected home market was needed until American industries became strong enough to compete with the established European firms. Thus arose the "infant industries" justification for protective tariffs and other forms of assistance to new establishments in a developing country eager to catch up with the more developed world.

Hamilton's program was carried to Germany by Friedrich List, who spent several years in Philadelphia and even became an American citizen before returning to Germany where he was the most effective advocate of the *Zollverein*, which led to the unification of the Germanic principalities into Bismarck's Germany. List was, in effect, following the precedent of Hamilton's campaign for the unification into a single country of the sovereign states that subscribed to the Articles of Confederation.

The policy of governmental promotion of desirable industries still thrives. In LDCs it plays a central role in formulating development plans. In already developed countries its current incarnation is called *industrial policy*.

The other American-inspired contribution to growth theory during the classical era was the work of one John Rae. Rae, who never found acceptable employment or recognition in his native Scotland, emigrated to Canada in the 1820s. There he worked as a schoolmaster, and was deeply impressed by the contrast between the rapidly developing English community and the surrounding stagnant Indian economy. On the basis of these impressions and considerable study he wrote one treatise, *Some New Principles on the Subject of Political Economy* ([1834] 1965). The book was essentially lost for about 70 years, in spite of being read, and praised, by Nassau Senior and J. S. Mill, among others. It contained insights that anticipated by 50 years those of Böhm-Bawerk and the Austrian

School as well as the Fisher-Keynes doctrine that the rate of investment is regulated by the requirement that the marginal efficiency of capital equal the rate of interest.

Rae attributed the Indians' poverty to an excessively high rate of time preference, which hindered them from making even modest investments, such as leveling and fencing their farms. This improvident attitude greatly impeded their accumulation of capital, and Rae agreed with Smith et al. that capital accumulation was needed for economic development.

Further, Rae explained the need for capital along the lines rediscovered by Böhm-Bawerk many years later. An increase in the amount of capital per worker permits using techniques that require a longer time to earn back the original investment, and these are typically the techniques that yield more output per work-year (including, of course, the work-years devoted to the original investment) than techniques with short pay-back periods. Moreover, Rae explained, as capital accumulates, if it is invested in familiar kinds of capital goods they will saturate the markets in which they are invested, driving down the rate of profit and snuffing out the incentive for further investment. Thus continued capital accumulation requires continued innovation that opens new markets and new channels for investment at high rates of profit.

In short, though Rae was not quite up to the elaborate formulation that Schumpeter achieved in 1911, he was most of the way to it. But his work was ignored for the remainder of the century.⁹

III

For about a hundred years after the end of the classical period, the problems of economic growth seemed to have lost their urgency. At any rate, other problems such as justifying and redressing the income distribution or explaining and moderating the business cycle displaced economic growth at the top of the economists' agendas. As evidence, when you read the sections on economic growth and progress in Mar-

⁹ One reason seems to have been very bad marketing. The book was published in Boston in such a small edition that copies became unobtainable in Europe almost at once.

shall's *Principles of Economics*, you are struck by how closely they echo the corresponding sections in Mill's *Principles*, written 40 years before. The main difference is that Marshall's optimism is more moderate than Mill's as one would expect, moderation being one of Marshall's most consistent characteristics.

There was a scattering of significant contributions during this period, however. Perhaps the most original and important one was Schumpeter's theory of innovation-generated growth, presented in his *Theory of Economic Development* ([1911] 1934). This theory shifted attention entirely away from straightforward increases in the stock of capital and the size of population, and concentrated on innovation as the engine of growth in contemporary and future economies.

In Schumpeter's theory, innovations include new products, new methods of production and of business organization, new markets, and indeed anything novel that promises exceptional profits to the firm that introduces it. A successful innovation stimulates the growth of the economy through three distinguishable channels.

First, of course the innovator must invest in order to exploit his discovery. In addition, there are likely to be imitators who will invest even larger amounts in their eagerness to share the profitable opportunities.

Second, the investments induced by the innovation do not crowd out investments that would be undertaken without it; they are an addition to the ongoing level of investment. This is so because these investments are financed, in part, by plowing back some or all of the substantial profits earned by the innovator and his imitators—profits being always a peculiarly investable form of income.

And finally, and by far most important in Schumpeter's view, the investments in developing and exploiting the innovation are financed largely by an expansion of bank credit, with the normal stimulating and inflationary consequences of credit expansion.

This theory explains a number of familiar characteristics of economic growth, particularly its unevenness with respect to both time and economic sector. Economies typically do not grow along constant trend-lines, but rather in spurts—booms separated by quiescent intervals

or even recessions. The booms reflect the investment induced by massive, discontinuous innovations. There was a railroad boom, an automobile boom, most recently an electronics boom. In each case, a long period of investment in the sectors most directly affected by the innovations lasts until the major new types of fixed capital have been installed, and then peters out. By the same token, the boom tends to be strongest in and to emanate from a leading sector where the innovation occurred, and to spread from there via linkages to the rest of the economy, affecting sectors unevenly and sometimes even adversely, as the automobile affected blacksmithing.

As a result of these effects, economic development takes the form of a sequence of business cycles, each being a response to a fresh discontinuous innovation.

Many years later, in *Capitalism, Socialism, and Democracy* (1942), Schumpeter returned to the high theme of economic progress. Schumpeter was 30 years older then, as was industrial capitalism, and much economic development had intervened. In this book, Schumpeter argued that the dynamic individual entrepreneur, who had been the hero of *The Theory of Economic Development*, had been superseded by the research laboratories and R & D departments of large corporations. The entrepreneurial function had been routinized. The bureaucracies of the corporations that produced established commodities and invented and innovated new ones had become indistinguishable from government bureaus. This convergence, he felt, would lead to the demise of the corporations; they would have completed their historic function, and would be absorbed quietly into the governmental apparatus. Capitalism would blend into socialism. Whether democracy would survive this blending seemed doubtful. Thus the older Schumpeter surveyed the prospects for an older capitalism with misgivings.

In the early decades of the century, two mathematicians made remarkable contributions to growth theory. First, in 1928, Frank P. Ramsey published "A Mathematical Theory of Saving" in the *Economic Journal*. In it he derived a formula, now called "the Ramsey Rule," that specifies the optimal proportions into which an economy's output should be divided between

consumption and investment, taking account of the marginal utility of consumption and the marginal disutility of labor in the economy, and the economy's aggregate production function. This paper is the first to include a rigorous derivation of optimal saving-consumption behavior in nonstationary conditions. Of course, some unpleasantly strong assumptions were required to obtain this result. But the paper exemplified the general strategy to be followed in analyzing saving-consumption decisions using other assumptions.

The second mathematical breakthrough was by John von Neumann, already a famous mathematician. He published "A Model of General Economic Equilibrium" in 1937. This paper studied a time-sequenced, disaggregated economic model somewhat similar to Leontief's input-output formulations but allowing scope for entrepreneurial choices. The paper established the properties of the equilibrium time-paths of the quantities of the different commodities produced in the economy, and of their prices. The most interesting finding was the fact that in equilibrium (with unchanging tastes and technology and many other strong assumptions) all sector outputs would grow at the same rate, and that rate would be equal to the equilibrium rate of interest. This theorem is one of those delightful propositions that are obvious once someone has discovered them.

Von Neumann's model, like Ramsey's, invoked such drastic simplifications that no economist would expect it to lead to interesting and significant findings. But both papers not only pointed the way to rich theoretical developments, but served to guide practical development planning. Those applications, however, were deferred until after World War II, when fostering economic development became a live policy undertaking once more.

On the empirical side, the foundations of modern economic accounting were laid during the 1920s and 1930s, largely following conceptual lines sketched by A. C. Pigou in his *Economics of Welfare* (1950). The major contributors were Simon Kuznets and his students in the United States, and Richard Stone and his associates in England. In addition, by 1940, Colin Clark had compiled detailed comparative statistical portraits of advanced and developing economies.

IV

Thus at the end of World War II the tools needed for a resurgence of interest in economic development theory lay ready to hand. The incentive was also at hand. The collapse of the German, Japanese, and European empires at the end of the war left dozens of countries, some new, some old, all impoverished and eager to attain at least the standards of living the Western European countries had before the war. These countries turned first to the United States, and later also to the United Nations and the European former colonial powers for financial assistance and for technical and economic guidance in building modern economies. The dormant subject of economic growth woke up abruptly and strode back to the center of the stage.

I shall not even attempt a critical review of the vast outpouring of books and papers dealing with economic development that ensued. There are several reasons for my reticence. One important reason is that this literature is still too young for us to be able to distinguish significant contributions from promising but false leads. Another reason is the very vastness that I mentioned above. Neither I nor anyone (with the possible exception of a Schumpeter) could absorb more than a small fraction of those words, graphs, tables, and equations until time has done its winnowing.¹⁰

One theoretical approach introduced during the postwar period demands our immediate attention, however: Rostow's own. Rostow divides the history of a mature economy into a sequence of stages analogous to the stages through which a growing child passes. First, there is a long period of gradual growth in which the economy attains "the preconditions for take-off." Then comes the most dramatic stage, "the take-off," which is an abrupt acceleration, analo-

¹⁰ Besides, the job has already been done, insofar as it can be, by Frank H. Hahn and R. C. O. Matthews in their justly esteemed *Economic Journal* review article (1964) and, more recently, by Nicholas Stern also in the *Economic Journal* (1989), by Clive Bell in his article, "Development Economics" in *The New Palgrave Dictionary* and by other contributors to the *Dictionary*, by the contributors to Gustav Ranis' and T. Paul Schultz' *State of Development Economics: Progress and Perspectives* (1988), and by Rostow in the book under review.

gous to the adolescent spurt of a young human. After the take-off the economy's rate of growth may hold steady or abate somewhat in "the drive to maturity," which is followed by "the age of high mass-consumption." The trajectory is not followed to Spenglerian or Toynbeeian lengths.

Beginning with the take-off, economic growth occurs in spurts corresponding to Juglar and Kondratieff cycles, driven by the bursts of investment that important innovations induce. Rostow often quotes Schumpeter's dictum that "cycles are the form economic development takes under capitalism."

It is a bit surprising that Rostow's concept attracted such widespread attention, for he was by no means the only economist to notice that real economies develop along irregular paths instead of following the smooth exponential curves that growth theorists find so convenient, nor was he even particularly early. He was, however, unique in using this conceptual framework to advance a well-articulated theory that explains many of the stylized facts of economic development: its irregularity, the tendency for one or a few related sectors to outstrip the others for a while but to pull the rest of the economy along eventually, the emergence of business cycles, the frequently observed shift in the terms of trade between the agricultural and industrial sectors as the economy develops.

V

We can now turn from the standard account of the history of the theory of economic development to Rostow's version. The book under review, Rostow's *Theorists of Economic Growth* is divided into four parts, corresponding roughly to sections I, III, and IV above.¹¹ The first part deals with the classical period, from Hume to Marx, inclusive. As we have seen, the theory of economic development flourished during that period: development and the distribution of income were the main concerns of the leading economists. The second part treats the neoclassical period, from roughly 1870 to 1940. This was the slack period for work on economic growth. The third part of the book takes up the period from the end of World War II to the present. In this period, the theory of

economic development enjoyed a marked revival stimulated by the determination of about a hundred newly freed countries to enjoy the fruits of Western technology. The final part, much shorter than the others, surveys outstanding problems, "What We Don't Know About Economic Growth."

Each part is organized somewhat differently from the others, in response to differences in the material to be covered. The first part is organized around the contributions of the great names of the period: David Hume, Adam Smith, Thomas Robert Malthus, David Ricardo, John Stuart Mill, and Karl Marx. All, with the possible exception of Hume, were deeply interested in policies that would promote economic growth.

In the second period, few economists regarded economic growth or development to be their major interest, though many made contributions that impinged upon it. Accordingly, a different principle of organization was needed, and I shall explain below the format that Rostow chose. The post-World War II period presented a contrasting problem. There was a new burst of interest in the theory of economic development, and a tremendous outpouring of literature from a greatly enlarged economics profession. Hence the historian's problem was transformed from sifting a scarcity of relevant material to contending with an unmanageable plenitude. Rostow's response was to divide the contributions into three broad types—formal growth models, statistical analyses, and conclusions derived from practical experience—and to consider a restricted sample of each type.

A single, prominent thread runs through all three historical parts. The book's very first sentences announce it candidly:

The purpose of this study is to explore how a sequence of growth theorists, beginning in the middle of the eighteenth century and stretching up to the present day, chose to deal (or not deal) with an array of variables and problems that are, in my view, inevitably posed by the dynamics of economic growth. The book discusses the ideas of many economists with all the sympathetic understanding I can muster. But I have not tried to hide my own views along the way. (p. 3)¹²

¹¹ Rostow does not discuss Hamilton, List, or Rae.

¹² All page references not otherwise identified are to Rostow (1990).

What this preamble entails is stated more clearly toward the end of the book. There Rostow writes:

I have tried to establish how a wide spectrum of theorists have viewed the determinants of: the size and quality of the working force; investment and the generation and absorption of technology; growth in relation to business cycles; growth in relation to relative price trends in manufactured goods and basic commodities; the stages of and limits to growth; and the role of noneconomic factors. These headings reflect, of course, a perspective elaborated in what I have published since 1938 on the subject of growth and fluctuations. And, although I have tried in this book to capture with sympathy the perspectives of predecessors and contemporaries, my own point of view has not merely shown through but has also been occasionally stated quite explicitly. . . . (p. 445)

The topics listed in this passage constitute the organizing principle of all three historical parts of the book. In the first, classical, part, the section devoted to each author is divided into subsections, one for each of the topics. In the second, neoclassical, part, there is a chapter, or sometimes two, devoted to each of the topics. And in the third, contemporary, part, the discussion of each contribution treated is focused on its attitude toward one or more of these same topics. Thus the book is permeated by Rostow's theoretical conceptions.

There would be no harm in that if the topics around which the book is organized were as significant to all the authors treated as they are to Rostow and if all the topics that those authors deemed important were included in Rostow's list. But that is far from the case.

The classical economists probably suffer most from Rostow's selection of topics. They were not much interested in several of the topics on Rostow's list (e.g., "the generation and absorption of technology"). On the other hand, they were deeply concerned with the effects of economic progress on the distribution of income and on the prevalence of poverty, topics not on the list.

A few illustrations will bring out the consequences of Rostow's mode of presentation. To consider how Adam Smith's contributions fare, recall that *The Wealth of Nations* had two closely related principal messages. The first was that the British economy needed to be freed

from the shackles of mercantilist direction and restriction so as to permit the "invisible hand" to guide resources to their most productive uses. The second was that the capital stock had to grow faster than the labor force in order to drive real wages above subsistence. A somewhat subsidiary, but important, concern was with the effect of growth on the division of the national income among the three social classes: the land-owning gentry, the rising merchants and manufacturers, and the working class.

Only one of these problems fits comfortably into Rostow's format. Governmental direction of the economy is not one of Rostow's key topics, and Rostow mentions Smith's advocacy of laissez-faire only briefly and obliquely in the course of assuring the reader that Smith, though he advocated free markets, was not an extreme libertarian. The ways in which economic development affects the prosperities of the three social classes also, not being one of Rostow's topics, receives no attention. On the other hand, the importance of capital accumulation falls under Rostow's heading of "Investment and Technology," and Smith's discussion is presented at length.

Skipping to the later days of the classical period, Rostow's treatment of J. S. Mill is quite different. Mill was an extremely systematic writer, and in his exposition he touched all bases, including the ones designated by Rostow. Specifically, Mill paid great attention to "population and the working force"; indeed population growth was one of his main concerns. He dealt with "Investment and Technology," and was aware of the stimulus that technological innovations gave to investment and to increases in productivity. He called attention to the rough periodicity of "business cycles," and offered a terse explanation based on bursts of frantic speculation followed by panicky "re-vulsions." He treated the effect of growth on the "relative prices" of manufactured and agricultural products in the spirit of Smith and Ricardo. Mill even covered the topic of "stages of and limits to growth," tracing the development of European economies from the primitive hunter-gatherer stage to the inevitable stationary state with, however, population held down to a size that makes a comfortable standard of living available to all. Finally, coming to Rostow's last major topic, "non-economic factors," Rostow stretched the meaning far enough

to include Mill's only slightly loaded evaluation of the comparative merits and evils of capitalist and communist (i.e., socialist) modes of economic organization.

Rostow summarizes Mill's position on all these issues correctly and fairly. But, though most of the elements of the picture are there, the reader is not presented with an intelligible view of Mill, his contribution to understanding economic development, or his motives. The trouble as I diagnose it is that, while Mill systematically touched all bases, he did not emphasize all of them equally (as Rostow does), nor did he contribute equally to them all. Specifically, he opened an important new vista to "population and the working force," by arguing vigorously for population policy and family planning in several extended passages in the *Principles*, while his treatments of the other topics on Rostow's list followed the Ricardian tradition with minor variations.

Herein, I think, lies the critical defect of Rostow's mode of presentation. It is designed to trace the evolution of thought about the half dozen listed topics, which were chosen because they have special pertinence to Rostow's theory of economic development. By that same token, however, it does not trace the progress of the struggle to understand the phenomenon of economic development. The evenhanded attention to the chosen topics, as if they were all equally significant throughout the history of the subject, obscures the ebb and flow of issues and the motivations and concerns of the actors. The resultant blandness is the least of the penalties that Rostow incurs. In the present instance, Rostow does call attention to Mill's urgent concern for limiting population growth and to his advocacy of widespread education and abolition of the legal and social disabilities imposed on women as indispensable means to that end. Nevertheless, he buries this theme in one of the six sections of his expository structure, thereby obscuring its dominant role in Mill's thinking and in his program for economic development.

The sections on Mill illustrate another, less fundamental peculiarity in Rostow's exposition. Sometimes, apparently in the effort to give a complete summary of an author's treatment of a subject, Rostow simply lists topic headings, omitting all substance. For example, in discuss-

ing Mill's treatment of "investment and technology," Rostow writes, "Mill starts his exposition of the role of capital in production in sound textbook style: with a set of rather elaborate definitions; six fundamental propositions; and a detailed exploration of the distinction between fixed and working capital" (p. 106). Then Rostow passes on to other matters without a hint about what the definitions were, or the fundamental propositions, or the distinction between fixed and working capital.

VI

After Mill came the long lull that lasted until after World War II. As we noted above, almost no economists adopted economic development as a major interest and very few papers of lasting importance were written on the subject. Part II of *Theorists of Economic Growth* deals with this period.

Rostow bridges the hiatus in work on economic development by discussing contributions to the topics in his standard list, written for the most part with other applications in mind. There is a chapter, sometimes two, tracing the evolution of doctrines relating to most of the topics on the list—population theory, national income accounting, theories of investment and innovation, business cycles, and international terms of trade. The central question in each of these chapters is how the leading contributions to the subject relate to the views reached in Rostow's theory of development.

The two chapters on business cycles, chapters 10 and 11, exemplify the spirit of these treatments. One of Rostow's central themes is the thesis that "cycles are simply the form growth historically assumed" (p. 429, reiterated numerous times throughout the book in slightly different words). These chapters, trace the history of business cycle research from Clement Juglar ("something of a washout so far as the relation between growth and fluctuations is concerned," p. 260) to the National Bureau of Economic Research, inclusive, with special attention to how clearly each contributor recognized the connection between business cycles and economic growth expounded in Rostow's theory.

Most of the contributors to business cycle theory fail this test of perceptiveness pretty

badly, in spite of frequently generous grading. Dennis Robertson, for example, receives high marks largely because of passages such as "The international boom of 1872 is in my view to be particularly connected with railway building, that of 1882 with inventions in the steel trade; . . .," quoted from his *Banking Policy and the Price Level*. J. M. Keynes, on the other hand, receives a low grade because of his refusal to conduct analysis at the sector level; and W. C. Mitchell fares hardly any better, despite considerable sectoral detail, because "the data as organized by Mitchell cry out for growth as well as cyclical analysis" (p. 286) but do not receive it. Tinbergen and Samuelson are also classed among the students of business cycles who failed to perceive their intimate linkage with economic growth.

The other chapters dealing with the 1870-1940 period similarly view their topics from the highly specialized perspective of searching for eminent precedents for Rostow's theory of economic development. The chapter on national income accounting applauds Colin Clark for recognizing the importance of innovation as the prime engine of economic growth, another emphatic Rostovian theme. Simon Kuznets is praised for his early work, which was disaggregated by sector and which stressed the role of innovation in stimulating growth, but is scolded for his later concentration on aggregative measures of economic progress. Schumpeter, of course, receives appropriate kudos, being one of the period's few economists to agree with Rostow's views in most respects.

Alfred Marshall wrote his major work during this period, but received special treatment. Rostow obviously finds Marshall extremely sympathetic. He shares Marshall's sensitivity to the complexity of the forces that control economic events and to the richness of the motivations that influence economic decisions, and correspondingly he shares Marshall's distrust of abstract theorizing and his objections to mathematical methods in economic analysis. Marshall is the only economist (apart from Rostow himself) to have a full chapter devoted to his contributions, and Marshall's general approach to economics as well as his deep commitment to broadly enjoyed economic welfare are expounded fully and enthusiastically.

Yet Rostow has to stretch hard to justify in-

cluding Marshall in his history of development theory. To be sure, Marshall emphasized the role of time in economic affairs, as Rostow points out, and introduced the distinction between "long-run" and "short-run" responses. But Marshall used these concepts as tools for understanding how markets adjust to changes in circumstances; they have nothing to do with the long run in which economic development takes place (sometimes called *the secular run*). Indeed, Marshall's main technical interests and contributions lay always in the realm of comparative statics. As mentioned above, when Marshall wrote about economic development or growth he generally followed Mill with remarkable fidelity.

VII

The third phase in the history of economic growth theory extends from the end of World War II to the present. In this period, economic development became once again a leading field of economics, stimulated by the practical problems of the new "third world" nations. Accordingly, Rostow changed his mode of presentation again when he came to that period. He noted that the field effectively trifurcated, distinguishing three branches that I shall call mathematical models of growth, quantitative analyses, and experience-based theories. There is a chapter on each branch, and the outline of each chapter corresponds to the same topics that dominated the previous parts of the book, though with some variations.

The chapter on mathematical models of growth is brief and supercilious. The tone is set at the very outset, where Rostow refers to "the achievements and deficiencies of the growth-model caper" (p. 333). There is no mention in this chapter of the Ramsey, von Neumann, or Pontryagin-Bellman models which jointly introduced the basic ideas of this branch of growth theory. Instead, Rostow took the Harrod-Domar dynamic model as his point of departure. Now the Harrod and Domar models (which are really distinct, though often not distinguished) are both in the post-Keynesian, multiplier-accelerator tradition and neither is concerned with economic development.

The unique feature of Roy F. Harrod's multiplier-accelerator model (1939, 1948) was some

not very plausible assumptions about investors' behavior that gave it a knife-edged property: Any deviation from an equilibrium growth rate would generate a greater deviation in the same direction in the next period. Plausible assumptions about the coefficients and about population growth and technological progress indicated that a less than equilibrium growth rate was almost inevitable sooner or later, whereupon the economy would be driven down to the doldrums of substantial unemployment, as in the 1930s.¹³

Evsey Domar used his formally similar model (1944, 1946) for a number of quite different purposes, for instance to demonstrate that, using plausible multiplier and accelerator parameters, chronic government deficits could induce enough investment and rapid enough national income growth so that, though the national debt would grow, servicing it would require a steadily diminishing proportion of the growing GNP.

Neither, as I said, purported to throw light on the causes or conditions of economic growth, or had much influence on the development of that field: they were concerned rather with the 1930-ish problems of persistent unemployment and public finance.

The remainder of the chapter on mathematical growth models similarly ignores the most significant intellectual contributions of the effort to devise a tractable formal theoretical framework for understanding the factors that affect economic growth, and deals instead with a succession of disconnected side issues. It concludes, predictably, that the effort was misguided and futile:

Rostow's second category of post-World War II studies of economic growth comprehends quantitative analysis and planning. The exemplars of this type of work are Simon Kuznets, Hollis Chenery, and some of Chenery's students, particularly Lance Taylor and Moshe Syrquin.

Kuznets and Chenery both studied the characteristics of developed and developing countries statistically by assembling for as many countries as feasible time series of basic economic indicators such as national income and its components, principal price indexes, the work force and its distribution among major

sectors, and so on. Kuznets then inspected these series closely to discern relationships among them that tended to accompany rapid economic growth. He noticed, for example, that the distribution of income tended to become more unequal in the early stages of industrialization, but later to move in the opposite direction. He also noticed, as had Colin Clark and others before him, that during the process of industrialization the preponderance of economic activity normally shifts first from agriculture to manufacturing sectors and later from manufacturing to service sectors. One of his most emphatic conclusions was reaffirmation of the belief that economic progress depends more on adopting scientifically based technologies than on merely accumulating capital.

Chenery, who for many years headed the Economic Department of the World Bank, initiated there an extensive program of quantitative research into the characteristics of rapidly developing economies. Under his leadership, the World Bank developed the world's most complete and authoritative compilation of statistical data on the economies of most countries, both developed and underdeveloped.

Using these data, sometimes supplemented by special studies, Chenery and his associates explored many of the same issues that Kuznets studied. But, whereas Kuznets used long time series to trace the experiences of long industrialized economies, Chenery and his group devoted most attention to newly developed or currently developing countries for which the available time series are generally 20 years long at most. Therefore most of Chenery's studies were cross-section analyses, resting on the assumptions that the broad structures of all countries at the same stage of development and of the same size are roughly the same, and that per capita GNP is a reasonable proxy for stage of development. Invoking these postulates, he used regressions of major structural characteristics on per capita GNP and population size in a sample of nearly 100 countries at a range of stages of development to show how such characteristics as the proportion of income saved, the importance of foreign trade, the relative importance of raw material and industrial output, and so on evolve as economic development proceeds. In more recent studies some of Chenery's group, including Moshe Syrquin and Sherman Robinson, have investigated the same

¹³ Clearly, 1939 and 1948 were not fortunate dates for introducing such a theory.

relationships using more sophisticated econometric techniques.

While appreciating the value of Kuznets', Chenery's, and their associates' work in compiling basic economic statistics for developed and developing countries, Rostow has long doubted the value of their analyses. He and Kuznets faced off originally in 1960 at an International Economic Association conference devoted to Rostow's theory of economic development and his concept of stages of growth (Rostow 1963). Then, as on subsequent occasions and again in this volume, Rostow insisted that the broad structural indicators used by Kuznets, Chenery, and others are too blunt to reflect the processes by which innovations in leading sectors have effects that spread throughout the economy through a variety of linkages, thereby generating both business cycles and economic growth. Furthermore, to rely on average behavior as reflected in cross-country regressions is to ignore the fact that each country's growth experience is unique, and to conceal "the pain, complexity, and endless creativity inherent in the process of growth" (p. 367).

Thus, Rostow concludes, the quantitative analyses of development also were misguided and futile, except for the useful statistical data that they produced as a by-product.

A little while ago, I scolded Rostow for paying too much attention to the wrong people in his chapter on mathematical growth models. Now I have to scold him for neglecting the right people in this chapter. The right people in question are the ones who studied the statistical data to detect the sources of the increases in productivity in progressing countries. Their principal finding was that national outputs in the nineteenth and twentieth centuries increased far more than the growth of the labor force and the accumulation of capital could explain.

Probably the most influential of these writers was Robert Solow, though he was not the first to conclude that the increases in labor and capital in the United States in 1909-49 were far from sufficient to explain the vast increase in the national product.¹⁴ Solow's paper (1957) was

particularly effective because of its brevity, clarity, and ingenuity. In it he showed that the growth of the nonfarm product in the U.S. from 1909 to 1949 could be explained well by a constant-returns-to-scale production function of labor and capital inputs multiplied by a factor that grew with time. The time factor, plausibly identified with technological improvements, accounted for more than half the growth in output. This work has been extended, internationalized, and refined, particularly by Edward F. Denison (1989), whose studies are mentioned by Rostow.

Rostow's final category of post-World War II studies of economic development can be called experience-based studies. The defining characteristic of these studies is that each conveys conclusions derived by a practitioner from first-hand struggle with the problems that confront a less developed country striving to acquire the amenities enjoyed by already developed countries. Because countries in which these experiences were acquired differ vastly from each other, ranging from the most populous countries in the world to some of the tiniest and from the world's most ancient and sophisticated civilizations to tribal cultures cherished by anthropologists, one would not expect the lessons derived from these experiences to cohere very well, and they do not.

Rostow found a neat solution to the problem, which baffled me, of choosing a few works to characterize the wildly diverse contributions that belong under the rubric of experience-based theories. He simply passed the buck to Gerald Meier and Dudley Seers, the editors of the World Bank collection, *Pioneers in Development* (1984). The chapter on these theories consists mostly of reports on the work and conclusions of nine of the ten economists selected by Meier and Seers.¹⁵

I should like to avoid seeming flippant, but the best way I can find to characterize this collection of experiences is to liken it to the fable of the blind men and the elephant. You will remember that each of the blind men had good justification for his report on what an elephant is like, and yet the assembled reports did not add up to an elephant. So it is with these theo-

¹⁴ He was preceded by Moses Abramovitz (1956) and John Kendrick (1961), and they also had predecessors. For further information, see Moses Abramovitz (1989, p. 14).

¹⁵ The tenth was Rostow, whose contribution is reserved for a separate chapter. The basis for Meier and Seers' selection is not disclosed.

ries. Meier's characterization in his editor's introduction was apt. He wrote that by and large the diagnoses were

structural, shaped by trade pessimism, emphasizing planned investment in new physical capital, using reserves of surplus labor, adopting import substitution industrialization policies, embracing central planning of change, and relying on foreign aid. But there were cross currents, . . . especially notable were controversies over balanced growth versus unbalanced growth, industrialization versus agriculture, import substitution versus export promotion, planning versus reliance on the market price system. The debates on some of these issues are still unresolved. (Meir and Seers 1987, p. 22)

Rostow wisely refrained from attempting to integrate these divergent responses to diverse experiences. He just reported them, evaluated them briefly, and assigned grades that I interpret to range from A+ to B, as is appropriate in a graduate seminar. As I interpret the verbal evaluations, Sir Arthur Lewis received the only A+; Lord [Peter] Bauer, Albert Hirschman, Paul Prebisch, and Jan Tinbergen were among the Bs.

Rostow concludes from these experiences and his own that the great obstacle that prevents the less developed countries from embracing sound development policies is that their leaders give political considerations primacy over economic ones; that is, they give their short-run interests priority over their country's long-run progress. That is indeed an obstacle, but it seems to me, and to several of the "pioneers," that deep-seated social traditions and attitudes also impose highly resistant impediments to adopting Western technologies and styles of economic behavior.

VIII

The final part of the book consists essentially of two chapters in which Rostow peers into the future. The first of these asks, "What don't we know about economic growth?" It is divided into the, by now familiar, sequence of sections dealing with the components of Rostow's approach to the theory of development. The section on business cycles asks why the eighteenth-nineteenth century linkage between the cycles

and the advent of major innovations seems to have been broken ever since World War I. Rostow's suggested response is ad hoc: a swift re-counting of events in the realm of international trade and finance that affected cyclical behavior during the period. The section on relative prices similarly notes the disappearance of the established pattern whereby Kondratieff cycles were generated by dramatic changes in the conditions of agricultural supply, and asks whether those long cycles in price levels have disappeared for good. The preliminary question of whether those long cycles ever existed is not asked. The other sections are also confined to taking Rostow's schema as a maintained hypothesis and raising detailed issues within that framework.

In the very last chapter, "Where Are We? An Agenda in Midpassage," Rostow doffs his robes of recorder of the history of economic development theory, and dons the mantle of a prophet and prescriber for the twenty-first century. The omens that he sees are good ones. There are five great challenges to be met: The Cold War has to be ended (but NATO must not let its guard down prematurely); the powers that emerge during the century, particularly India and China, must not become embroiled in their own hostilities; economic growth throughout the world must continue to grow lustily, unimpeded by restrictions on trade; the final stage of "high mass-consumption" must be achieved worldwide without, however, precipitating environmental disaster; and those few countries, particularly in sub-Saharan Africa, that lag in attaining the preconditions for the take-off must be helped by policies that are attuned to their individual cultural and historical heritages.

Rostow feels that with sufficient goodwill and cooperation among the nations of the world, and the generous spirit recommended by David Hume, all these challenges can be met. Adam Smith's doleful stationary state can be avoided, and John Stuart Mill's happy and prosperous stationary state can be achieved. I'd be the last to deny that international goodwill and cooperation can achieve great things, but I can't share Rostow's complacent confidence that the environment will be able to stand high mass consumption by the 11.2 billion inhabitants that he foresees on the planet by the middle of the

century. And neither I nor, I presume, Rostow feels completely assured that the necessary fund of international goodwill and generosity will be forthcoming.

APPENDIX

ROSTOW'S APPENDIX ON "MODELS OF ECONOMIC GROWTH"

In viewing the work of his predecessors and contemporaries from the perspective of his selected topics, Rostow exhibits a tendency to rewrite the works of his subjects as if they shared his conceptual apparatus. A different expression of this tendency permeates a surprising mathematical appendix written with the collaboration of Michael Kennedy, a mathematical economist. I say surprising because in the text Rostow repeatedly expressed his aversion to mathematics in economics. Nevertheless, he included the appendix, and it was a mistake unless the purpose was to exemplify the egregious errors that, he maintains in the main text, mathematical exercises in economics are prone to.

I'll give only one example of the anachronisms in the Appendix, though one that receives considerable emphasis. Much of the Appendix is devoted to restating Adam Smith's theory of distribution in mathematical terms. The exposition gets off on the wrong foot by saying, "We initially focus on the implications of the Smithian assumption that the growth of factor supplies depends on the levels of factor rewards" (p. 511). Of course, Smith made no such assumption except with respect to population. The assertion is innocuous, however, because when Kennedy and Rostow get down to work they introduce reasonably accurate approximations to Smith's beliefs concerning the supply of land and capital. The analysis incorporates a more serious deviation from Smith's thinking, however. Kennedy and Rostow introduce their "Smithian" theory of production thus:

The economy is assumed to exhibit constant returns to scale in the three factors—capital, labor, and land combined. The production function is

$$Y_t = F(K_t, L_t, N_t)$$

where N_t denotes land. (p. 513)

This formula is not found or even suggested in *The Wealth of Nations*. It is the standard formulation of the "neoclassical production function," and invites us to imagine that the three factors can be substituted smoothly for one another. Indeed, that is just what happens. The exposition continues with, "We again assume marginal product pricing of the factors of production so that . . ." (p. 508).

Hardly any assumption could be more remote from Adam Smith's own thinking. The "marginalist revolution" did not occur until virtually a century after *The Wealth of Nations* was published, and there is no indication in Smith's writings that he ever thought in terms of smooth substitutions either in production or consumption, still less in terms of valuing factor

services on the basis of such substitutions. Oddly, there is no sign in the Appendix that the authors had appreciated the more accurately Smithian model in Samuelson's "A Modern Theorist's Vindication of Adam Smith" (1977), though that paper is cited in the section on Smith in the text.

I hasten to reassure readers that I did not find any inaccuracies in the main text that are comparable with those in the Appendix.

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