Ideas and Concepts of Long Run Growth*

"Long run" and technical progress are subjects which have lain dormant from the Classics to the end of World War II, if exception is made for Marx and Schumpeter. Since then curiosity about them has been aroused again, impelled from different sides: the interest of the former colonies in development on the one hand, and a renewed optimism in mature industrial countries on the other, combining as it did Keynesian policies and technical progress in an attempt to drown social antagonisms in a flood of prosperity. Each of the two interests has given rise to a separate theory and literature, understandably in view of the large difference in problems. It would be desirable to bring them under the same roof, as it were, but I shall be modest enough to confine myself to the industrial countries.

Technical development was often felt to be an alien intruder in economics, and many economists wanted to keep it out altogether. It was, therefore, somewhat of an embarrassment when Abramovitz (1952) followed by others showed that by far the greater part of the historical advance in product per man was due to technical progress, i.e. it would not have happened by simply applying more capital per man, unless that capital embodied new methods.

Notwithstanding that, growth theory *par excellence,* the model of John von Neumann does not know any technical progress at all. All possible techniques are known already in that model and nobody learns anything. Von Neumann's model is a *tour de force* showing how steady growth can go on and perpetuate itself automatically without any change in technique and without any reco-

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gnisable aim (except accumulation as such). Effective demand does not play any role in the model: all profit is automatically reinvested. Labour is no problem because it is available at subsistence wage in any amount. There is no restriction on natural resources either. Optimum growth is the result of the magic of a price system which ensures equality of profit rate and rate of growth at the maximum level.

This is the climax of " pure economics," the complete elimination of history. It reminds me of Joshua bidding the sun to stand still to let the battle go on. This economic perpetuum mobile is symptomatic for the formalistic tendencies of contemporary economics which are much against the intentions of John von Neumann himself who hoped for quite a different effect of his model.

While von Neumann's paper (1945) formed the origin of one movement in growth economics, the work of Harrod (1939, 1948) provoked another.

In contrast to von Neumann, Harrod recognises two important constraints of growth: the one is effective demand, the other is the supply of manpower which he takes as given exogenously.

For Harrod steady growth presupposes that the demand and the capacity effects of investment be reconciled. Demand is proportionate to the level of investment, capacity to the integral of investment over time. The two effects can be matched, demand and capacity can grow in step only when there is exponential growth. The rate of it is given by s/c, the savings ratio divided by the capital-coefficient.

A characteristic feature of Harrod is a disbelief in the neo-classical adjustment of factor combinations: the capital-coefficient is rigid and is not even changed by technical progress. Another feature, however, Harrod shares with most other growth economics: his method is to start from an analysis of the conditions which make a steady state self-perpetuating growth possible, a kind of " stationary state of growth rates." By showing how and when these conditions clash with the real world and the system therefore moves away from the " steady growth " Harrod tries to describe things as they are. As an underlying tendency, a trend, the steady state path nevertheless is for him a reality; it is based on the reinvestment of profits which takes place when the recent investments have proved satisfactory. The actual movements away

from this " warranted growth path " (which are enforced for example when the growth hits the ceiling of labour supply and the system is driven down into deep recession) he identifies with the trade cycle (see especially his 1951 paper in *Economic Journal*). Thus his trade cycle is as it were enforced (exogenous) and his trend is inherent (endogenous) — the reverse of the position of Kalecki as we shall see directly.

Neo-classical growth theory, if only in a spirit of dialectical negation, is derived from Harrod. It did not exist before.

The weight of its argument (see, for example, Solow, 1956) is on proving that Harrod's steady state need not be unstable; that it can be made stable as soon as the assumption of a constant capital-coefficient is removed. " In the long run," so the argument runs, there is a choice between various existing methods of greater or lesser capital intensity, a choice which will depend on factor prices (i.e. real wages and real profits) which in turn will be (or ought to be?) ruled by relative abundance or scarcity of labour and capital. Accordingly, a discrepancy between the warranted rate of growth (savings ratio divided by capital-coefficient) and the natural rate (i.e. growth rate of manpower), leading as it will to growing or shrinking unemployment, is bound to correct itself automatically: if the warranted growth rate (which for the sake of the argument is assumed to be equal to the actual growth rate at least initially) is too high, a shift to more capital intensive methods will save labour and equalise the two rates. If the warranted (and actual) growth rate is too low, a shift to less capital intensive methods, using more labour, will restore coincidence of the two rates.

(The *level* of unemployment is not touched by this argument which only relates to its relative growth or decline.)

It should be noted that a rise or fall of capital-intensity in the context of the above argument necessarily involves a rise or fall of the capital-coefficient. Indeed if more labour is used per unit of capital, the output of a given capital must rise, else there would be no point in using the method. And if less labour is used per unit of capital, the output must fall, else the method would have been used already before in preference to the existing one.

Thus in the neo-classical adjustment, capital-coefficients move in the same direction as capital-intensity, though by a lesser pro-

portion. The change in the capital-coefficient, by virtue of the Harrod equation, leads to a change in the growth rate in the right direction, while at the same time the effect on productivity changes the growth of labour supply (measured in efficiency units), also in the right direction. In this way warranted and natural rate are moving nearer to correspondence.

So far so good, but what the argument proves concerns only the warranted rate. What happens to the actual rate can really not be deduced without assumptions about expectations which rule the investment behaviour. Let us see what happens in two extreme cases, that is, if entrepreneurs extrapolate either the growth of capital or the growth of capacity.

We treat the case where the warranted (= actual) growth rate is lower than the natural rate, and a decrease in capital intensity is required. The alternative case is symmetrical and will not be treated separately.

Let us now suppose that in actual fact firms continue to accumulate capital at the same rate as before; in decreasing the capital-coefficient they will therefore increase their capacity more than before. Thus they will generate as much demand as before, but more capacity than before: they will run into excess capacity, and most likely, into a recession. The alternative procedure would be to continue the growth of capacity at the old level and lower the rate at which capital is accumulating: that would lead to less demand generation, and again to excess capacity and slump.

In each case the movement of the actual rate is away from the natural rate of growth, contrary to the neo-classical assertion. Harrod's instability does not depend on his assumption of constant capital-coefficient! That should be obvious from the start if one keeps in focus the basic idea of Harrod: that the demand generation and capacity generation of the investment must be matched, and that will happen only on a certain growth path.

Such arguments, implying as they do assumptions about entrepreneurial expectations and investment determination, are brushed aside by the neo-classicists as "merely short run." Long-run arguments which do not refer to an investment function and the implied expectational assumptions cannot, however, produce any results relevant to the actual rate of growth. For an elaborate and precise analysis of the entanglements of neo-classical growth theory the reader is referred to Amartya Sen (Sen, 1970).

I think that the attempt to hybridize Harrod and neo-classicism can only produce a freak. Harrod wanted to show the relevance of effective demand to long run growth, and his equation makes sense only in this context. In contrast to this neo-classicism is interested in an optimum, an equilibrium implying full employment, a concept which is difficult to adapt to growth and development in conditions of rapid change. Economists should rather not try to unite what logic has parted.

Kalecki's views on what he calls the trend (which may be growth or shrinkage) contrast with the prevailing ideas on growth. First, the dominating problem for him (as for Harrod) is effective demand. Without demand there can be no growth and Kalecki's starting point is therefore the question: where does the demand come from?

Second: in contrast to Harrod, Neumann and neo-classicism Kalecki does not start from the concept of a steady state and its conditions. He says the problem ought to be dealt with in the same way as the trade cycle (and preferably in relation to it) by setting up a functional equation which, together with given initial conditions, will determine the process.[1] This may have a permanent solution which means that ultimately a steady state growth will be reached, but in the intervening time a transitory solution will be relevant which will depend on initial conditions. In science this transitory solution can often be neglected because it quickly disappears, but in economics it will usually be practically relevant. It shows how the steady state, if there is any, will be reached. Moreover, the interrelations of cycle and trend will only be revealed by this method of functional equation.

Third: Kalecki does not believe in an endogenous trend arising from the interplay of investment and effective demand and profits created by it, which in turn generate further investment in the next period.

The intuitive appeal of this idea is very strong (I have felt it myself formerly) but Kalecki does not succumb to it. He rather shares the attitude of Rosa Luxemburg who wondered where ca-

[1] Under the name of "process analysis" this can also be carried out step by step without the use of functional equations.

pitalism should find an outlet for the products of its relentless accumulation, and who concluded that only expanding foreign markets or wars could be an answer to this. Kalecki is impressed by the continuing capacity effect of investment which is naturally depressing. A constant net investment will mean increasing capacity but no increase in effective demand. The problem is solved by exponential growth, but to make it possible a given gross investment will have to generate, via profits and enterprise savings, a larger gross investment in the next period: the re-investment coefficient will have to be greater than unity. On this condition gross investment and therefore also the gross capital stock, taking the trend values, will grow exponentially at the same rate, and so will capacity if it is a constant proportion of gross capital.

This will assure steady growth provided the initial values of effective demand and capacity in relation to investment are also satisfactory (Harrod speaks of the investment being "justified"). That is, we cannot start the steady growth from any arbitrary situation, but only from an initial investment which is "justified."

Now it is evident that Kalecki does not believe a re-investment coefficient above one is realistic. The re-investment of savings is complicated by the fact that a part of it accrues outside enterprises and therefore provides no stimulus to investment. In so far as it can be borrowed by business, it will do no harm, but firms may not be in a position to indebt themselves sufficiently. Moreover, there is the depressing effect of the capacity created. How strong it is will depend on the prevailing technique: a high capital-coefficient, providing relatively little capacity for a given investment, will favour the automatic propagation of growth, while a low capital-coefficient will be unfavorable to it. From the available data it seems that capital-coefficients in manufacturing are not very high (see S. Kuznets, 1961).

There is a more specific motive for the position Kalecki takes. His model of the interrelations of investment, profits, saving and effective demand can *alternatively* either produce a cycle or a trend.[2] He uses it to explain the cycle and has therefore to rely on exogenous stimulus to explain the trend. In his model the re-investment coefficient has to be below one in order to generate a cycle. At such a level of the stimulus to re-investment a trend would be impossible unless further assumptions are introduced.

[2] This has been shown by the analysis of Kalecki's equation of the cycle by R. Frisch and H. Holme (1935).

It may be noted here that Kalecki's view about the lack of an endogenous trend is relevant to a question of economic policy, namely the stimulation of private investment by a reduction of the rate of interest, with the aim of raising permanently the level of employment. He argues that this policy will fail in its aim, because the new capacity created after a time will counteract the initial effect of stimulation of investment and the employment will return to its former level.

In a more specific formulation Kalecki ("Three ways to full employment") says that the investment necessary to maintain full employment may easily create more capacity than is necessary for the expansion of full employment output. There will be then decreasing utilisation with corresponding depressing effect. There is some analogy here to Harrod's vision of growth hitting the ceiling of the "natural rate" (manpower growth). It may be noted that innovations in so far as they are saving manpower will ease this problem, although with great troubles owing to limited mobility of labour. We are reminded here of Marx (Vol. I, Ch. 23) who saw the motivation and *raison d'être* (from the point of view of the capitalist) of innovation in the virtual increase of manpower which it contrives and which facilitates the expansion of capital (capacity).

Let us turn now to Kalecki's exogenous explanation of the trend. His trend generator *par excellence* are the innovations. Their effect on investments rests in the expectation of extraordinary profit they raise in the innovator, an expectation which is not created by the actual process of the *Konjunktur* but comes into the circulatory system of demand and investment as an extraneous factor, based not on earnings experience but only on anticipation of something quite new.

The trend generating effect depends essentially on the assumption of a continuous stream of innovations: in other words the stimulus is repeated again and again, so that the negative effect of creation of new capacity is compensated.

It should be mentioned at this point that the recognition of a growth generating effect of innovations indirectly serves to weaken

the belief in an endogenous trend: if indeed the emergence of new techniques such as railways, motor cars etc. has powerfully contributed to economic development, then it becomes exceedingly doubtful whether there is any room left for an endogenous trend. Both together, techniques and reinvestment, might explain more growth than there has ever been!

This does not exclude that techniques and economic forces in the traditional sense might somehow co-operate in the production of the trend; but that, as we shall see presently, is just Kalecki's theory.

In fact he sees the technological development as the working of a " semi-autonomous " force: that is, the emergence of new know-how [3] and the economic growth of the past are reacting on one another and between themselves produce the trend. There is a positive feed-back at the base of the trend, just as there is a negative feed-back at the base of the cycle.

This vision of development reconciles two very strong impressions:

a) that new know-how is an important impulse to growth, and

b) that the way in which the economy responds to new know-how depends very much on current and recent economic growth, or on the " economic climate."

In execution Kalecki's ideas of the trend have remained sketchy in each of the versions he gave.

In the first version (1943) he considers two effects of the innovation: at first there is the anticipation of profit by the innovator which impells him to invest; with the subsequent diffusion of the new method, a depressive effect appears with negative results for investment. Each of the two effects is proportionate to the volume of capital equipment at the moment when the new technique emerges. The negative effect, however, materialises only a considerable time after that. If there is a constant stream of new techniques (" uniform technical progress ") the two opposite effects will cancel out, as long as the economy is stationary. If the economy

[3] The word " innovations " in this context might be misleading because in the almost generally accepted sense of Schumpeter it refers to the stage of full economic realisation of the new technique in the innovator's business.

has been growing, however, the positive effects of current new techniques outweigh the (delayed) depressing effects of former innovations which affected only a smaller capital stock. Thus the technical progress will lead to new growth, provided there has been growth in the past, and if the speed of technical progress is great enough it will serve to perpetuate a given rate of growth.

Moreover, the economy could be lifted from a stationary state by an acceleration of technical progress.

The " trend effect " of technical progress thus depends

a) on the growth of the economy in the past, and

b) on the speed of technical progress, and its change in time.

In this first version of the trend theory the interplay of the exogenous (technological) and endogenous (economic) factors comes out most clearly.

A weakness of the version is that the delayed negative effects arising in the course of diffusion are not very clearly analysed. It will be questioned further below whether they need exist at all. They do not appear in further versions of the trend explanation.

The next version (1954, 1962) makes the trend effect again proportionate to the volume of capital. The analysis concentrates on a steady state solution — a continuous stable trend.

The last version (1968) represents the exogenous influence of technique as a function of time F(t) which appears on the right hand side of the difference equation which describes the long run development. The trend is obtained as a particular solution of the equation; if F(t) is an exponential, the trend will be exponential growth at the same rate. Kalecki assumes that F(t) behaves very roughly like an exponential within a certain range, and deduces that the trend will also be nearly exponential.

This treatment of the trend as a particular solution is mathematically appealing, but it is hardly suitable to convey the essence of the " semi-autonomous " movement — the influence of past growth which is again stressed in the text. This might only be represented by a separate equation by which F(t) is determined from the long run experience of the recent past.

I switch now to an analysis of my own in which I do not want to implicate others; the reader may judge for himself how much it owes to them.

The investment undertaken by the innovator, like any other investment, will generate additional demand and profits and additional capacity. The additional demand and profits will be spread rather far over the whole of industry, while the capacity effect very largely will be concentrated on the particular branch of the innovator.

Within this particular branch there will be a redistribution of profits. The additional capacity created by the innovator will claim its share of the total profits of the branch. This is the "capacity effect." Moreover, in view of his superior technique, the innovator (if the innovation is indeed a success) will have a higher mark-up than the others, and he will therefore draw to himself a disproportionate share (in relation to capacity) of the total profits. The profits of the others will fall, in the first instance simply by a reduction of their utilisation of capacity.

Let us now consider the problem from a macro-economic point of view: we have innovations going on in various branches, and therefore the chance that the demand effects of the innovators' investment offset the capacity effects appear somewhat greater. In so far as the additional demand goes to other (non-innovating) branches, it will act as a stimulant there. The question whether profits, and therefore further investment, over the economy as a whole will be depressed or not will thus very much depend on the relation between the innovators' investment and its multiplier effect, which may be very much weakened in an open system, and the capacity created by it. If the capacity is large, and the extra profit margins of the innovators sizeable, then a negative effect on investment, in the aftermath of the innovation, may make itself felt.

There is, however, the possibility of quite a different scenario. The competitors of the innovator, although weakened financially, may feel that it is a matter of life or death for them to introduce the new techniques themselves (if they can); this will usually depend on the help of banks. There may thus be an "enforced rationalisation" investment, a seemingly perverted reaction to a fall in profits and demand. This sort of enforced technical progress appears at several places in Marx's analysis of accumulation. If this reaction prevails there will be no negative after effect of the innovation at all.

The situation generally becomes more favorable to growth when the diffusion process is largely completed. At this point the

extra profits of the innovator will have disappeared and the old mark-ups will have been re-established for the whole branch. This means that the depressing effect on utilisation from this source will be ended.

The result will be achieved either by price competition in the market of the product, or by an upward pressure of wages in the firms which enjoy differential profits on account of technical advantage ("wage drift"). These differential wage increases in favored firms will put the rest of the branch under the same pressure as price competition, because the wage increase will gradually spill over into the other firms. The wage drift may be an important condition for the re-establishment of normal profit mark-up in all cases where price competition is not effective.

The upshot of the preceding discussion is that the innovation may have — even though it need not — negative after effects on the investment activity. In any case we must, however, face the fact that the investments carried out by the innovator (and perhaps by his followers) will have continuing capacity effects just like any other investment, and the question is how they will be offset.

The solution lies in the idea of Kalecki discussed further above pp. 42-43): the economic effect of a steady constant stream of new technology depends on (is proportionate to) the volume of capital equipment at the time. In a growing economy the steady stream of new know-how will therefore produce a growing volume of "innovation investment"; the demand effects of this will outweigh and exceed the capacity effects of the innovation investment of preceding periods, provided the stream of innovations in proportion to the capital stock is large enough.

I shall now make a concluding attempt to explain in concise form the peculiar role of innovations in the process of growth.

Let us start from the idea that investment as such does not have the power to re-generate itself on an extending scale; this is because of the "incomplete re-investment" (due to savings outside enterprises and other reasons). Now if additional exogenous investment such as that created by anticipation of innovating profits is added to the in-complete re-investment, this may complete, and even over-complete it, and then the conditions for a continuing trend are fulfilled. This presupposes that the investment effect of

the stream of new technologies exceeds a certain minimum in order to be able to play the role assigned to it above.

The role of the above mentioned exogenous factors in the genesis of the trend reminds us inevitably of the role which random shocks play in the cycle which they keep going in spite of its inherent tendency to fade out owing to "damping." And indeed, are the new technologies anything but random shocks? The only difference is that they are shocks in one direction mainly — they are mostly stimulating, and therefore impart to the totality of exogenous shocks a bias. This means they will lengthen and accentuate the booms and shorten and weaken the slumps (Kalecki, 1954, p. 151). Indeed this is all that is required for long run growth.

Mathematically speaking what the above means is that the initial conditions are again and again changed by the innovations (and other shocks). The innovations are not represented by a function of time (as in Kalecki's last version) which yields a particular solution representing the trend. Such a particular solution would be independent of the initial conditions. Instead, in my formulation, there will be discontinuously changing initial conditions, exactly like the random shocks which according to R. Frisch and, following him, Kalecki, prevent the cycle from dying down; the only difference being that I assume the shocks to have an upward bias which produces the trend.

The proposed marriage of exogenous and endogenous causes of the trend leaves ample room for the role of history while at the same time admitting that the impulses coming from outside are seized and moulded by the inherent mechanism of the economic dynamics which acts through the multiplier and the distribution of income, through the accumulation of retained profits and utilisation of capital equipment.

My analysis in *Maturity and Stagnation* (1952) — which was carried out on the naive assumption that an endogenous trend (analogous to that of Harrod) exists and technical progress does not affect the investment process — has thus not been essentially changed by my conversion to the "semi-autonomous" trend. On the basis of that I can still maintain, as I did, that the emergence of an oligopolistic structure in the American economy near the turn of the century, *via* its effect on the "profit function" has reduced utilisation and created fear of excess capacity, and through

the adverse effect on investment has led to a gradual reduction of the growth rate.

I have sometimes been asked why I do not apply a similar analysis to the post-war scene, in view of the concentration which has been going on. I think that any tendency to increase the "profit function" (mark-up) on that account has been offset not only by liberalisation of trade but, more important, by the pressure of organised workers on the wage which has been made possible in conditions of full employment. This pressure has acted so as to maintain the share of workers in the product in face of a tendency of technical progress to create extra profits. In so far as pressure of wages aimed at the differential profits (in the manner of "wage drift" which discriminates between industries and firms according to their profit position) there would be no shift to prices, and the wage pressure would be successful in securing a participation of the workers in the result of technical progress. This explanation is in tune with the continuing prosperity up to 1974. For the subsequent break in the trend the reasons are, I think, to be found in the change of political climate and other factors.[4] It is possible, however, that subsequent to this break, in conditions of continuing unemployment and weakened bargaining power of the workers a tendency for the profit function (the mark-up) to increase, with adverse effects on utilisation and growth, may re-appear again.

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[4] See my "Stagnation Theory and Stagnation Policy," *Cambridge Journal of Economics*, April 1979.

BIBLIOGRAPHY

M. ABRAMOVITZ (1952): "Economics of Growth," in *A Survey of Contemporary Economics*, Vol. II, edited by B.F. Haley, Homewood, Illinois.

M. ABRAMOVITZ (1956): "Resource and Output Trends in the United States since 1870," in *American Economic Review*.

R. FRISCH and H. HOLME (1935): "The Characteristic Solutions of a Mixed Difference and Differential Equation Occuring in Economic Dynamics," in *Econometrica*.

R.F. HARROD (1939): "An Essay in Dynamic Theory," in *Economic Journal*.

R.F. HARROD (1948): *Towards a Dynamic Economics*, London.

R.F. HARROD (1951): "Notes on Trade Cycle Theory," in *Economic Journal*.

M. KALECKI (1943): *Studies in Economic Dynamics*, London.

M. KALECKI (1954): *Theory of Economic Dynamics*, London.

M. KALECKI (1962): "Observations on the Theory of Growth," in *Economic Journal*.

M. KALECKI (1968): "Trend and Business Cycles Reconsidered," in *Economic Journal*.

S. KUZNETS (1961): *Capital in the American Economy. Its Formation and Financing*, National Bureau of Economic Research, Princeton.

J. VON NEUMANN (1945): "A Model of General Equilibrium," in *Review of Economic Studies*, Vol. XIII.

A.K. SEN (1970): "Interest, Investment and Growth," in *Growth Economics*, ed. A. Sen, Penguin Books.

R.M. SOLOW (1956): "A Contribution to the Theory of Economic Growth," in *Quarterly Journal of Economics*.

J. STEINDL (1952): *Maturity and Stagnation in American Capitalism*, Oxford (Reprinted Monthly Review Press, London and New York, 1976).

J. STEINDL (1979): "Stagnation Theory and Stagnation Policy," in *Cambridge Journal of Economics*.

J. STEINDL (1980): "Some Comments on the Three Versions of Kalecki's Theory of the Trade Cycle," in *Studies in Economic Theory and Practice*, ed. J. Los, North Holland Publications.