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# MARX'S ECONOMICS

A DUAL THEORY  
OF VALUE AND GROWTH

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## Introduction

It is our great misfortune that economists have for a long time been divided between the 'orthodox' and Marxian camps as a result of cliquishness; each school has lost touch with the other and has become inbred. In Japan, for example, Marxian economists have formed an association called Keizai Riron Gakkai (Economic Theoretical Association) in opposition to the Riron Keizai Gakkai (Theoretical Economic Association) of non-Marxists. In spite of the similarity of the names of the societies, no fruitful conversation has ever been held between them. They are at daggers drawn and describe each other as a society for reactionaries and a society for economists with lower I.Q.s.

This has been the tradition since Marx. However, we may notice a significant difference between the quarrels of the 1870s and those of the 1970s. It is true that Marx attacked many of his predecessors, but in his criticism he used the same language as they had used. Although he began his life as a philosopher, he later became fascinated by classical economics, which might be considered the mathematical economics of his time, and remodelled its tools and apparatus in order to construct his own economics. The fact that he was one of the authorities on classical economics made it possible for a dialectic development to take place between Marxian and traditional economics. It is indeed a pity that contemporary Marxists have lost the spirit of Marx in this respect.<sup>1</sup>

On the other hand orthodox economists, too, are in the wrong, not only in segregating Marxists but also in undervaluing Marx, who should in my opinion be ranked as high as Walras in the history of mathematical economics. It has rarely been pointed out that the general equilibrium theory was formulated independently and simultaneously by Walras and Marx, whereas it has often been mentioned that the utility theory of consumer's behaviour was discovered independently and simultaneously by

<sup>1</sup> Recently a number of East European economists have started to think in terms of the same terminology as Western economists commonly use. This is a change to be welcomed. See for example A. Bródy, *Proportions, Prices and Planning* (Budapest, 1970), 194 pp. For the recent currents of economic thought in the Soviet bloc, see A. Zauberger, *Aspects of Planometrics* (London: Athlone Press, 1967), 318 pp.

Walras, Jevons and Menger. It was in 1874 that Walras' *Éléments d'économie politique pure* was first published; whilst it was early in the 1860s that Marx began to investigate the problem of 'reproduction and circulation of the aggregate social capital'. The fact that Marx's work was only published after his death – by Engels, in volumes II and III of *Capital* in 1885 and 1894 respectively – does not affect the greatness of his achievement at all. Indeed, Marx's theory of reproduction and Walras' theory of capital accumulation should be honoured together as the parents of the modern, dynamic theory of general economic equilibrium.

However, unlike Walras but like Hicks, Marx constructed a two-stage general equilibrium theory. It has often been pointed out that Walrasian microscopic equilibrium theory is rather sterile, since it is too general and complicated to be able to derive definite conclusions. To get rid of this weakness Hicks developed an aggregation theory and reduced the general microeconomic equilibrium system to a macroeconomic system with a few variables and equations. One of the main purposes of Hicks' *Value and Capital* was to confirm or refute Keynesian propositions from the viewpoint of general equilibrium theory. By assuming that prices of all commodities change proportionately, Hicks treated all commodities as if they were a single commodity; he thereby obtained a three-equation system, consisting of the demand-supply equations for commodities, bonds, and money, by which the Keynesian theses were tested.<sup>2</sup>

Marx was in a similar position. He also wanted to derive some definite laws of movement for capitalist society and therefore needed a method of aggregation which would enable him to avoid the pure, general but powerless Walrasian conclusion: Everything depends on everything else. But Marx was satisfied with neither the Hicksian method of taking relative prices as weights of aggregation, nor Keynes' solution of measuring aggregate output, aggregate consumption and so on in terms of wage-units, because the weights used in these methods of aggregation would fluctuate, depending on market conditions. Marx, unlike Hicks and Keynes, wanted to establish economic laws of a very long-run nature, such as 'the law of the tendency of the rate of profit to fall', 'the law of population peculiar to the capitalist mode of production', 'the general law of capitalist

<sup>2</sup> J. R. Hicks, *Value and Capital* (Oxford University Press, 1946).

accumulation', and so forth, so that he had to base his macro-model on more stable and more solid aggregates. It is my opinion that the labour theory of value plays a most important part in Marx's economics, since it provides a system of constants, in terms of which his microeconomic model may be aggregated into a two-departmental macroeconomic model, under a number of assumptions.

It is no exaggeration to say that before Kalecki, Frisch and Tinbergen no economist except Marx, had obtained a macro-dynamic model rigorously constructed in a scientific way. His micro-model, the foundation of his macro-model, might on the other hand, as I have mentioned, be compared with Walras' general equilibrium model of capital formation and credit. These are the most elaborate models we have ever had, though Walras' is more detailed than Marx's in the analysis of consumer demand for commodities. This last point has often been reckoned as one of the defects of Marx's theory, but it must be remembered that only by drastically simplifying the aspect of consumers' choice was he able successfully to derive definite dynamic laws concerning the working of his system through time. It was a very practical bargain, which has become popular among us since Keynes' *General Theory*. Hicks accepted the same exchange in his *Theory of the Trade Cycle*. Leontief, in his short-run theory, even regarded consumption as constant. Thus many contemporary economists believe that it is more important to obtain a theory which can describe dynamic movements of the economy, rather than one which can elaborate consumers' preference. This is exactly the choice which Marx made.

Moreover, Marx's theory of reproduction is very similar to Leontief's input-output analysis. (Or more correctly, we should say conversely that Leontief reproduced Marx as well as Walras in a pragmatic way.) And as we shall see later, Marx's theory contains in itself a way to the von Neumann Revolution; although he will have lost some of his properties during the Revolution, after it he will be honoured as one of the authors of the Marx-von Neumann model, in which, if we wish, we can allow for consumers' choice as I have done in my *Equilibrium, Stability and Growth*. Thus Marx is still active on the frontier of our science. One of his tools has recently been rediscovered and named the factor-price frontier – one of the most fundamental concepts

of present-day growth theory. His idea of the dual duality, one duality between physical and value systems and the other between physical and price systems, has now been acknowledged by all economists as the first principle of all societies producing commodities for exchange, though it has to be simplified into a single duality between physical outputs and prices. The concept of the value-composition of capital, which Marx utilized in aggregating industries and in constructing his breakdown thesis, is no more than the Marxian counterpart of the capital-labour ratio, which has been found most useful in the analysis of growth. These would be enough examples to recommend Marx as a purely academic economist for one of the very few chairs with the highest authority.

Unfortunately, however, it will be found that Marx has to lose much, even his most precious properties, in order to be legitimated by orthodox economists. Marx's labour theory of value and his theory of exploitation are, in spite of repeated criticisms by his opponents, highly suggestive and economically meaningful under some conditions. Nevertheless, they must be victims of the von Neumann Revolution; in fact, as we shall see, von Neumann's new treatment of capital goods and his criterion for the choice of techniques are found to conflict with the uniqueness of the actual value system, which is an unavoidable requisite for a system of weights to be able to serve as aggregators. It is true, as we shall also see, that the value theory and the exploitation theory may be revised in terms of the optimum values so as to survive the Revolution. But such revisions assume homogeneous labour; otherwise the value theory, either in the optimum or in the actual form, may be inconsistent with any uniform rate of exploitation.

Another victim is provided by his theory of the breakdown of the capitalist mode of production. It is evidently the essence of Marxism, but it was only briefly discussed by Marx himself; so that he might not be too surprised to hear that counter-examples have been found later. It must also be emphasized, on the other hand, that despite the counter-examples more work needs to be done in this largely unexplored area. As mathematical growth theory has become involved in the Rostovian take-off problem, it must be concerned with the Marxian breakdown problem too, and many interesting findings may be expected.

It will take a long time for these Marxian concepts to re-establish their legitimacy; perhaps they will never be able to acquire full citizenship in scientific economics. Nevertheless, they are attractive and worth speculating about. It is no wonder that some economists cannot agree that they should be abandoned. Those who are interested in these subjects will continue to form a subgroup for investigating such special and yet illegitimate topics. Marxian economics may continue to exist in this way after all the valid achievements of Marx have been commonly accepted by economists, and the division between valid Marxian economics and orthodox theory has been removed.

Thus our approach to Marx is somewhat different from the so-called Marxian economics, now stylized by both Marxists and non-Marxists. We make Marx stand out not only for his own sake, but against the economic theory of our time. Our aim is to recognize the greatness of Marx from the viewpoint of modern advanced economic theory and, by so doing, to contribute to the development of our science. We do not discuss Marx in relation to his predecessors, such as Smith, Ricardo and Quesnay; we pay no attention to the development of Marxian economics after Marx. We neglect even his works other than the three volumes of *Capital*, and confine ourselves to assessing, according to the standards of contemporary economic theory, his contributions in that book to the following major topics of traditional Marxian economics: (1) the labour theory of value, (2) the theory of exploitation, (3) the transformation problem, (4) reproduction, (5) the law of relative surplus population, (6) the falling rate of profit, and (7) the turnover of capital.

In part I the classical labour theory of value is rigorously mathematized in a familiar form parallel to Leontief's intersectoral price-cost equations. The hidden assumptions are all revealed and, by the use of the mathematics of the input-output analysis, the comparative statical laws concerning the behaviour of the relative values of commodities (in terms of a standard commodity arbitrarily chosen) are proved. There is a duality between physical outputs and values of commodities, which is similar to the duality between physical outputs and competitive prices. It is seen that the labour theory of value may be compatible with the utility theory of consumers' demands or any of its improved variations.

Part II discusses a fundamental theorem concerned with the rate of profit, after it explains Marx's theory of exploitation. The Morishima-Seton-Okishio theorem states that the equilibrium rate of profit is positive if and only if the rate of exploitation is positive.<sup>3</sup> This is one of the theorems which Marx wanted to establish in *Capital*. It may be considered as the heart and soul of Marxian philosophy, since it implies that exploitation is necessary for the continued existence of a capitalist economy, because it cannot survive if the equilibrium rate of profit is not positive. The theorem is proved by using the concepts of the factor-price frontier and the exploitation frontier. Since the factor-price frontier is a topic at the forefront of contemporary economic theory, the theorem may be of great interest, even if we confine ourselves to considering only its analytical aspects.

Marxian economics, unlike traditional economics, has developed two different systems of accounting, one in terms of prices and the other in terms of values. If there were no exploitation, they would be identical. But in any capitalist economy where exploitation exists, the 'law of value' does not present itself in its pure and simple form; values and prices may differ from each other. The transformation problem is therefore concerned with the conversion of accounts in terms of value into accounts in terms of price. Chapter 7, part III is concerned with the problem of converting the values of commodities into their production prices, whereas the problem of converting the rate of surplus value into the rate of profit is the subject of chapter 6, part II. Our discussion of the transformation problem brings forth, in addition to the main results aimed at,<sup>4</sup> a by-product which is

<sup>3</sup> M. Morishima and F. Seton, 'Aggregation in Leontief Matrices and the Labour Theory of Value', *Econometrica*, 1961; N. Okishio, 'A Mathematical Note on Marxian Theorems', *Weltwirtschaftliches Archiv*, 1963.

<sup>4</sup> It has been a tradition among critics of Marx since Böhm-Bawerk to point out contradictions between volumes I and III or to conclude that Marx was wrong in the transformation problem. The tradition has recently been reinforced by using modern techniques of mathematical economics. (See P. A. Samuelson, 'Understanding the Marxian Notion of Exploitation: A Summary of the So-Called Transformation Problem Between Marxian Values and Competitive Prices', *Journal of Economic Literature*, vol. IX, no. 2, June 1971, pp. 399-431.) My discussion of the transformation-problem in this book, the original version of which was available in a mimeographed form before the publication of Samuelson's paper, is very different from his in its conclusions, in spite of the surprising similarity in the mathematics used. (For example, he has also obtained the exploitation frontier as well as the factor-price frontier.) I am very much more sympathetic than he is. This is

more important than the main products, although Marx was not fully aware of it. This is the finding that the aggregation condition that industries which are similar in the value-composition of capital can be aggregated safely into one hybrid sector, a 'department', is a corollary of the transformation problem, offering the basis for Marx's two-departmental growth theory. Chapter 8, in which the aggregation condition is established, is an important chapter forming a bridge between Marx's micro-theory of price determination and his macro-theory of output determination.

Part IV deals with Marx's theory of economic growth. We follow Marx in starting by analysing the state of simple reproduction. When the system satisfies Marx's aggregation conditions, various elementary sectors (or industries) can be aggregated into two major departments, producing consumption and capital goods respectively. This simple macro-theory of stationary states is then generalized into the theory of extended reproduction which is Marx's growth theory. It is seen that his model performs badly because he assigned different and asymmetric roles to the capitalists of departments I and II in the accumulation of capital. But with some revisions the model is found to generate a dynamic path which is unstable, as it diverges from the balanced equilibrium growth path, unless it is already on the balanced growth path at the outset.

As soon as we derive such an unstable path, we can easily discuss Marx's theory of relative surplus population, on which the theorem of the breakdown of the capitalist mode of production is based. Its uniqueness is clear when it is compared with the neo-classical theory. It removes the postulate of full-employment and full-capacity growth and maintains the necessity of monotonic or cyclic accumulation of the reserve army of the labour force. It is not difficult to find counter-examples to Marx; but nevertheless it is true that the cases alleged by him are possibilities that are missed or suppressed by neo-classical economists. Finally, the last part of chapter 11 is devoted to a correct proof of the law of the tendency of the rate of profit to fall.

Part V is mainly devoted to an appraisal of Marx's achievements. In chapter 14 we criticize the labour theory of value in its an interesting example of the non-univalence of the correspondence between economics and mathematics.

relation to (i) the heterogeneity of labour, (ii) joint production, and (iii) the problem of choice of techniques. Once one of these three is admitted, the labour theory of value is seen to get into difficulties. This means that, rigorously speaking, we cannot admit Marx unless he is prepared to abandon the labour theory of value. At first sight this may seem to be a most drastic proposal, which Marxian economists could not accept; but Marxian economics without the labour theory of value is in fact found to be as conceivable as Walrasian economics without utility theory, for the following reasons. Firstly, it must be remembered that we understand the labour theory of value as a theory of aggregation, reducing the number of sectors to a manageably small number. We understand this aggregation theory as a pragmatic theory which is applicable in some cases and inapplicable in others, as Hicks' theory of a group of commodities is in his *Value and Capital*. We must avoid it because we want to obtain a rigorous general theory, but we admit that it is a useful theory if it is carefully applied. Secondly, by virtue of the recent development of multi-sectoral growth analysis we are now very much richer in the techniques of dynamic analysis than was Marx. In the future it may be possible to derive fruitful conclusions from the Marxian multi-sectoral growth model by using such new techniques; if so, aggregation may be avoided and the role of the labour theory of value will become less important.

In chapter 13, before making these critical comments, we show that Marx's theory of reproduction was the prototype for the contemporary theory of economic growth. In fact his theory is comparable with von Neumann's theory, which is the most satisfactory dynamic economic theory we are now provided with. It is indeed a great surprise to find that many of von Neumann's novel ideas were clearly stated in *Capital*. Furthermore, Marx's work in this field was done independently of the labour theory of value and can easily be developed into the Marx-von Neumann theory of general dynamic equilibrium. The conclusion is, therefore, that irrespective of our ideologies or political views, we all owe the foundation of dynamic general equilibrium theory, the core of economic theory, to Marx.

This appraisal may be compared with that made by O. Lange nearly forty years ago. He compared Marxian economics and modern economic theory as follows: 'Marxian economics can

work the economic evolution of capitalist society into a consistent theory from which its necessity is deduced, while "bourgeois" economists get no further than mere historical description. On the other hand, "bourgeois" economics is able to grasp the phenomena of the every-day life of a capitalist economy in a manner that is far superior to anything the Marxists can produce.'<sup>5</sup> However Lange never compared Marx's analytical dynamic theory, rather than his historical and sociological theory of economic evolution, directly with its counterparts in modern economic theory. If he had compared them, he might have conceded the superiority of Marxian economics over modern economics in dynamic analysis. In spite of the existence of Frisch's, Tinbergen's and Kalecki's macro-dynamics and von Neumann's growth theory, the interest of the majority of orthodox economists was confined to static or short-run problems at the time when Lange's comparison was made. It was only after the war that the theory of growth became the main subject of orthodox economics. It took nearly ninety years for orthodox economists to overcome the initial advantages of Marxian economics in the field of dynamics. Now it is proposed to integrate the growth theories of the two schools into the Marx-von Neumann theory, and a new stage of development is about to start.

<sup>5</sup> O. Lange, 'Marxian Economics and Modern Economic Theory', *Review of Economic Studies*, June 1935, p. 191.