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TIME IN ECONOMIC THEORY

JOAN ROBINSON

'Today' is at the front edge of time. It moves continuously forward with an ever lengthening past behind it. Any event that occurred at any date in history occurred when that date was 'today'. We attempt to understand its causes, which lay in its own past and to trace its consequences which followed in its own future. The future up to today of any event in the past has already happened. As would-be social scientists - historians and economists - our relations to an event in the past and an event taking place 'today' are radically different. The consequences of past events can, in principle, be known, or at least discussed, while the consequences of a present event can, at best, be predicted with a range of possibilities which may turn out not to have been correctly anticipated. This is a necessary condition of human life. Life as we experience it would not be possible if the future was known for certain.

There was a young man who said
'Damn ! Now I perceive that I am
A creature that moves
In predestinate grooves
Not even a bus, but a tram'.

He was wrong. 'Today' is influenced, but not completely bound, by the past. Any action or decision taken today is either the result of blind habit and convention or it is directed towards its future consequences, which cannot yet be fully known.

There is a third kind of time which is met with in economic theory, that is, logical time in a specified model.

I. LOGICAL TIME

In a properly specified stationary state, there is no distinction between any one day and any other. On a properly specified growth path, such as a von Neumann ray, exhibiting a particular pace of expansion of employment and of a specified stock of means of production, there is no movement forward and upward or backward and downward, except the movement of the reader's eye along the curve.

Unfortunately, the great majority of models in the textbooks are not properly specified. Take, for instance, the familiar Marshallian cross of supply and demand curves showing an equilibrium point in the middle. At a price above the equilibrium level, offer exceeds demand, and below, demand exceeds offer.

Now we are told, if price at any moment is not at the equilibrium level, it will tend towards it. This means that historical events are introduced into a timeless picture. As Professor SAMUELSON kindly explained to me, 'When a mathematician says "*y* rises as *x* falls", he is implying nothing about temporal sequences or anything different from "When *x* is low, *y* is high" [1].

To move implies a temporal sequence. To fill in the story of a movement towards equilibrium, a complicated dynamic process must be specified and to specify a process that will actually reach equilibrium is by no means a simple matter[2].

The other favourite diagram in elementary neoclassical textbooks is an isoquant showing a given output produced by different combinations of 'capital' and labour. The question, raised by THORSTEIN VEBLEN in 1908 and by myself in 1953, as to whether a 'quantity of capital' is a number of dollars or a stock of productive equipment, has not yet been answered, but even if we allow them to specify it as a number of tons of putty, they are not

[1] See J.ROBINSON, 'Misunderstandings in the Theory of Production', *Greek Economic Review*, Vol. 1, 1, p. 4.

[2] See A.MEDIO, 'A mathematical note on equilibrium in value and distribution', *Economic Notes*, Siena, Vol. 7, 23 (1978).

out of the wood. Two points on the isoquant represent two different techniques of production, one with a higher ratio of putty to men employed than the other. A movement from one to the other would involve augmenting the stock of putty or dismissing some workers. Before we can go on with the story, we want to know which.

MARSHALL was aware of the difficulty[3]. He drew a long-period supply curve going forward through time, with economies of scale and learning by doing. At any date that had once been reached, he conceived that there was a curve running backwards showing lower costs than on the forward curve because economies that have once been achieved would not be lost if demand were to shrink so that output had to be reduced. But this device raises more problems than it solves.

A pseudo-production function (though I confess I was the first to draw one) is not a legitimate construction. It exhibits different techniques, each with the appropriate stocks of equipment already in being. This was a protest against a production function with putty capital but it did not go far enough. It led on to a protest against confusing comparisons of imagined equilibrium positions with movements through historical time.

SRAFFA'S model escapes these difficulties if we interpret it in terms of comparisons of possible self-reproducing states. There are two completely separate sets of comparisons. One is of different technological systems, which is hinted at in *Part III* of *Production of Commodities*… The other is of different distributions between wages and profits of the net output in a single system. There is a great deal to be learned from this model, particularly in a negative direction. It is a *Prelude to a Critique of Economic Theory.* The theory which cannot survive the critique is the notion that the rate of profits in a capitalist economy is determined by the relations between 'factors of production' expressed in the concept of the 'marginal productivity of capital'. But as the basis for analysis in a positive direction there is a difficulty about the specification of SRAFFA'S model in terms of

[3] *Principles,* Appendix H.

logical time. The difficulty arises already in the first part of the argument before joint products and fixed capital are introduced; in the present context we need not go beyond it.

The technical conditions of the model are described in a 'system' of input-output equations in physical terms. There is the same turnover period for each element in the system. The labour force, working with the inputs, replaces them with a surplus which is divided between wages and net profits at the end of the period. This entails that at the beginning of the period there were stocks of the required inputs in existence in the correct proportions.

SRAFFA conducts the analysis in terms of *changing* the share of wages in net output but this cannot be taken literally for a given share puts the model on to a predestinate tramline. The argument must be conducted in terms of *comparing* different shares with the same technical system. To any given share, there corresponds a particular rate of profits, uniform throughout the system, a pattern of prices of inputs and outputs, and a pattern of ratios of gross profits to the wage bill (profit margins) in the various industries.

Many high-theorists are fastidious about mentioning money but I do not see any objection to introducing an arbitrary money-wage bill per period, and reckoning prices and profit margins in money terms.

Now, the difficulty is that there is no relation between distribution and the physical composition of net output. The wage is a share of net output, whatever it may be made of. If growth is going on, part of net output consists of investment goods which workers' households cannot consume. We can evade this problem by putting the model into a stationary state so that all net output is consumed - throwing the wage, as SRAFFA says, into the limbo of non-basics. Then net output may be conceived to be made up of homogeneous baskets of consumable goods, but still it is unnatural to postulate that rentiers take their share in the same proportions of various items that go to workers' households.

This problem arises because there is no causality in SRAFFA'S system. The capitalists do not decide what labour to employ, what prices to set and what investment plans to draw up.

All they can do is meekly to fulfil the equations that the observing economist has written down. The only limitation on what the equations may be is that the workers' share of consumable goods is enough to support life.

But if we are to introduce decisions into the model, we must introduce time. Decisions are taken in the light of beliefs about their future consequences. To make the model coherent, we must endow the capitalists with correct foresight as to what composition of output and what pattern of prices will maximise their profits. Then the division of net output as between wage goods and luxury items is made to lit the distribution of income between workers and rentiers. Each rate of profits, with a given basic technology, must be conceived to have an appropriate composition of the flow of net output.

In a short-period model, there is not correct foresight. There are individual expectations which need not be consistent with each other and which may turn out later to have been mistaken. Productive capacity - the stocks of inputs and training of the labour force - has been brought into existence by past events; it is whatever it is. Capitalists, taken one with another, are offering employment at certain wage rates in order to produce a particular flow of output and households are deciding upon a particular flow of purchases. The consequent interaction of individual decisions is seen in the total composition and prices of the total flow of output and its distribution between wages and gross profits. This brings about the realisation of surplus value, in Marxian language, or the equalisation of savings with investment, in Keynesian language.

In working out the relationship between the share of wages in net output, and the corresponding uniform rate of profits on capital, SRAFFA'S model cannot evade the distinction between the future and the past.

II. HISTORICAL TIME

We certainly would not expect, in studying past history, to find a date at which a uniform rate of profit was ruling in the capitalist world, or in any one country comprised by it. The construction of a long-run model does not lead up to any plausible hypotheses about reality. It is useful for eliminating contradictions and pointing towards causal relations that will have to be taken into account in interpreting history. Nor should we expect to find a period in which technology can be represented in a single system of equations or in an orderly series of vintages. The analysis for comparing technologies has unfortunately run up the blind alley of the pseudo-production function, which has held up the development of long-period theory for the last twenty years. To construct models that cannot be applied is merely an idle amusement. It is only by interpreting history, including the present in history, that economies can aspire to be a serious subject.

A notable practitioner of the discipline, E. H. CARR, has maintained that the study of history is of the same nature as the study of physical science:

'All thinking requires acceptance of certain pre-suppositions based on observation which make scientific thinking possible, but are subject to revision in the light of that thinking. These hypotheses may well be valid in some contexts or for some purposes, though they turn out to be invalid in others. The test in all cases is the empirical one whether they are in fact effective in promoting fresh insights and adding to our knowledge. The methods of RUTHERFORD were recently described by one of his most distinguished pupils and fellow-workers :

"He had a driving urge to know how nuclear phenomena worked in the sense in which one could speak of knowing what went on in the kitchen. I do not believe that he searched for an explanation in the classical manner of a theory using certain basic laws ; as long as he knew what was happening he was content."

This description equally fits the historian, who has abandoned the search for basic laws, and is content to enquire how things work[4].'

[4] E.H. CARR, *What is History?*, pp. 53-54, Macmillan (1961).

The study of history and of natural phenomena are social activities. There is no point in trying to justify them. Like climbing Everest, the motive for studying society is because it is there. Knowledge of physics has produced enormous practical consequences for good and ill. Knowledge of history, as it filters down to the man in the street, produces political consequences. But if any study is conducted with a view to its consequences, it is liable to become corrupted. A serious subject must be studied, with an open mind, for its own sake.

Here the study of society and of the physical universe are, in principle, alike but the difference of degree is enormous. The inclination to bend the evidence in favour of a pre-conceived result is much more prevalent when human beings are studying human society than when they are studying the external world, and the discipline of the subject to prevent it is much weaker.

Professor ZIMAN describes procedures in the physical sciences:

'In order that science may continually break through the invisible barriers of its own paradigmatic categories, each scientist is encouraged to be an imaginative source of interpretation, both of his own contributions and of the work of other scientists.

On the other hand, nothing may be published as scientific information without careful, critical scrutiny by editors, referees and reviewers. The highest standards of instrumental accuracy and logical necessity are imposed on all scientific communications. Experiments are conscientiously repeated and theoretical calculations tested by alternative procedures. Every scientific paper, ostensibly building on the preceding work that it cites, carries an implied or open criticism of much of that work, which it seeks to validate or disconfirm and supersede. Review articles, colloquia and research monographs delineate controversial issues, and delicately point out the deficiencies of many reputable research contributions.

Experienced scientists know, indeed, that real progress in research is slow and painful, and that many experimental observations and plausible arguments will not stand up for long under expert questioning. If science is to evolve, it must continually purge itself of misconceptions, follies and practical errors: there must be preserved a central store of absolutely reliable knowledge, from which to draw in evaluating novel ideas and on which, very slowly and carefully, to build. In order that

science may retain its reliability and credibility, each scientist is expected to exercise critical vigilance over his own work and the claims of his contemporaries.

This truly remarkable and civilized behaviour amongst scientists we take for granted: these are the standards against which occasional pathologies are judged. And if those who rule society - aristocrats or democrats, capitalists or socialists, conservatives or radicals - want scientific knowledge on which they can rely, they must not allow the inner tension of science to slacken, break, or overbalance. According to the narrow logic of bureaucratic planning, it is a wasteful, irrational system that ought to be made efficient and economical. But by encouraging innovation, yet conserving past achievement, by calling the gambling competitive spirit from each of us, yet making us also the guardians of truth and the judges of quality, it is remarkably successful as the source of many wonders[5].'

These standards do not prevail in the social sciences and it seems vain to expect that they ever could. In the absence of a decisive and agreed method for reading the evidence from history, the choice between rival hypotheses is influenced by psychological and political factors not susceptible to pure reason. Thus hypotheses are turned into doctrines.

MARX set out to discover 'laws of motion' of the capitalist system as it had emerged in the Western world and he made bold predictions about what for him was the future. Now a good stretch of that future is our past. Here we have an opportunity to apply scientific method to the study of our own society, checking his hypotheses with actual results. In the writing of history, this has borne good fruit but in economies it has been wasted, for the most part, in a theological style of verbal disputes.

The short-period theory in MARX - the process of the realisation of surplus as it has been developed by KALECKI - has laid the foundation for an analysis of employment, distribution and effective demand and of the consequences (though not of the causes) of changing technological knowledge.

Nowadays, hypotheses based on this line of thought are swamped in orthodox teaching by the doctrines of monetarism. At

[5] JOHN ZIMAN, *Reliable Knowledge* (1978), C.U.P., p. 132.

the present time (1979) a policy based upon those doctrines is actually being carried out in the U.K. This will provide a rare chance to show which of two rival hypotheses is going to prove to be the least correct.

III. WHEN IS THE LONG RUN?

In expounding economic theory, the statement is often made that such and such will happen 'in the long run'. For MARSHALL, the long run is a period of *future* time after some event has occurred. An unforeseen rise in the demand for fish, at a certain date, causes its price to rise. High profits attract investment into the business and the subsequent higher flow of output will bring the price down. MARSHALL implies that the price will come back to more or less where it was before, but predictions of this kind are usually guarded by the phrase 'other things equal'. The Marshallian method of exposition is to attempt to trace the effects over the future of a particular event happening 'today' by the one-at-a-time method, that is to say by assuming that we know what would have happened over that particular period of future time if this event had not occurred. This could be specified in a model where all elements are under the control of the observing economist : MARSHALL makes the step from a model to reality by an act of faith. He knows that other things in fact will not be equal - history marches on - but he supposes that it is possible to trace the effects of a single specified event *as though* it was the only change that occurred at a particular date.

The weak point in the argument is that he cannot specify *what* would have occurred in the absence of this event. He has a concept of the level of the normal rate of profit, but he has no theory whatever of what causes it to be at any particular level or of a mechanism that causes it to be maintained at a constant level 'in the long run'.

This arises from the basic fudge in MARSHALL'S theory of the long-term rate of interest (which means the rate of profit) as the 'reward of waiting'.

RICARDO postulated a mechanism which keeps real wages from remaining, over a stretch of some years of historical time, much above or below the level necessary to support the customary standard of life of the workers. MARSHALL removed this cruel mechanism from his system and put nothing in its place.

The search for a theory of the normal rate of profit is proverbially like looking in a dark room for a black cat that probably is not there. If we had complete information about a period of past history we could see what were the flows of gross profits in various industries, what allowances were made for depreciation and so what were the flows of net profits and we could see what changes were made over the period in stocks of productive capacity and the ownership of financial wealth. To account for what happened, we should have to enquire what conventions and expectations were guiding conduct at dates in the period when decisions were taken by firms and households. Thus we could choose between the hypotheses that theorists have put forward and see which were the least unplausible.

Then we should have a long-run theory based on past experience and we could use it to predict what will be the future provided that no relevant change takes place in the conditions prevailing in the past.

Unfortunately, when our predictions turn out to have been incorrect, we should have the fresh task of finding out whether there has been a relevant change or whether our theory was not correct in the first place.

IV. WORK IN PROGRESS

Economies can never be a serious subject on the plane of physics but we can make it a great deal less frivolous than it is at present. We must throw out concepts and theorems that are

logically self-contradictory, such as the general equilibrium of supply and demand, the long-run production function, the marginal productivity of capital and the equilibrium size of firms.

In the space thus cleared, we can assemble the hypotheses about the world we are living in which seem to be surviving best. In commodity markets, prices fluctuate under the influence of changes in the relations of supply to demand, without ever tending towards stability. In corporate industry, prices are set by the producer in relation to costs, but since costs include depreciation, *net* proceeds can be known only after the event. These prices are not much affected by the volume of demand but are sensitive to changes in money costs and in taxation.

The most reliable part of our apparatus is the analysis of effective demand initiated by KEYNES and KALECKI. Swings of activity must be seen, not as starting up from cold, but as overlaying slow long-run changes in productive capacity produced by accumulation, technical change (including changes in methods of operation of the labour force) and alterations in the composition of output. The interaction between the long-run and the short-run consequences of technical innovations is a complicated subject which requires more study.

The evolution of business activity and trade-union policy should be approached in the spirit of natural-history observation of the behaviour of classes and groups.

The analysis of international trade should be preceded by an inquiry into the meaning of a 'nation' in the relevant respects - a question which nowadays is not so simple as used to be supposed.

All this, and much more, indicates work to be done, provided that we give up the search for grand general laws and are content to try to enquire how things happen.

SUMMARY

Everyday, in real life, the past is irrevocable and the future predicted with a margin of uncertainty. In a theoretical model, time can be frozen but it is a common error to confuse a comparison of static positions with a movement between them. E. H. CARR claims that historians and natural scientist are alike in having given up the search for grand 'laws' and are now content to try to learn 'how things happen'. To improve the status of economies it is necessary to get rid of logical contradictions, which involves eliminating the concept of static equilibrium; to guard against conception by ideological prejudice and to use the study of history, as it unfolds, to check up on the hypotheses that theory suggests.

RÉSUMÉ

Chaque jour, dans la vie réelle, le passé est irrévocable et le futur se prévoit avec une marge d'incertitude. Dans un modèle théorique, on peut geler le temps, mais c'est une erreur courante de confondre la comparaison de deux positions statiques avec le mouvement qui les relie. E.H.CARR déclare que les historiens et les biologistes font la même chose en ayant promu la recherche de grandes «lois», alors qu'ils se contentent maintenant d'essayer d'apprendre «comment les choses arrivent». Pour améliorer le statut de la science économique, il est nécessaire de dépasser les contradictions logiques. Ceci implique l'élimination du concept d'équilibre statique, la vigilance vis-à-vis des présupposés idéologiques, et l'utilisation de l'étude de l'histoire pour vérifier les hypothèses que suggère la théorie.