THE CLASSICAL THEORY OF ECONOMIC GROWTH

BY ADOLPH LOWE

ONE of the most satisfying prospects that the newly awakened interest in economic growth has opened up is the advance in the direction of an integrated social analysis as contrasted with the rigorously circumscribed economic analysis of neo-classical theory. Even in dealing with a relatively short-term problem like business cycles, one can doubt the wisdom of treating behavior patterns and the institutional environment as fixed once and for all. Certainly when we turn our attention to growth processes, such as the rise of the industrial system or the secular development of capitalism, systematic mutations in the meta-economic conditions have to be taken into account as much as changes in the economic field proper.

This is all plain and commonly accepted. Yet when one tries to proceed beyond fine, methodological postulates to the actual work of integration, truly formidable difficulties arise. Not only is the number of meta-economic variables legion—and they comprise the whole realm of nature and society. But even if the individual sciences—from geology, physics, and chemistry, through technology and biology to psychology, sociology, political science, law, and the humanistic sciences of man—could establish a systematic catalogue of these variables as they appear in the context of the respective indigenous field of each science, there would still remain the task of "translating" their "meaning" into the conceptual framework of economics.

What this amounts to can best be illustrated by an example. For many centuries the idea of "monopoly" was known as a socio-political concept, pointing toward a certain manner in which power is exercised, with some notion of exploitation thrown in. But neither power nor exploitation is a manageable concept in

the framework of traditional market analysis. Only when monopoly was understood as a change in the nature of the price-quantity relationship—compared with the nature of this relationship under fully competitive conditions—did it become a tool in economic analysis. Failure to perform such a translation, whenever concepts indigenous to one dimension of science are to be introduced into another dimension, is mainly responsible for the fact that experiments with "integration" have only rarely carried us beyond description into the realm of genuine causal analysis.

One might expect to find some enlightenment about the problem raised here in the recent writings on economic dynamics. Indeed, a lively discussion is under way, clarifying the nature of processes, the types of change, and the role of time, in their influence on human behavior.[1] But the time-honored distinction between dependent and independent variables—that is, between an economic process and the underlying meta-economic forces which drive it on and change it—is generally maintained. We find an exception to this general approach, however, in what Professor Frisch and his followers have called "dynamic process analysis." There certain relations are stressed which may exist between variables at different points of time, and which—because of the prevailing "lags"—can create self-enforcing processes, even if the variables themselves do not change. Such movements, which may be damped, cyclical, or explosive, are designated as "endogenous," in contrast with the other type of changes, which arise from "exogenous" stimuli represented by independent variables.

It is only fair to say that this modern notion of "endogeneity" is but a dim reflection of a much more ambitious method of analysis that dominated an earlier epoch of theoretical economics.

1 See, for example, Paul A. Samuelson, *Foundations of Economic Analysis* (Cambridge, Mass., 1947) chap. 11; R. F. Harrod, *Towards a Dynamic Economics* (London 1948) Lecture I; J. Tinbergen and J. J. Polak, *The Dynamics of Business Cycles* (Chicago 1950) chap. 9; J. R. Hicks, *A Contribution to the Theory of the Trade Cycle* (Oxford 1950) p. 10, as well as his earlier *Value and Capital* (Oxford 1939) chap. 9; William J. Baumol, *Economic Dynamics* (New York 1951) chap 1.

As a matter of fact, upon this issue of endogeneity versus exogenity, rather than upon conflicting theories of value, hinges the main difference between genuine classical theory and post-Millian economic reasoning, including all versions of neo-classical analysis. The problem and its relevance for the theory of dynamics was probably realized most clearly by the late Joseph Schumpeter, who stated it, a quarter of a century ago, as follows.

After describing economic theory in terms of Marshall's "tool chest," Schumpeter asserted that it arose from something quite different, namely, from a "theory . . . which claimed to contain the essence of all fundamental knowledge about the economy, and also the solution of its main empirical problems. The practical success as well as the grand defeat of the doctrine of the classical economists . . . are bound up with the fact that they aimed at just this goal, and that to reach it they established, in youthful recklessness, fundamental assertions and postulates without any real basis. . . . The characteristic example . . . is the quite uncritical manner in which Ricardo used an alleged connection between wage level and subsistence level as a substitute for a theory of wages. . . . Modern theory differs from classical theory not simply in not asserting any longer the existence of that particular relationship, for the reason that it cannot be verified. More important is the fact that modern theory does not establish any such propositions at all. Rather it offers a formal framework, into which any conceivable relationship, e.g., the opposite one, can be inserted *casuistically as a special datum*. . . . However no particular relationship as such is indispensable for the validity of the framework itself" (italics mine).[2]

Leaving alone the value judgment expressed in Schumpeter's remarks, we must admit that they do indeed point to a fundamental difference between the classical and the modern approach. What is at stake is no less than the entire possible range of deductive reasoning.

[2] Joseph A. Schumpeter, *Die Wirtschaftstheorie der Gegenwart* (Vienna 1927) vol. 1, pp. 6–7. The rather free translation from the German is mine.

Let us be quite explicit about the disputed region. It concerns the whole natural, social, and technical environment of the economic system, that is, the conditions that determine the quality and quantity of demand on the part of consumers and investors, the supply of productive factors, the prevailing technique of production, social distribution, the bargaining behavior of consumers and producers, and last but not least, the changes in all these elements through time. Modern theory, by treating these conditions once and for all as data, can never give us more than a catalogue of all *possible* movements of the economic system, derived from, and arranged according to, hypothetical sets of data combinations. It does not and cannot claim to tell us which particular set, and consequently which specific movement deduced from it, corresponds to reality. To make deduction applicable to reality, we must in each case first assess, by methods of induction, the order of data ruling in the particular situation. Only then are we in a position to select from our catalogue of hypothetical deductions the one that comes closest to the actual constellation.

This sounds quite trivial to the contemporary economist brought up in the modern tradition. All he may wonder is how one could proceed in any other way. Yet another method was in fact applied for a full century, during which deductive reasoning was not confined to conclusions drawn from sets of data postulated anew whenever analysis took another step. Rather, the explanation of the order and changes of these data itself formed part of the theoretical work of economists.

Of course, every process of deduction must ultimately start from some set of "synthetic" propositions, which classical economics too could arrive at only by means of induction. But whereas the modern economist is compelled to begin every deductive operation, if it is to have realistic bearing, with another empirical investigation of the relevant data, the classical economist did so only once—namely, when he described the primeval

state of affairs from which the economic process was supposed to have started. Different notions as to the nature of this original reality produced contrasting images of economic evolution in the different classical systems. But for each classical system separately the empirical stage was, at least in principle, set once and for all with these initial assumptions. From there on the economic process could be deduced by an unbroken chain of reasoning. In this sense Ricardo's assertion that the stationary state is the ultimate goal of economic development, or Marx's "general law of capitalist accumulation," proclaims explicitly what is implicitly contained in all classical systems.

Obviously this classical procedure results in an "endogenous" dynamics of a much more comprehensive nature than that offered by modern process analysis. Underlying these classical constructions is a belief in the cognitive power of deduction, and a notion of society and history, that seem to contradict all ideas concerning the relationship between science and reality that prevail today. Yet in studying economic growth, at least as it develops under capitalism, the conceptional range of classical theory seems more appropriate than the delimitations of modern theory.

The central problem of capitalism has often been defined as the question of how order rather than chaos ensues from the undirected action of innumerable individuals. We can give this question a time shape by asking what interaction of forces has determined the particular course that capitalist development has taken over the decades. If this development had been "planned," as may well be the case with the future development of the Western economic system, the problem of an "endogenous" dynamics would hardly arise. The basic "data" and their major changes would have been set by conscious decision, and would rightly have to be treated as independent variables of the economic process that has been set in motion by them. But over the last two hundred years we have been confronted with a self-propelling secular process, in the course of which not only did the data

change "spontaneously," but in addition these changes displayed striking regularities.

As we look at this secular process in retrospect today, our analysis of it may receive little help from the *substance* of the classical theory of economic development. This does not in itself reflect upon the dynamic *method* which the leading classical economists applied.[3] To realize this, more is required, of course, than a cursory statement of the classical procedure. The latter will have to be elaborated in all its ramifications by the study of some of its most significant protagonists. I begin with the earliest, and in many ways the most lucid example: the theory of economic development as contained in Adam Smith's *Wealth of Nations.* I shall then consider certain modifications that Ricardo and the early "anti-harmonist" writers introduced into the original model, and shall complete the survey with a detailed examination of Marx. In a concluding section, centered on J. S. Mill, I shall deal briefly with the reasons for the subsequent abandonment of the classical method of growth analysis.

Smith

I pointed above to the truism that however far the range of deduction may be extended, it must start from some original set of propositions. In all classical theories of development these propositions are "historical"; that is, they refer to an "original" order of society from which the economic process is supposed to spring. Smith never defined these original data systematically, but the context of his work leaves no doubt as to what he considered them to be. Division of labor and exchange, allegedly the "consequence of a certain propensity in human nature," [4] represent the basic pattern of economic behavior. They operate within the

[3] I first took this position in my *Economics and Sociology* (London 1935) chaps. 4 and 5. Since then valuable support has been given to this view by B. S. Keirstead in his *Theory of Economic Change* (Toronto 1948), especially in Parts I and II of that work.

[4] Adam Smith, *Wealth of Nations,* ed. by Edwin Cannan (London 1930) Book I, chap. 2. Subsequent references to Smith are to this edition.

institutional framework of a competitive class society: private property in the means of production, including land, which are unequally distributed after the "early and rude state of society" [5] has passed, and full mobility of the factors of production, safeguarded by the watchmen of the public interest. As our investigation progresses we shall meet some additional assumptions, which round off the set of historical constants.

Now in order to set the economic process in motion and give it the direction which Smith attributes to actual economic development, these constants have to generate the factors of production in the appropriate quantity and quality: an adequate supply of labor, of natural resources, and of capital, and a steady increase in productivity. In contrast with the constants themselves from which they spring, these factors cannot be regarded as given once and for all by nature and history. They are continuously being drained off and replenished according to certain laws of motion.

At this point we encounter the main peculiarity of classical analysis. Again neither the problem at stake nor its solution has been explicitly formulated by Smith. Both have to be inferred from scattered passages, which are found mainly in Chapters 1, 2, 3, 8, and 9, of the first book of *Wealth of Nations*, and in Chapters 3 to 5 of the second book.

First of all, there is a law governing the *supply of labor* (Book I, chap. 8). It is based on two complementary hypotheses. On the one hand, forces are at work that tend to reduce, over the secular period, the level of real wages to the subsistence level. The causal nexus is identical with what was later called the "iron law of wages": variations in the level of real wages evoke counteracting changes in the size of the working population. On the other hand, real wages can and do rise, as long as the natural and technical conditions of a country permit a steady increase in its wealth. Not that the systematic link between the level of real

[5] *Op. cit.*, Book I, chap. 6. This chapter contains the rather naive but methodologically essential hypotheses suggesting how this original state—the basic set of data—was transformed into the civilized state defined by the above conditions.

wages and the size of the population is destroyed for good in a progressive society. But demand for labor, as expressed in "the funds which are destined for the payment of wages," can overtake supply. And with the increase of real wages population grows, since "the demand for men, like that for any other commodity, necessarily regulates the production of men."

Thus labor supply is ultimately dominated by the cooperation of two balancing forces: the propensity to procreate, which is seen as a composite of a biological urge and a rational calculation of the "value of children," and the available wage fund. The former is another constant of the socio-economic process, but one which by itself would cause the system to "run down" to a constant level of labor supply and thus of real output. This tendency is counteracted by the latter force, which is a variable. What forces rule its changes?

The answer is given by Smith's law of *accumulation.* The funds which govern the variations in labor supply are the result of saving, which itself arises from another alleged human propensity or constant of the social mechanism: "the desire of bettering our condition" (Book II, chap. 3). Of course, it is not by the act of saving itself, but by the use they make of their savings, that people fulfill this desire. Accumulation, comprising both saving and investing, "is the most likely way of augmenting their fortune," provided a "neat or clear profit" or a rate of interest "in proportion to the clear profit" can be earned (Book I, chap. 9).

The level of profit and interest, however, is as precarious a magnitude as the level of wages. "In a country which had acquired that full complement of riches which the nature of its soil and climate, and situation with respect to other countries allowed it to acquire, which could, therefore, advance no further, and which was not going backwards, both the wages of labour and the profits of stock would, probably, be very low" (Book I, chap. 9). The reason is seen in the competition among capitalists once a country is "fully stocked in proportion to all the business

it had to transact." As is the case with wages, "it is not the actual greatness of national wealth, but its continuous increase" (Book I, chap. 8) that favors profits. Since the notion of capital-deepening lies outside the field of Smith's vision—and for better reasons than the later classical economists can adduce for themselves—only a continuous widening of the capital structure can sustain profits and thus accumulation, and can keep real wages above the subsistence level. Such widening or economic growth, however, can be stimulated only by a rise in productivity, because the other growth factor, population increase, is regarded, as we saw, as a response rather than a stimulus to accumulation. Thus the psychological constant again makes the system "run down" to a constant level, unless its tendency is counteracted by changes in the variable factor, this time productivity. In this factor we now encounter the strategic variable of the whole system.

If one places side by side the many remarks on productivity and economic progress which are contained in *Wealth of Nations,* one can collect the whole list of factors that Schumpeter classifies as "innovations": extension and improvement of machinery, increased division of labor, new branches of trade, and territorial expansion. But the emphasis with which these various factors are treated differs markedly. It is technical progress in the narrower sense that is in the center.

Among the conditions for such improvement of productive power is, first of all, a country's equipment in terms of natural resources and its geographic position. The threat of the exhaustion of natural wealth is regarded as far distant. As to the interim period, Smith is little concerned about decreasing returns, so that for the foreseeable future he can again treat the whole complex of natural conditions as a constant of the dynamic model. The decisive variable is a particular form of technology, namely, "division of labor."

It has always been recognized that for Smith division of labor is the true dynamic force. Yet in our context we do well to dis-

tinguish between the general phenomenon which, as we have already seen, he traces back to a psychological constant, and the varying forms in which this phenomenon materializes throughout history. The latter comprise for Smith all types of technical progress, in particular the introduction of improved machinery. At the same time, his notion of technical progress is defined by the characteristics of the economies of specialization, as he describes them in his first three chapters. Above all, mechanization, like specialization, is supposed to "facilitate and abridge labour," but not to displace the worker who performs it. Quite to the contrary, in the introduction to Book II Smith even asserts that division of labor in this inclusive sense is conditional upon a prior increase in labor supply. The passage is important enough to be quoted in full: "As the division of labour advances, therefore, in order to give constant employment to an equal number of workmen, an equal stock of provisions, and a greater stock of materials and tools than would have been necessary in a ruder state of things, must be accumulated beforehand. But the number of workmen in every branch of business generally increases with the division of labour in that branch, or *rather it is the increase of their number which enables them to class and subdivide themselves in this manner*" (italics mine).

In other words, the machine is regarded as a complement of labor rather than a substitute for it, a definitely pre-industrial notion of technology. To find such ideas in *Wealth of Nations* is hardly surprising, if we remember the date of publication of the book. They fit well with Smith's distrust of large-scale organization of industry and of long apprenticeship, both of which he evaluates by pre-industrial standards (Book I, chap. 10).

This identification of technical progress generally with specialization has far-reaching consequences for Smith's model of economic development. The improvements that determine the rate of economic progress, and thus the rate of profit, do not arise from spontaneous shifts in the production function, catering to

the pre-existing level of demand. Their introduction depends rather on the opening of new sources of demand, a proposition that is expressly stated in the title of the famous Chapter 3 of the first book: "That the Division of Labour is limited by the Extent of the Market." Far from being an independent variable, technical progress as understood by Smith develops "in proportion to the riches and populousness" of the country in question, and in proportion to its trade with other countries. It is the rate of increase in aggregate demand that governs the rate of technical progress.

Furthermore, Smith leaves no doubt about where the source of such continuous increase in demand is to be found. It is true that hardly any one before him has put equal emphasis on the advantages of international division of labor, and he sees in foreign commerce the stimulus to most modern improvements in manufacture and even in agriculture. And yet he calls this causal nexus an "unnatural and retrograde order." "According to the natural course of things, therefore, the greater part of the capital of every growing society is first directed to agriculture, afterwards to manufactures, and last of all to foreign commerce" (Book III, chap. 1). Thus pride of place belongs to the domestic market, that is, to a continuous increase of population, equipped with sufficient buying power. With this our argument has turned a full circle.

Here it may be helpful to restate the sequence of this circular, or rather "spiral," process, and the strategic points in it where the constants exert their recurring influence. We have to remember that we find ourselves confronted with a process *in development.* Therefore in order to describe the sequence of events we have to break the chain of interdependent links artificially at some point. The most opportune place to do so is the point where the increase of aggregate employment, owing to the preceding "turn of the spiral," has raised aggregate demand, thus providing new investment opportunities for further division of labor. These oppor-

tunities are bound to raise profit expectations and thus demand for money capital, which will keep the level of the rate of interest above the minimum, and, together with the propensity for "betterment," will stimulate a positive rate of savings. These savings offered for investment represent demand for additional labor and keep real wages above the subsistence level. Under the influence of the propensity to procreate, labor supply responds to the wage stimulus, so that the investment opportunities can actually be realized through increase in employment. At the same time the additional payrolls expand the market beyond the expectations held at the beginning of the spiral turn that is under observation. This creates new investment opportunities, and the next turn begins.

The main center of interest in this causal chain is the factors of production, on the growth of which the development of the economic process depends. There we must distinguish between the supply of natural resources on one hand, and on the other hand the supply of labor and savings and the changes in the technique of production. The former is treated as a natural constant, at least up to the point when the system has utilized to the full its given stock of resources. The supply of the other factors, and especially all changes in such supply, is a function of the dynamic process itself, together with the operation of certain constants. Labor supply is fully determined by the interaction of a bio-psychological constant with the market price of labor, as savings are determined by a psychological constant and the market price of savings. Technological change, finally, is induced by the expansion of what Smith calls "national wealth" (comparable with what is today called "national income"), the continual increase of which is the inevitable result of the spiral process.

What is decisive is the fact that this process of development is not distorted by any independent variables. Therefore it is not only open to exact prediction but, in the absence of any possible disturbances from without, it moves in dynamic equilibrium. True, the absence of outside shocks is only a necessary condition

for such equilibrium, and is not in itself sufficient to insure it; to clinch the argument in favor of a self-propelling harmonious dynamics, proof had to be given that the spiral chain would never be broken from within. Here lies the systematic significance of the specific form of technology that dominates Smith's dynamic model. Only a technology that is labor-attracting insures the steady expansion of the market, and thus the unbroken continuity of the "upward spiral."

The so-called "optimism" of Smith's vision of economic development hinges on his treatment of technical progress. Otherwise, as we saw, all the "pessimistic" arguments are present which in the hands of his successors turned the expanding secular process into the dismal stationary state. The bio-psychological constants, as conceived by Smith, would cause the mechanism to run down, were it not for the counteracting force of technology. But only by linking technical progress strictly with the growth of the system can the mechanism be made to "run up" steadily, until the full utilization of the natural environment prevents further expansion of aggregate and per capita income.[6]

One element, and only one, in the customary set of data retains in Smith's dynamics the role of an independent variable: consumer tastes. The *bi-polar shifts* of the productive factors according to the variations in these tastes exhaust what employment fluctuations the system can undergo, and they are of a sectorial and short-run nature only. The rigid manner in which *aggregate changes* in factor supply are linked with one another in a regular sequence precludes any aggregate fluctuations over the

[6] Looking at this axiom of Smith's model from the vantage point of a fully developed industrial system, it is easy to raise the objection that it is unrealistic. But the axiom is an indispensable condition for the twin postulates of "autonomy" and "harmony" on which both the theory and the policy recommendations of Smith's economics rest. To have missed this central point is the main defect in Keirstead's otherwise valuable exposition of Smith's dynamics (see *Theory of Economic Change*, cited above, note 3, pp. 69–77). In linking moving equilibrium with a peculiar type of technology, Smith has shown an insight into the operation of the market mechanism that is sadly lacking in the work of most of his classical and all of his neo-classical successors.

long run, and this for two reasons. Not only are such changes in factor supply always a response to a preceding change in demand, and therefore in the nature of a self-correcting adjustment, but they are also of necessity slow, thus permitting steady absorption. The rhythm of change is ultimately limited by the rearing period of children. Though these periods overlap in a continuous process of growth, making the influx of additional labor into the market a continuous process, they keep the rate of growth slow and steady.

This consideration gives to the hypothesis of "other things remaining equal," which underlies all classical analysis of short-term processes, a more than methodological significance. In a spiral process of development, as conceived by Smith, all factors other than bi-polar changes in taste do in fact remain equal over the short run. Far from assuming the function of controlled experiments, as it does in modern economics, in the context of original classical economics the *ceteris paribus* rule is a pronouncement on reality—at least on the aspired-to reality of perfect competition.

In summary, we can say that Smith's theory of economic development is composed of two kinds of building blocks: a set of natural, psychological, and institutional constants, and a circular mechanism that links the changes in the supply data with the course of the economic process in reciprocal causation. This reciprocity of cause and effect over time—though at any given moment cause and effect are clearly separable—raises economic analysis to the level of more comprehensive social analysis, at least so far as the supply conditions of the factors of production reflect the social process. The other social forces, as embodied in the constants, are not drawn into the circular mechanism of causation. We shall see that in this respect at least one later classical system, that of Marx, goes much further in establishing "laws of interdependence." But though for Smith the constants only affect the process of development, without themselves being af-

fected by it, their nature as constants prevents them from prejudicing either the stability or the calculability of the economic process. They belong to the "natural order," in the twofold meaning which this term has in the social philosophy of the Enlightenment. Therefore their mode of operation can be known, and the resulting model of economic dynamics is the image of a fully predictable process of "natural" development. Social economics was indeed raised by Smith to the formal level of a true science.

Ricardo and the Early "Anti-Harmonists"

It is not my intention to present a systematic survey of all the variants that the classical theory of economic development exhibits, or to trace the influence that different writers exerted on one another in formulating their ideas. Our concern with the problem is methodological rather than historical, and for such a purpose a random selection of a few further hypotheses is quite sufficient. The reason for this is that Smith's model has remained the formal pattern for the "liberal" strand of classical economics, though the later models differ substantially from it and also from one another. The differences arise either from a change in the constants assumed, or from the weakening of the circular mechanism through the introduction of certain independent variables.

The outstanding example in both respects is Ricardo. By substituting the law of diminishing returns on land for Smith's assumption of constant returns, the trend of economic development is radically changed. Ricardo's "pessimism," as expressed in the first two editions of the *Principles,* is exclusively due to this modification of Smith's model. The idea of an *ultimate* running-down of the system is integral to the Smith model also, as we saw above. All that Ricardo did was to move forward into the present the point of time when the stinginess of nature asserts itself. Not only does this place the level of real wages under a constant threat, which can be removed only temporarily by tech-

nical progress; but in addition Ricardo presents a new theory of profits, according to which the same tendency threatens their persistence also. It is no longer competition among capitalists, but the rise of money wages—inevitable under the pressure of decreasing returns—that cuts into profits. More and more this strangles accumulation, and thus the whole process of expansion.

Nevertheless, the strictness of the spiral process was in no way affected by this change. A "downward" spiral was added to the initial "upward" spiral, and this has important consequences for functional distribution; but the process as such remains fully determinate and calculable.

A much more serious modification was introduced in the third edition of the *Principles*, with the new chapter, "On Machinery." By taking note of the labor-displacing effects of industrial technology, Ricardo removes the cornerstone of the Smithian structure.[7] As in Smith, profits still depend on technical advance, and even more so when decreasing returns continuously tend to push up money wages. But though the prospects of innovation profits stimulate saving, their investment, which is still taken for granted, no longer assures growing aggregate employment. The displacement effect threatens to diminish the "gross produce"—that is, the size of the market—and steady growth is no longer assured. Ricardo did not himself draw the far-reaching conclusions regarding the secular process that this new notion of the technical factor suggests. The new insight expressed in the critical Chapter 31—in itself a rare case of self-destructive intellectual honesty —is hardly compatible with the notion of a system which, though "running down" in terms of real output, is free from any aggregate fluctuations.

It has become customary in recent years to attribute the first genuine insight into the causes of such fluctuations to Malthus. This emphasis is less than fair to some of his forerunners, and more than fair to Malthus' capacity to understand what indeed

[7] The fallacies contained in Ricardo's proof of the displacement effect do not alter the systematic consequences of his conclusion.

he saw. On both scores Lord Lauderdale and Sismondi deserve to be reinstated in the position that they held in the history of economic doctrines before Keynes traced to Malthus the introduction into "respectable circles" of the principle of effective demand.[8]

However this may be, the formal procedure of all these writers is the same. They break the link that—in Smith as well as in Ricardo, and prior to him in Say—had fastened savings firmly to investment. By stressing the "propensity" element in the creation of savings over and against the circular effect of profit expectations, savings themselves become an independent variable, to which investment may, or may not, adjust itself spontaneously.

With this the stability of economic development is undermined, though not necessarily its upward trend. If Malthus has a claim to originality in this respect, it lies in his demonstration that aggregate fluctuations are compatible with an upward trend of real output and employment. His law of population is much less strict than the hypothesis that underlies Smith's iron law of wages. "Moral restraint" is capable of breaking the circular chain at the most critical point—where the supply of labor is related to the level of real wages—transforming the latter into an independent variable. This second break in the circular chain may then undo part of the social evils brought about by the first, though it further reduces the determinateness and thus the predictability of the process of development.

Marx

We can say that in order to approximate their models to the complexities of the real world, the early nineteenth-century writers felt compelled to relax the strictness of the original circular mech-

[8] For a balanced treatment of the relative merits of Malthus and Lord Lauderdale, see A. H. Hansen, *Business Cycles and National Income* (New York 1951) chap. 14. But in concentrating on the notion of "voluntary" underconsumption or "oversaving," Hansen disregards the importance of Sismondi in stressing the complementary role, and for the past history of capitalism the more important role, of "forced" underconsumption due to pressure on the wage level.

anism. Marx's methodological position is unique because, although writing half a century later, he went in the other direction far beyond Smith. He transformed almost all the original constants into dependent variables. For this reason his model is the outstanding case of "endogenous dynamics," whatever reservations may have to be made about the substance of some of his most essential propositions.

To gain insight into the mechanism of Marx's model, we can best begin by considering those elements for which equivalents can be found in Smith's model. The process of development that Marx tries to formulate in the "general law of capitalist accumulation" [9] is kept moving, as in Smith, by the interaction of a law of population, a law of accumulation, and a law of technical change. But the social forces that replenish the stock of productive factors through these laws are quite different from those postulated by Smith.

To start with the law of population or labor supply, for Marx it is "relative surplus population" as created by technological displacement, rather than the "absolute surplus population" due to natural increase, that determines the state of the labor market and the level of real wages (vol. 1, chap 25). Since the introduction of labor-displacing technical changes can be geared to the demand for labor, labor supply can be kept at such a level that it is always available at minimum cost, that is, at wages near the subsistence level.[10]

Now the force that makes the capitalist-entrepreneur use the weapon of innovation in this manner operates through the "special" law of accumulation, the latter term to be understood in

[9] *Capital* (Kerr Edition, Chicago 1906, 1909) vol. 1, chap. 25. Subsequent references to Marx are to this edition.

[10] It is a controversial point whether Marx regarded the industrial reserve army as a necessary condition for the pressure on the level of real wages, or merely as a force supplementary to the operation of the law of surplus value. The decision depends on what state of competition, pure or monopsonistic, one attributes to the labor market. Only if one assumes pure competition—hardly Marx's assumption—is the existence of a reserve army a necessary condition. We shall treat it as such, in order not to become involved in Marx's theory of value.

the classical sense of saving-plus-investment. But for Marx—in contradistinction to the earlier classical writers—accumulation is not stimulated by an innate propensity, but by the social pressure of a competitive society. Smith's psychological constant is transformed into a dependent variable of the institutional environment, which compels the capitalist "to keep continuously extending his capital, in order to preserve it" (vol. 1, chap. 24).

But Marx is in full agreement with both Smith and Ricardo that accumulation alone is not sufficient for the capitalist to survive. This is so, at least, if accumulation takes the form of "accumulation with constant organic composition of capital"—Marx's term for a "pure widening" of the capital structure. As will be shown below, in this case profits are threatened from two sides: through price decreases due to the competition of fellow-capitalists (Smith's argument), and through wage increases, since in this case the demand for labor rises without a simultaneous increase in supply (Ricardo's argument). Only accumulation with "rising organic composition of capital"—capital-attracting technical progress, in modern terminology—can sustain the level of profit and with it the process of accumulation and development. And as we shall see presently, even this type of accumulation ultimately defeats its own ends.

Thus in Marx, as in all classical systems, it is technical progress that provides the ultimate dynamic force. But there the resemblance ceases. Before Marx technical progress was regarded as the vehicle of social progress and of market stability. It was supposed to create additional employment and thus to extend the market; to overcome, at least temporarily, the stinginess of nature; to stimulate investment and thus to banish the specter of oversaving. But to Marx modern technology is a Janus-faced phenomenon. While sustaining accumulation and thus growth, it maintains and even increases mass misery, breaks the stability of the economic process by blocking the extension of the market, and ultimately even jeopardizes profits.

We saw that it was a specific type of technical progress—spe-

cialization—that produced the harmonistic effects of the Smithian model. Another peculiar type creates the ambivalent tendencies in Marx's model. Its characteristics are two: it is labor-displacing and capital-intensifying.

I have already referred to the first characteristic in discussing Marx's law of population. In elaborating the earlier suggestions of Barton and Ricardo, Marx demonstrated that, as a rule, the reabsorption of technological unemployment is, under industrial conditions, not a question of short-run adjustment but of secular growth, conditional on prior formation of real capital. The significance of this proposition for the operation of Marx's model is twofold. On the one hand, by periodically flooding the labor market the industrial reserve army prevents the masses from participating in the benefits that increasing productivity potentially offers. On the other hand, it prevents aggregate consumption from rising in proportion to aggregate output, thus threatening the system with (forced) underconsumption.

The second characteristic of technical progress, as Marx sees it, is progressive capital intensification, that is, an increase in the value of capital relative to the wages paid out over a stated period.[11] On this assumption he builds a supplementary theory of profits, in which the paradoxical effects of technical progress find their climax. This "law of the falling tendency of the rate of profits" is probably the most controversial of Marx's propositions,[12] although it follows logically from any consistent theory of labor value. If aggregate profits are the difference between the value of output and aggregate payrolls, then the rate of profit (that is, the ratio of aggregate profits to the value of total capital stock) is bound to fall whenever capital intensification raises the value of fixed capital at a higher rate than payrolls—at least so long

11 In some of Marx's statements, stocks and flows are badly confused. But there is no doubt that the above formulation renders the meaning of what he wanted to express.

12 See, for example, the critique of this law contained in P. M. Sweezy, *The Theory of Capitalist Development* (New York 1942) chap. 6, a book that is certainly sympathetic to the general trend of Marx's ideas.

as it is possible for labor's share in aggregate income to be maintained.[13]

We must ask, of course, why capitalists introduce innovations if the result is a fall rather than a rise of the profit rate. To this Marx has three answers. First, there are a number of counteracting factors that reduce the "law" to a "tendency." The most important of these factors are the reduction of the value of the fixed capital stock (in spite of its physical increase) as a consequence of rising productivity, and the secondary effect of labor displacement on wages, namely, a fall in real wages. But these counteracting forces operate obviously ex post facto. Therefore Marx's other two reasons are more convincing from the standpoint of a capitalist who is confronted with the investment decision. On the one hand, Marx is fully aware (vol. 3, chaps. 13 and 15) of the temporary "pioneer profits" that form the center of Schumpeter's profit theory; although competition is bound to wipe these out over the long run, until it does so they raise the rate of profit. On the other hand, a fall in the rate of profit is fully compatible with a rise in its volume. This, of course, can be a stimulus only for the borrower, not for the lender, whose remuneration is calculated in terms of the rate. Whenever the rate falls, therefore, especially disturbing effects arise from the behavior of the capitalist (in the narrower sense), who succumbs to a sort of liquidity preference (vol. 3, chap. 15).

I have dwelt at some length on this supplementation of the classical theory of profit, since its simple meaning is shrouded in a fog of verbiage spread over it by Marx himself and subsequently

[13] It is quite another question, which has been much discussed in recent years (Sweezy, Joan Robinson), whether real wages, and thus labor's share in aggregate income, must not rise under these assumptions. This conclusion would then obviate Marx's whole deduction of the "catastrophic trend" of capitalist development. Now it is quite true that *per capita* real wages must rise with increasing productivity, unless money wages fall at the same time, which would in turn restore the level of profits. But this need not be true of *aggregate* real wages, unless aggregate employment is maintained. This condition, however, runs counter to Marx's intentions, since he derives an economic crisis from the fall of the profit rate. Whatever may happen to the real wages of the employed, therefore, growing misery of the working class as a whole is quite compatible with such a fall.

by his critics. But again, we are not interested here in the substantive truth of the proposition, but in its significance for the logic of Marx's model.[14] What is new in Marx's law of technical change, compared with the corresponding propositions of his predecessors, is the combination of progressive with regressive tendencies that it describes. Only through its operation can profits, accumulation, and employment, and thus economic development, be stimulated—the same phenomena that are also checked by its operation. The result is an endogenous cycle of expansion and contraction, which takes the place of the steady running "up" or "down" of the classical mechanism. In this manner Marx's general law of accumulation makes regular fluctuations an inherent property of economic growth.

This modification invests the model with a degree of realism never before attained by any theory of development. But it makes the exposition of the underlying process rather complicated. And this all the more so, since Marx visualizes at least two different types of business cycles. As in many of his propositions, he left his cycle theory as a torso. But Sweezy (*op. cit.*, chap. 10) is probably right in asserting that Marx was fully aware of the two types, which nowadays pass as "overinvestment" and "underconsumption" cycles, the action of the falling rate of profit being associated with the latter. And far from playing one off against the other, as has become the modern fashion, he treats them as equivalent forms of the economic process.

We shall not pursue here a detailed examination of the manner in which Marx derives the sequence of cyclical phases for each of the two types. The main methodological significance of his cyclical model of growth lies in the fact that, once the cycle has started, it operates as the law of circular motion, according to which the factors of production are drained off and replenished in calculable fashion.

[14] The substantive conclusion as to the instability of the level of profits can also be derived from the underconsumption effects that labor-displacing innovations exert.

All that is needed to set the cycle going is an institutional environment, very like the one that figures in Smith's model, and the availability of innovational projects of the type described. The former developed out of the breakdown of mediaeval society, which also provided the original investment funds for what Marx calls the process of "primitive accumulation" (vol. 1, chaps. 26–32). The latter is a consequence of the industrial revolution. The social pressure of the institutional order assures the appropriate motive force, whereas a continuous stream of inventions is the material for the profit motive to actualize itself through the fundamental economic behavior: accumulation. No additional channels are required to feed outside forces—biological or psychological—into the economic mechanism. The factors that sustain it, especially labor and capital, are recreated by the mechanism itself.

Again we have to break into a continuous process at an arbitrarily chosen point, in order to describe the circular mechanism. We select the point where availability of new projects, together with a large supply of idle labor and capital, induce what is today called "autonomous investment," thus starting a new revival. What form the ensuing upswing takes, and in what manner it ends, depend on the relative weight, in total investment, of "pure widening" projects and technical improvements respectively. If the former dominate, the labor pool inherited from the preceding depression will be gradually exhausted and wages will rise. This creates the "overinvestment" dilemma, resulting in general cutthroat competition.[15] Conversely, a sufficient supply of genuine improvements will, during the upswing, continuously refill the labor pool, thus preventing wage rises. But by this very fact it will drive the system in the end into the underconsumption di-

[15] The relevant passages (vol. 1, chap. 25, and vol. 3, chap 15), in which a fall in profits, the stoppage of further accumulation, and thus the outbreak of the crisis, are derived from the wage rise, are open to criticism. We know today that overinvestment can arise only to the extent that factor specificity prevents a short-period adjustment of disproportionalities in the structure of production, a line of reasoning that is alien to Marx's thinking.

lemma.[16] It is characteristic of the end phase of either type of upswing that profits decline. This brings accumulation to a temporary stop, leading to general contraction and the recreation of the large factor pools, which are the condition for a new revival.

When examined from the aspect of determinateness and predictability, Marx's model gains upon Smith's by freeing the circular mechanism from all exogenous biological ad psychological constants. As a cycle, the economic process recreates all conditions necessary for its continuation. Up to this point, however, it is difficult to see that the resulting secular process can be anything else but a sequence of cycles, distinguished at best by different types of upswings and crises, but without any specific trend of development. This gap is filled by Marx's most original contribution: the linking up of even the institutional environment with the cyclical process.

The decisive link is the "capital-intensifying" nature of technical progress, as understood by Marx. First of all, from cycle to cycle it raises the degree of "concentration"—that is, the average amount of capital per firm, and possibly the average size of the labor force per firm also. Second, and even more important for the dynamic process, it promotes "centralization" of production, namely, an increase in the share of large concerns in capital stock, aggregate output, and employment. This transformation is brought about by the periodic downswings, and derives from the greater crisis resistance of the larger and thus the more efficient firms. These retain, even during the depression, a certain volume of profits, whereas the general fall of the rate eliminates the smaller and less efficient firms.

This economic effect of the depression, however, is the cause

[16] The scattered passages in Marx referring to underconsumption are so vague that this problem has become a fertile field for both text interpretation and controversy; see Sweezy (cited above, note 12) chap. 10. Some neo-Marxists, notably Otto Bauer and Sweezy, have tried to construct from the available building blocks a consistent theory of "forced underconsumption." These constructions are defective, because they try to prove with purely "mechanical" arguments what can be demonstrated only with due regard to "changes in expectations."

of much more fundamental social effects. The process of competitive elimination gradually transforms a widely stratified society, originally composed of many independent producers, into two starkly antagonistic groups: a few "capital magnates," and the large mass of the proletarianized people. But again this process is Janus-faced. Misery and exploitation mount, as does underconsumption, making the periodic crises worse and worse. Yet at the same time centralization furthers the rationalization and planning of the productive process and the international unification of markets. It cannot help training the laboring masses in the "cooperative form" of production, and organizing them in self-defense. "Centralization of the means of production and socialization of labor at last reach a point where they become incompatible with their capitalist integument. This integument is burst asunder" (vol. 1, chap. 32). From this point on, the autonomous mechanism of the capitalist process gives way to planned direction.[17]

Thus the trend of socio-economic development follows from the interaction of two apparently contradictory tendencies. Both are inherent in labor-displacing, capital-intensifying technical change, when applied in a society that has gone through the process of "primitive accumulation." A constructive tendency—progressive accumulation, concentration, centralization, proletarian training and self-organization—plays against a destructive tendency—displacement, increasing misery, growing underconsumption, and worsening crises. The final catastrophe requires, of course, a "voluntaristic" stimulus—the "wrathful indignation" of the proletariat. But even this is traced back to the pressure of the social environment and treated as an inevitable response to it, as is the case with capitalists' profit incentive and its behavioral expression—accumulation. Later Marxists, notably Hilferding, Luxemburg, Sternberg, and Sweezy, have extended

[17] This is true even though under socialism the sphere of material production remains a "realm of necessity," as Marx maintains (vol. 3, chap. 48) against some of his more utopian disciples.

and refined the argument by applying it to the explanation of monopolistic tendencies and the related behavior patterns, as well as to the rise of a non-revolutionary working class and a new middle class in the leading capitalistic countries. But the determinateness of the socio-economic circular mechanism is unimpaired, as long as the effects follow from the operation of the basic variable "technology" in a historically given, but endogenously changing environment.[18]

For this reason clarity about the logical position of these ultimate "causes" is crucial for full understanding of the model. The case is simple as far as the environmental factors are concerned. They are the passive element in the process of development. Originally a set of data given by nature and history, they change slowly under the influence of the cyclical process, which they in turn affect through the channel of behavior. Once the economic process has started, the environment enters into a fully endogenous relationship with it.

The active factor, technology, is a more complex phenomenon. We must distinguish between the scientific-technological process of invention, and innovation as the economic application of invention. The latter is endogenously related to the movements of the cycle, and can be regarded as "bunched" in reverse proportion to the rate of profit. Invention, on the other hand, seems to be less closely bound up with the socio-economic process. Certainly modern technology generally is a child of the age and cultural climate in which modern capitalism arose. One might even assert that the constant flow of ever-new inventions is stimulated by the crumbs from the tables of the earners of profit, which fall to the inventor. But this motive can hardly be taken as his sole stimulus, and in any event it operates as a "carrot" rather than as a "stick." Finally and above all, the particular form that the invention has to take in order to direct the dynamic process

[18] Luxemburg and Sternberg have added to the institutional factors of the environment the geographical-historical element of a "non-capitalist space," which is gradually being filled up. Marx's own stand in this respect is not clear.

in the historically ordained direction cannot be attributed to endogenous forces only. That Marx's capitalist should prefer labor-saving to labor-attracting devices agrees with the circular mechanism of the system as well as with the postulated trend of evolution. This is not true of the other characteristic of these devices: their "capital-intensifying" nature. This feature is indeed indispensable as a causal link in the chain of events, which lead through concentration and centralization to the self-organization of socialism in the "womb of the old society." But it cannot be derived with equal cogency from the basic behavior pattern of the capitalist. His ultimate aim would be served much better by capital-saving devices, which tend—at least in Marx's interpretation—to raise the profit rate. Exactly as in Smith, a very specific technology is an indispensable condition for the evolutionary process taking its postulated course. But again as in Smith, this variable has been introduced into the system from without rather than having been derived from the operation of the circular mechanism.[19]

It is an interesting task to criticize the Marxian model by confronting each one of its "links" with the actual process of capitalist development. But though the course of history has refuted the prediction of the ultimate catastrophe—at least in the terms conceived by Marx—it has not by this refuted the method by whose help Marx attempted to establish a scientific theory of the development of the industrial market economy. We may well deny every single one of his substantive propositions, and yet regard the methodological lesson of his work as a challenge that no responsible social scientist can afford to evade.

I can vindicate this position by citing a witness who, in view of his earlier pronouncements quoted above, should be accepted as impartial: ". . . there is one truly great achievement to be set against Marx's theoretical misdemeanours . . . the idea of a theory, not merely of an indefinite number of disjointed individual pat-

[19] See also Lewis S. Feuer, "Indeterminacy and Economic Development," in *Philosophy of Science*, vol. 15, no. 3 (October 1948) pp. 225–41.

terns or of the logic of economic quantities in general, but of the *actual* sequence of these patterns or of the economic process as it goes on under its own steam, in *historic* time, producing at every instant that state which will of itself determine the next one. Thus, the author of so many misconceptions was also the first to visualize what even at the present time is still the economic theory of the future for which we are slowly and laboriously accumulating stone and mortar, statistical facts and functional equations" (italics mine).[20]

The Classical Theory of Growth Abandoned

It is an open question whether "theoretical misdemeanors" alone are responsible for the fact that to this day "respectable circles" have not taken note of Marx's methodological daring, and that men like Silvio Gesell and Major Douglas could crowd him out of the most important treatise written in this generation. The latter fact seems all the more paradoxical since, judged in methodological terms, Keynes' *General Theory* is much nearer, if not to Marx himself, at least to his prototype Smith than anything written in academic economics since the days of Mill—a point to which I shall return presently.

But it is true that when *Capital* appeared, the main stream of classical economics had already abandoned not only the original approach to the problem of secular development but even any concern with it at all. The reasons for this were never explicitly stated, and must be inferred from the context of the later classical writings.

An illuminating phase of transition is represented by Book IV of Mill's *Principles.* Chapters 4 to 6 of this Book, dealing with the tendency of profits to fall to a minimum, and with the stationary state, are written much in the old vein, combining the Ricardian "running down" tendency of the system with the Malthusian alleviations referred to. But these chapters are pre-

[20] Joseph A. Schumpeter, *Capitalism, Socialism and Democracy* (New York 1942) p. 43.

ceded by the extremely interesting Chapter 3, in which five hypothetical cases of the behavior of the factors of production are analyzed in a thoroughly modern fashion. Changes in factor supply (constant or increasing population combined with constant or increasing capital and constant or increasing productivity) are discussed in a "catalogue of permutations" that would do honor to any modern textbook.

Apparently Mill regarded all these cases as empirically possible, with little to choose between them on a priori grounds. This agnostic position follows quite logically from the destruction that had been dealt (by Malthus and by Mill himself) to the "laws of data changes," especially the iron law of wages and its descendant, the wage-fund theory; to the naive theory of accumulation (by Lauderdale, Sismondi, and Wakefield); and to the optimistic interpretation of technical progress (abandoned by Ricardo, and restored by Mill himself only with many qualifications). The existence of business cycles had by Mill's time been fully realized, but no one had succeeded in integrating an explanation of them with the general theory of price and distribution. Even the purely physical tendencies of real output seemed more complex than they had appeared to the optimist Smith or to the pessimist Ricardo. For Mill the outcome depended on a "conflict between two tendencies" (Book IV, chap. 2), namely, technical progress and diminishing returns on land, an outcome that he regarded as unpredictable.

In short, the former "constants"—natural, psychological, and technological—had revealed themselves as so many variables. And since Marx's idea of relating them in circular fashion to the institutional environment contradicted what was still left of the original notion of a "natural order," they could only be regarded as independent variables. This is the manner in which neoclassical economics has treated them ever since, no longer attempting to account for the regular form that the capitalist process has taken during the secular period of two hundred years.

I agree with Keirstead (*op. cit.*, chap. 4) that Schumpeter's

"Theory of Economic Development" is no exception to this rule. What Schumpeter has done is to put forth an explanation of the business cycle on the basis of a theory of innovations. But not only are innovations treated as an independent variable; their effect on the labor market is completely disregarded. Since Schumpeter insists that, in principle at least, every new cycle starts from equilibrium, the economic process as such has no causal function. Of his later works, *Business Cycles* stresses the role of historical causes at the expense of any circular mechanism. By building his model of the secular process on the dubious foundation of Kondratieff's hypothesis, Schumpeter at best *describes* a movement without being able to *explain* it.

His last book, *Capitalism, Socialism and Democracy,* contains a number of highly interesting suggestions about the interaction between the economic process and the social order in late capitalism. But Baumol is certainly right in pointing to the "somewhat loose and conversational manner which makes it almost impossible to discern the details of the analytical framework." [21] Thus the man who alone among recent academic economists recognized the meaning, and in the end the lasting importance also, of the Smith-Marx scientific procedure, himself did very little to revive it. The leadership fell to a man who was strangely unaware of the tradition that he followed.

What places Keynes, in spite of his railing against "classical" economics, squarely within the classical frame of reference is, on the one hand, his return to macro-economics (in the Quesnay-Marx tradition rather than in the Smith-Ricardo tradition) and, on the other hand, his replacing some of the independent variables of neo-classicism by constants, in the manner of Smith.[22] I refer, of course, to Keynes' revival of specific "propensities," "preferences," and "expectations," with whose help the *actual* course of the economic process is analyzed and predicted, at least for the

[21] Baumol, *Economic Dynamics* (cited above, note 1) p. 20, note 2.

[22] To realize Keynes' position one must distinguish, of course, first, between classical and neo-classical economics, and second, between the substantive propositions of classical macro-economics and the method by which they were developed.

short run. Certainly the functions that describe the Keynesian system can, in principle, assume any values. To that extent the theory is indeed general and its apparatus purely formal. But when it comes to analyzing the actual process of capitalism and its inherent autonomous tendencies, Keynes no longer has recourse to the procedure by which neo-classicism tried to "apply" its apparatus, namely, by empirically determining the "data" from case to case. General propositions are put forth about how people at large divide an increment of income between consumption and saving, how movements of the rate of interest affect the demand for cash, and how long-term expectations affect investment. In scattered remarks, which refer to the secular process, a truly Marxian position is taken.[23] And the conclusions drawn regarding an industrial market left to its autonomous devices are hardly more reassuring.

All this, and also the recent attempts to build a more specific and more exact theory of economic growth on Keynesian foundations (Harrod, Hicks), requires detailed discussion beyond the range of this paper. But enough has been said to suggest to the reader that closer study of the classical apparatus, far from having merely historical significance, leads straight into the center of research in contemporary theoretical economics.

With this we have returned to our starting point: how to construct a verifiable theory of economic growth that adequately combines social with economic analysis. The lesson to be drawn from the foregoing investigation cannot be a call for the return to the "closed" circular mechanism of classical economics. Rather, the problem consists in establishing the criteria by which those

[23] It is true that the systematic elaboration of what is now called "maturity" theory is the work of some of Keynes' disciples. But all the elements of this theory are present in the three pages of the *General Theory* that deal more extensively with economic development (chap. 21, sec. VII). Keynes calls this a question "for historical generalization rather than for pure theory." This is precisely the analytical level on which the classical theory of development moves. The apparent difference in generality is exclusively due to the early classical belief in "natural" parameters, whereas Keynes and his followers are satisfied, like Marx, with generalizing about certain historical periods.

areas where the economic process does indeed interact with its environment can be distinguished from fields where the "underlying forces" operate as independent variables. In some instances, as in the theory of expectations, elements belonging to both areas may well be active. At this stage we do not possess such criteria, nor does our ability to handle circular mechanisms transcend the rather crude determinism of dynamic process analysis in its modern version.[24] But the growing concern with "endogeneity" is certainly in accord with sound methodological principles. After all, the limits of endogenous explanation coincide with the limits of our understanding of the social process.

[24] See, for example, Paul A. Samuelson's contribution in Howard S. Ellis, ed., *A Survey of Contemporary Economics* (Philadephia 1948) pp. 352–81. It remains to be seen whether social scientists will profit from the theory of "servo-mechanisms" or "feedback systems," which play an increasingly important role in modern physical research. See Richard M. Goodwin's contribution to Alvin H. Hansen, *Business Cycles and National Income* (cited above, note 8) pp. 417–68. That the notion of a "circular mechanism" is much older than these constructs of modern physics, and is indigenous to social research, should not be doubtful after the foregoing observations.