The Economic Journal, **101** (*January* 1991), 122–133
Printed in Great Britain

THE DETERMINANTS OF GROWTH

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I. THE ISSUES

For the classical economists from Smith, and notably, Ricardo, Marx and Malthus, understanding the process of economic growth was central. And the question 'What determines the rate of growth?' has always constituted one focus of development economics, a subject which we may date from the Second World War. It has, however, been a popular topic for those involved in formal economic theory only for short periods, notably from the mid 1950s to the late 1960s. At the height of that period, now a quarter of a century ago, the ECONOMIC JOURNAL published what must be one of its most consulted papers, the estimable survey by Hahn and Matthews (1964). The loss of interest of the profession in the theory of growth for nearly twenty years, from the late sixties to the late eighties, was unfortunate.

The recent rekindling of that interest (see, for example, Romer, 1986 and 1990, and Lucas, 1988) is to be welcomed. It may be traced to a number of factors. These include, first, the progress in the microeconomic theories of industrial organisation, invention and innovation, and human capital, which have made the discussion of the advancement of knowledge and its relation to markets more coherent. Second, we now have 45 years of increasingly well-documented post-war experience from which a number of lessons can be gleaned. The time period is long enough to reveal accelerations and declines in rates of growth, to show that the growth experiences of different countries can differ in crucial respects, and to ask questions such as whether the incomes per capita of countries will converge. Central to this evidence is the fact that growth rates in different countries can differ, and differ for an extended period of time. This was indeed one of Kaldor's (1961) six stylised facts, to which he drew attention in the late 1950s, although at that time the post-war experience was only fifteen years old and the list of countries which could be included in that empirical analysis of experience was fairly narrow. It is perhaps appropriate, a quarter of a century since Hahn and Matthews (1964), a half-century since Harrod (1939), and with a half-century of extensive cross-country data, to make the determinants of growth a topic for the centenary of the ECONOMIC JOURNAL. Certainly many of the important contributions have been published here.

The first purpose of this paper is then to assess what we have learned from theory about the determinants of growth, and to examine where we should look

* I am very grateful for the helpful comments of Tony Atkinson, Robin Burgess, Peter Diamond, Francisco Ferreira, Gary Fields, Mervyn King and Amos Witztum and the support of the Suntory Toyota International Centre for Economics and Related Disciplines at the LSE.

for insights in the future. In doing this I shall be concerned particularly with advances since the Hahn–Matthews survey and with the lessons from developing countries. The study of growth is generally about the medium or long run. It is about the accumulation of physical capital, the progress of skills, ideas and innovation, the growth of population, how factors are used, combined, and managed and so on. It is therefore, principally, about the supply side.

Most of the theory of the fifties and sixties was positive, in the sense that it was concerned not with policy but with understanding what determines growth. The theory of optimal growth was indeed developed in the mid-1960s (notably Cass, 1965, Koopmans, 1965 and Mirrlees, 1967) but had a limited impact, and in retrospect its main contribution, which was an important one, should be seen in terms of understanding the logic of dynamic optimisation, rather than as an applied tool for solving real policy problems. Both in development economics and in economic theory there has been a resurgence of interest, over the last few years, in the role (beneficial and otherwise) of the state. Our second question is then 'How can, or should, the state influence the rate of growth?' This will be a minor theme for four reasons: first, theory and evidence on the determinants of growth are not yet sufficiently strong for confident assertions on policy for growth to be made; second, it raises difficult and important questions concerning what kind of growth we should be seeking in relation to standards of living and their distribution, to the environment and so on; third, I have recently set out my views on some relevant aspects of public policy and development elsewhere (Stern, 1991); and fourth, brevity has been enforced. We consider growth theory in Section II and growth experience in Section III. We conclude (Section IV) with some speculation and suggestions for future work.

It will be argued that the emphasis in the literature on the long run and on technical progress has, so far, led to only limited advancement in understanding. Further, whilst the questions raised are interesting, the emphasis has been excessive and basic medium-run questions of economic organisation and infrastructure have been missed. In drawing these conclusions I shall be particularly influenced by the experience of developing countries. There is every reason to expect fruitful empirical and theoretical research on the determinants of growth over the next few decades. Whilst not our main focus here, it should be stressed that the desire to understand the causes of growth should not lead us to think that the promotion of growth should be the first and over-riding aim of government policy. Experience has shown that there is no guarantee that growth will eliminate destitution and hunger (Dreze and Sen, 1990) or protect the environment (Kneese and Sweeney, 1988).

II. GROWTH THEORY

Harrod (1939) put the Keynesian savings-investment equilibrium in a dynamic context by observing that the level of investment, I, gives the growth, $\dot{K}$, in

capital, K. On dividing the equilibrium condition that savings (S) are equal to investment by K, we obtain the Harrod–Domar condition,

$$\dot{K}/K = s/v, \tag{1a}$$

where $s = S/Y$ (Y is national income) and $v = K/Y$ (equilibrium in this context means that planned savings, given the level of income, are equal to actual savings; equivalently, it involves the clearing of the output market). An alternative version of (1 a) is

$$\dot{Y}/Y = s/\nu, \tag{1b}$$

where ν is the incremental capital-output ratio (ICOR, equal to $\dot{K}/\dot{Y}$), the equality of the two growth rates being the same as the equality of v and ν.

This simple theory has been and remains very influential. Lewis (1954) saw the problem of raising the rate of growth as that of raising s, and saw this arising through the growth of an advanced sector which generated profits and thus, via a classical savings function, savings. Much discussion in planning, for example in India (see, for example, Gupta, 1989), has focused on the raising of savings rates and the control of ICORs. We must be careful not to be misled by the use of coefficients such as v and ν into thinking that factors are used efficiently subject to the technological constraints. We shall be emphasising this point, particularly for developing countries, in what follows. A discussion in terms of the reduction of the capital-output ratio is the beginnings of an examination of the role of efficiency in growth. Capital, of course, is not the only factor and a discussion of efficiency must extend to labour and intermediate goods. This takes us to the whole topic of social cost-benefit analysis, which is designed to identify the most productive investments, taking a broad view of social output and of social opportunity costs. Therefore that subject, properly viewed, is directly concerned with the intertemporal allocation of social consumption (see Drèze and Stern, 1987).

In the subsequent work on growth theory the realisation soon came that, whilst raising the rate of growth of capital could raise the rate of growth of output in the short or medium term, in the long run the rate of growth of the economy would be limited by the rate of growth of non-produced factors, notably labour. With constant returns to scale, no technical progress and an exogenous labour supply, we find that, in the long run, the rate of growth of output is determined by the rate of growth of the labour force, as demonstrated by Solow (1956). Raising s raises the rate of growth of output in the short run, but in the long run it merely increases v in the same proportion so that eventually s/v becomes equal to the rate of growth of labour (it follows from $\dot{K}/K = s/v > n = \dot{L}/L$ and constant returns to scale that $\dot{K}/K > \dot{Y}/Y$ so v rises). For developing countries (and probably developed too, see Atkinson, 1969) the focus on the long term is excessive, a point to which we shall return.

The concern to build models which allowed long-run growth in output per head led to a focus on technical progress which came to be seen as the main source of long-run growth. In its Harrod neutral or labour augmenting form this technical progress acts simply like an expansion of the labour force. For the most part, in the 1950s and 1960s, technical progress was seen as exogenous.

There were, however, notable examples (e.g., Kaldor, 1957, Arrow, 1962, Atkinson and Stiglitz, 1969), where experience was seen as the basis of learning. We shall return to the Arrow model shortly. There was also a group of papers in which the direction of technical progress was determined by economic choices (see, e.g., Kennedy, 1964, Ahmad, 1966, and Drandakis and Phelps, 1966 – all from the ECONOMIC JOURNAL). In these last cases, however, the frontier of choice for technical progress was unexplained and attention was focused on showing that the choice would tend in the limit to the Harrod-neutral form.

Solow (1957) showed how growth could be decomposed, using an aggregate production function, into contributions from different sources, namely the growth rates of factor inputs weighted by competitive factor shares (the 'contributions' of factors) plus a residual. This residual was often labelled technical progress, although it is perhaps best seen as what it is, i.e., the difference between the growth of output and a weighted sum of the growths of inputs or, by definition, the growth in total factor productivity. Formally, differentiating the production function $Y = F(X_1, X_2, \ldots, X_n, t)$ with respect to time where X_i is the quantity of input i we have

$$\dot{Y}/Y = \sum_i \alpha_i(\dot{X}_i/X_i) + F_t/Y, \tag{2}$$

where $\alpha_i \equiv (X_i \partial F/\partial X_i)/Y$.

Whilst this decomposition was suggestive it was unsatisfactory from the point of view of explaining growth since, apart from misgivings about the use of aggregate production functions for this purpose, it still left a major part of the sources of growth to be explained exogenously by 'technical progress'. Models followed in which the advance of the productivity of factors was endogenous, the most important example being that of Arrow (1962) incorporating learning by doing. Arrow chose to use a vintage model with technical progress available only for new investments. Kaldor (1957) (see also Kaldor and Mirrlees, 1962) used a technical progress function ($\dot{Y}/Y = g(\dot{K}/K)$) but had a view close in spirit to Arrow who, indeed, acknowledges his debt to Kaldor.

Analysis in vintage models becomes more complex since each piece of equipment must be identified using its date of construction. However, the central points of the Arrow approach can be neatly summarised in the non-vintage version provided by Sheshinski (1967). In the Sheshinski framework the production function of the representative firm (there are N firms) may be written

$$y = F(k, Al), \tag{3}$$

where l is labour in the firm, A is a factor denoting the level of knowledge and is taken to be K^γ where $K = Nk$ and $\gamma < 1$. Each firm learns not only from its own activities but also from those of other firms. The effectiveness of labour depends on total past investment with an elasticity of γ. There will be increasing returns at the level of the economy as a whole since a doubling of K and the labour force, L (equal to employment), would double output at constant A, but the increase of K, in addition to its direct effect on output, also

increases A. There are, however, constant returns for the firm which acts as if A is fixed. It can, therefore, behave competitively. Putting $\dot{l}/l$ equal to n (the rate of growth of L) we find (if N is constant) that the Sheshinski model has a steady state with a constant capital-output ratio where output and capital both grow at the rate $n/(1-\gamma)$. This is the steady-state growth rate in Arrow (1962). Hence for Arrow and Sheshinski, notwithstanding endogenous technical progress, we have the conclusions that the long-run rate of growth cannot be positive unless n is positive and that this rate cannot be affected by policy.

From the early 1970s interest in models of growth subsided for over ten years. A central figure in the resurgence of interest has been Romer who provided (1986, 1989) a model which produces results sharply different from these last two conclusions. The approach is suggestive but we shall see that the difference between this model and that of Arrow–Sheshinski is essentially that γ is set at 1. To allow focus on economic growth without population growth l is assumed constant (normalised at unity). The crucial feature of the model is that with $\gamma = 1$ we now have constant returns (at the level of the whole economy) to K *taken alone* (doubling K doubles output). It must be emphasised that both Arrow and Romer retain the assumption of constant returns in the function $F(\ )$ with respect to the two arguments taken together, so that, with A viewed as fixed by the firm, perfect competition is sustainable. It is not obvious that we should rule out increasing returns in the firm-level production function, although this would involve a recasting of our microeconomic behavioural and aggregation stories. Kaldor (see Targetti and Thirlwall, 1989) emphasised, in the 1950s and 1960s, the possibility of both static and dynamic increasing returns but his pleas were largely ignored. With the improved ability of microeconomic theory to handle increasing returns (see e.g., Tirole, 1988) it is time to explore this possibility more deeply in the context of growth.

With a Cobb–Douglas form in (3) in the Romer framework, $Y = N^{1-\alpha}K$ and the marginal product of capital is $N^{1-\alpha}$. Intertemporal optimisation is by choice of consumption. A fully-informed government maximises the integral of an isoelastic utility function, $[c^{1-\sigma}/(1-\sigma)]e^{-\rho t}$, of consumption per head, c. It can be shown, straightforwardly (the basic optimality condition is that the marginal productivity of capital should be equal to the rate of fall of the marginal utility of consumption), to yield an optimal rate of growth of $(N^{1-\alpha}-\rho)/\sigma$ (we continue to assume N is constant). However, private firms see a marginal product of capital $\alpha N^{1-\alpha}$ (they think of A as constant in (3)) and if intertemporal optimisation occurred through private decisions by owner-consumers with the same utility function the growth rate would be lower at $(\alpha N^{1-\alpha}-\rho)/\sigma$. If, further, capital income were to be taxed at rate τ then the growth rate would be still lower at $[\alpha(1-\tau)\, N^{1-\alpha}-\rho]/\sigma$. Hence we have long-run growth without population growth and without exogenous technical progress. Further, government action, by change of τ, could influence the long-run rate of growth.

We noted, however, that the difference was essentially that Romer's model was a boundary case of Arrow–Sheshinski, with $\gamma = 1$. That such important conclusions turn on such a fine distinction (which is unlikely to be settled

empirically) should make us uneasy about relying on the Romer (1986, 1989) model as a basis for explaining the role of policy in determining the rate of growth. Notice that if $\gamma > 1$ we can have growth rates which increase without bound.

There is a different class of models which can explain endogenously the long-run rate of growth following in the tradition of Uzawa (1965), and Shell (1973), and more recently, Romer (1990) and Lucas (1988). Technical advance comes from a sector which produces productivity enhancing ideas. The crucial endogenous variable is then the amount of resources which are allocated to that sector. Ideas produced by that sector may be used at zero cost in resources by firms in the other sector, which produces outputs of a good which may be consumed or invested. The resources allocated to the ideas sector may be determined in an optimal plan derived from a model for the optimal intertemporal allocation of consumption or from the equilibrium of a market economy. Without intervention the market outcome will not be optimal because ideas will be generated privately only if their dissemination is limited (by, e.g., patents) thus allowing those who generate them to sell them for a positive price. Without restrictions such as patents no-one would pay for an idea which was freely available to everybody. In these circumstances there is scope for state intervention to increase the flow of ideas. This could take place, for example, through government funding of research.

There are problems with this approach, however, if we try to tell empirical stories. It is extremely difficult to identify anything approximating to a knowledge-producing sector in real economies. R & D activity, for example, is poorly defined, difficult to interpret and in many cases in practice probably contains little real research in the sense of the 'ideas' in the model (see e.g. Griliches, 1984).

Have these newer theories provided advances which take us considerably beyond the position of the late 1960s? In my judgement, given the difficulties we have described, we have not yet advanced very far. We really do not know which, if any, of the many stories which might 'explain' the 'residual' or 'growth in total factor productivity' together or separately get to the heart of what is going on. We are faced by an identification problem of major proportions. But some of the right kinds of questions are being asked. We know that markets are not always very good at dealing with knowledge (see, e.g., Spence, 1984) and it is surely sensible to ask about the implications of this observation for growth. It seems plausible to see human capital as a major part of the story. In neither the Arrow–Romer nor the Uzawa–Lucas approaches should we expect the market economy to deliver efficient growth. The externalities of learning and the publicness of ideas provide important scope for policy and in some models such policy can have the effect of increasing the rate of growth.

As far as further research goes I think we shall need both approaches. I confess, however, to finding the Arrow–Romer route more promising, both since R & D is so hard to define and identify and because I do not see knowledge as arising only where it is deliberately sought through the application of resources to that sole end. Both Scott (1989) and King and

Robson (1989) have argued persuasively that it is the act of investment itself that generates the ideas and this indeed is the notion Arrow and Kaldor were seeking to capture in their earlier models. Kaldor's route invoked the technical progress function ($\dot{Y}/Y = F(\dot{K}/K)$). It was common in the 1960s to criticise him for basing his models (1957 and 1962) on something which was not clearly related to a familiar production function. However, we should look at this concept again (as King and Robson, 1989, and Scott, 1989, have done).

How does this very brief review of theory leave us as regards the agenda for understanding the determinants of growth in output per head and how they might be influenced? The growth theories have emphasised three (related) determinants: (i) capital accumulation, (ii) human capital (including learning), and (iii) research, development and innovation. We may associate all three determinants with the augmentation of input, notwithstanding that central in that story are inputs called skills and knowledge. From this perspective we should go beyond the standard theory and add (iv) management and organisation, which may provide better output from given inputs. It may not be unreasonable to apply all four of these ideas at an aggregate level.

If we go beyond the aggregate, however, there are two further crucial issues which arise: (v) infrastructure, and (vi) the allocation of output across directly productive sectors (discussed below). The deficiencies of infrastructure, together with the weakness of management and economic organisation, are likely to account for a substantial part of low factor productivity in developing countries. It is very hard to run factories and businesses effectively when the electricity and water supplies are unreliable, the telephone and the mail services are weak, and transport is slow, costly and hazardous. We may also include as a part of infrastructure what we might term social infrastructure. By this I mean the way in which business is done, rather than human capital (in terms of literacy, knowledge and so on). A system in which individuals behave dishonestly or where bureaucracy is obstructive, or where property rights are unclear may lead to a very wasteful allocation of resources in insuring against dishonesty, circumventing bureaucracy or enforcing property rights. The costs involved and the distortion of incentives may constitute serious impediments to growth (see, e.g. Platteau, 1990, Reynolds, 1983, Thomas, 1991).

These weaknesses of management, organisation and infrastructure may explain why scarce capital can be unproductive and why countries, such as India in the 1960s and 1970s, which have succeeded in raising their savings rates have not seen a higher growth rate (and measured rates of growth of total factor productivity have been negative; see Ahluwalia, 1985, and Bruton, 1989). It is interesting that in the last five years India has seen growth rates of GDP per capita around 3%, compared with an average of 1% or so in earlier periods and this appears to have coincided with increased capacity utilisation (UNIDO, 1990) – one index of the efficiency with which resources are used (see Bautista *et al.* 1981, Betancourt and Clague, 1981, and Phan-Thuy, 1981). These growth rates seem to have been associated with a high level of domestic demand and an interesting research programme could be constructed on the relation between demand and growth – whilst growth and productivity have

improved in India, macroeconomic imbalances (in terms of inflation and trade deficits) are becoming severe.

Different sectors in developing countries may have very different institutional arrangements and there may be a number of distortions preventing the allocation of resources in such a way that social marginal products in different sectors are equalised. In this context the shift of resources from one sector to another may have an important effect on the overall level of output (and Chenery, 1979, and Chenery *et al.*, 1986, found some evidence in support of this view). Thus close study of the institutional and other impediments to the movement of resources from one sector to another could have a substantial pay-off (in addition to the arrangements within the sector which we include under management and organisation).

I would argue, therefore, that whilst growth theory has both contributed to our understanding of how growth is determined and how it might be influenced, it has in many ways missed some of the crucial issues for developing countries. It may well be possible to model these productively, and I am sure that careful applied study of the role of management and organisation, the improvement of infrastructure, and sectoral transfer in developing economies could make a real contribution to our understanding of the determinants of growth and to the design of policy. They are not directly concerned with the long-run rate of growth in the sense of the steady-states in the models we have been discussing, but are none the less important for a medium term of some considerable duration. In this sense the focus on the long run in the theories may have been, at least in part, diversionary.

III. GROWTH EXPERIENCE

The theory of growth has been stimulated by and has stimulated the documentation and analysis of the empirical growth process by economic historians and statisticians, the notable pioneer being Kuznets (1955, 1961, 1963, 1966, 1971). Important subsequent contributions have come from Chenery and Syrquin (1975), Chenery *et al.* (1986), Morris and Adelman (1988), and Reynolds (1983). A particularly valuable set of data, which has provided recomputations of national income on the basis of purchasing power parity, has been made available recently (Summers and Heston, 1988). The combination of the availability of these data and the newer theories has provided a further stimulus to cross-section work, particularly by Barro (1989*a*, *b*). We provide a very brief review.

The work of Chenery and his collaborators (see, e.g., Chenery *et al.*, 1986) has constituted a substantial and important attempt to analyse the sources of growth in different countries. This builds on the growth accounting approaches pioneered by Solow (1957) and Denison (1967). Reviewing work on the period 1960–73, Chenery (1983) found that the 'contribution' to growth of the unexplained residual was substantial. For developed countries the residual constituted generally more than one-half of the growth rate. However, for middle-income developing countries the proportion of growth explained by factor input was generally above three-quarters, with the residual explaining

less than one-quarter. The explained proportion for developing countries becomes higher still if we take into account sectoral transfer from less productive to more productive sectors, whereas an attempt to use this type of idea to explain some of the residual for developed countries has been less successful (Chenery *et al.*, 1986).

In the studies cited, Chenery and collaborators, Morris and Adelman, and Reynolds have also tried to examine the circumstances under which different government policies and competitive environments have stimulated or inhibited growth. Some have argued, for example Krueger (1978), that those countries where government intervention has been lower, particularly in trade, have exhibited higher growth rates, with influential examples being the four tigers: Hong Kong, Singapore, South Korea, Taiwan. In all four countries, except Hong Kong, government intervention was, however, more extensive than is often portrayed (see, for example, Amsden, 1989). Other authors have been more cautious (see Chenery and Syrquin, 1975, Chenery *et al.*, 1986, and Morris and Adelman, 1988).

The importance of competition in promoting growth has been a common theme from Marx through Schumpeter, and more recently the neo-Austrians (see, e.g., Kirzner, 1987) and the management analysts (Porter, 1990). When Marx wrote 'Accumulate, accumulate! That is the Moses and the prophets!' (1974, p. 558) he saw, according to Kaldor's interpretation in his lectures which I attended in 1968, capitalists being obliged, by the forces of competition and increasing returns to scale, to invest the maximum possible in order to survive (although re-reading that section of Volume 1 of Kapital suggests that Kaldor may have been attributing his own ideas to Marx). Schumpeter's 'creative gale of destruction' (see, e.g., 1954) pictured inter-temporal competition with inventions and innovations creating short-term monopolies which were later eroded by further competitive inventions and innovations. This picture was endorsed by Hicks (1973) in his Nobel lecture with its emphasis on the 'impulse'. Porter (1990) in his study of Japan and other countries, has emphasised the role of competition between Japanese firms (rather than the role of the government, e.g., through MITI) in generating rapid technical advance. The experience of privatisation in the United Kingdom appears to confirm the importance of competition, relative to private ownership, in improving industrial performance (Vickers and Yarrow, 1988). A number of studies, however, have pointed to the importance in long-term growth of the establishment of an industrial base and technical skills (see, e.g., Chenery *et al.*, 1986, p. 358), and here the government may have a major role to play.

The recent work of Barro (1989*a*, *b*) is stimulated by the newer theories and based on the Summers–Heston data. It attempts to treat the problems of simultaneous causation, although at the level of aggregation involved (growth rates of GDP per capita, investment and so on being key variables, and the unit of observation being the country) these are probably insuperable. The results can nevertheless be suggestive and examples are (for the period 1960–85 and a sample of 98 countries) that growth in GDP per capita is positively related

to initial human capital and to investment (although the public/private breakdown seems unimportant) and negatively related to GDP per capita (suggesting some 'convergence'), 'political instability' and 'price distortions'. These relationships are based on significant coefficients of variables in an equation for the growth rate of GDP per capita in the simultaneous system.

The study of the experience of growth provides some confirmation of the importance of the six factors described in the preceding section and has pointed to both the role of competition and the potential for government action through, for example, the provision of education and infrastructure, both physical and social, in stimulating the growth process. There is less in theory or experience, however, that tells us that public ownership of the means of production is a necessary or indeed a helpful element.

IV. THE FUTURE

We have seen that the application of theory and a systematic accumulation of data and their analysis have taken us some way in the understanding of growth. At the same time growth theories, be they of the 1960s or the 1980s, leave much to be desired in their explanation of growth experience. The theories have shown an excessive concern with the long-run growth of total factor productivity and have made only a limited contribution to explaining it. We seem to have too many theories claiming 'property rights' in the unexplained 'residual', and have no reassurance that any of them, separately or together, really capture what is going on. Just as worrying is that they omit many issues which are probably crucial to growth in the medium run, including economic organisation and the social and physical infrastructure. We still have a great deal to learn about the six factors which we have identified as contributing to growth and about the role of the state in improving their contribution. Just as it has been a major concern over the last 100 years, I would expect research on these fundamental problems to continue. We will be greatly advantaged by longer runs of data on different countries and by the more sophisticated microeconomic theories of competition, information and technical progress which we have begun to see in the past 20 or 30 years.

We shall have to take much greater account of the closer integration of national economies through world markets and the role of trade in technological advance (see, for example, Grossman and Helpman, 1990). A concern with the understanding of the process of growth should also include an analysis of the role of the distribution of income in that process. This was a theme central to Smith, Ricardo and Marx, and one which, whilst perhaps less prominent in very recent growth theories was a focus of the discussion in development economics in the fifties and sixties (see, for example, Lewis, 1954 and 1955). It was critical to the work of Kalecki, who left a substantial tradition, including his influence on Kaldor (see, for example, Targetti and Thirlwall, 1989). On this and other topics, I would expect a resurgence of interest in the work of Kaldor, including his emphasis on both static and dynamic increasing returns. So far only a limited aspect of what Kaldor had in mind has been captured by the new growth theories.

There will also be a much broader view of advancement or development than consumption or income as conventionally measured. The perspective of standard of living will include health, education, political liberties and the environment. These should be of central concern for their own sakes, as well as through any contribution they might make to the production of consumer goods in the long run. The positive analysis of the determinants of the standard of living, and its improvement, of individuals in society will go hand-in-hand with an appraisal of what governments can do to protect individuals through social programmes, and in other ways. We now have enough experience of economic development to know that growth in aggregate income cannot, by itself, be guaranteed to eliminate deprivation.

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References

Ahluwalia, I. J. (1985). *Industrial Growth in India*, Delhi: Oxford University Press.

Ahmad, S. (1966). 'On the theory of induced invention.' Economic Journal, vol. 76, pp. 344–57.

Amsden, A. E. (1989). *Asia's Next Giant: South Korea and Late Industrialisation*, Oxford: Oxford University Press.

Arrow, K. J. (1962). 'The economic implications of learning by doing.' *Review of Economic Studies*, vol. 29, pp. 155–73.

Atkinson, A. B. (1969). 'The time-scale of economic models: how long is the long run?' *Review of Economic Studies*, vol. 36, pp. 137–52.

—— and Stiglitz, J. E. (1969). 'A new view of technological change.' Economic Journal, vol. 79, pp. 573–8.

Barro, R. J. (1989*a*). 'A cross-country study of growth, saving and government', National Bureau of Economic Research Working Paper No. 2855, February.

—— (1989*b*). 'Economic growth in a cross-section of countries', National Bureau of Economic Research Working Paper No. 3120, September.

Bautista, R. *et al.* (1981). *Capital Utilisation in Manufacturing*, Washington: The World Bank.

Betancourt, R. and Clague, C. (1981). *Capital Utilisation*, New York: Cambridge University Press.

Bruton, H. (1989). 'Import substitution', Chapter 30 in (H. Chenery and T. N. Srinivasan eds.), *Handbook of Development Economics*, Volume 2, Amsterdam: North Holland.

Cass, D. (1965). 'Optimum economic growth in an aggregative model of capital accumulation.' *Review of Economic Studies*, vol. 32, pp. 233–40.

Chenery, H. B. (1979). *Structural Change and Development Policy*, New York: Oxford University Press.

—— (1983). 'Interaction between theory and observation in development.' *World Development*, vol. 11, pp. 853–61.

——, Robinson, S. and Syrquin, M. (1986). *Industrialisation and Growth: A Comparative Study*, Washington: World Bank.

—— and Syrquin, M. (1975). *Patterns of Development, 1950–1970*, London: Oxford University Press.

Denison, E. F. (1967). *Why Growth Rates Differ: Post-War Experience in Nine Western Countries*, Washington: Brookings Institution.

Drandakis, E. M. and Phelps, E. S. (1966). 'A model of induced invention, growth and distribution.' Economic Journal, vol. 74, pp. 541–7.

Drèze, J. P. and Sen, A. K. (1990). *Hunger and Public Action*, Oxford: Oxford University Press.

—— and Stern, N. H. (1987). 'The theory of cost-benefit analysis.' In *Handbook of Public Economics* (eds A. Auerbach and M. Feldstein). North Holland: Elsevier Science Publishers BV.

Griliches, Z. (ed.) (1984). *R and D, Patents and Productivity*, Chicago: University of Chicago Press.

Grossman, G. M. and Helpman, E. (1990). 'Product development and international trade.' *Journal of Political Economy*. Forthcoming.

Gupta, S. P. (1989). *Planning and Development in India*, New Delhi: Allied.

Hahn, F. H. and Matthews, R. C. O. (1964). 'The theory of economic growth.' Economic Journal, vol. 74, pp. 779–902, reprinted Macmillan, 1967.

Harrod, R. F. (1939). 'An essay in dynamic theory.' Economic Journal, vol. 49, pp. 14–33.

Hicks, J. R. (1973). 'The mainspring of economic growth.' *Swedish Journal of Economics*, vol. 75, pp. 336–48.

Kaldor, N. (1957). 'A model of economic growth.' Economic Journal, vol. 67, pp. 591–624.

—— (1961). 'Capital accumulation and growth.' In *The Theory of Capital* (eds F. A. Lutz and D. C. Hague). London: Macmillan.

—— and Mirrlees, J. A. (1962). 'A new model of economic growth'. *Review of Economic Studies*, vol. 29, pp. 174–90.

Kennedy, C. (1964). 'Induced bias in innovation and the theory of distribution.' Economic Journal, vol. 74, pp. 541–7.
King, M. A. and Robson, M. (1989). 'Endogenous growth and the role of history.' LSE Financial Markets Group Discussion Paper No. 63, October.
Kirzner, I. (1987). 'Austrian school of economics.' In *The New Palgrave: a Dictionary of Economics* (Eatwell, J., Milgate, M. and Newman, P. eds.), London: Macmillan.
Koopmans, T. C. (1965). 'On the concept of optimal growth.' *Pontificia Academia Scientiarum*, pp. 225–88, Vatican City.
Kneese, A. V. and Sweeney, J. L. (eds.) (1988). *Handbook of Natural Resources and Energy Economics*, Amsterdam: North Holland.
Krueger, A. O. (1978). *Liberalization Attempts and Consequences*, New York: National Bureau of Economic Research.
Kuznets, S. (1955). 'Economic growth and income inequality.' *American Economic Review*, vol. 65, pp. 1–29.
—— (1961). 'Quantitative aspects of the economic growth of nations: IV. Long-term trends in capital formation proportions.' *Economic Development and Cultural Change*, vol. 9, pp. 1–124.
—— (1963). 'Quantitative aspects of economic growth of nations: VIII Distribution of income by size.' *Economic Development and Cultural Change*, vol. 11 (2), pp. 1–80.
—— (1966). *Modern Economic Growth*, New Haven: Yale University Press.
—— (1971). *Economic Growth of Nations: Total Output and Production Structure*, Cambridge, Mass: Harvard University Press.
Lewis, W. A. (1954). 'Economic development with unlimited supplies of labour.' *Manchester School*, vol. 22, pp. 139–91.
—— (1955). *The Theory of Economic Growth*, Homewood, Ill.: Irwin.
Lucas, R. E. (1988). 'On the mechanics of economic development.' *Journal of Monetary Economics*, vol. 22, pp. 3–42.
Marx, K. (1867). *Das Kapital: Volume 1*, English Edition (1974), London: Lawrence and Wishart.
Mirrlees, J. A. (1967). 'Optimum growth when technology is changing.' *Review of Economic Studies*, vol. 34, pp. 95–124.
Morris, C. and Adelman, I. (1988). *Comparative Patterns of Economic Development 1850–1914*, Maryland: John Hopkins University Press.
Phan-Thuy, N. (1981). *Industrial Capacity and Employment*, Westmead: International Labour Organisation.
Platteau, J. Ph. (1990). 'Land reform and structural adjustment in sub Saharan Africa: controversies and guidelines.' Report prepared for the Food and Agricultural Organisation, August.
Porter, M. E. (1990). *The Comparative Advantage of Nations*, London: Macmillan.
Reynolds, J. (1983). 'The spread of economic growth to the third world: 1850–1980.' *Journal of Economic Literature*, vol. 21, pp. 941–80.
Romer, P. M. (1986). 'Increasing returns and long-run growth.' *Journal of Political Economy*, vol. 94, pp. 1002–37.
—— (1989). 'Capital accumulation in the theory of long-run growth.' In *Modern Macroeconomics* (ed. R. Barro), Cambridge, Mass.: Harvard University Press.
—— (1990). 'Endogenous technical change.' *Journal of Political Economy* (forthcoming).
Schumpeter, J. A. (1954). *Capitalism, Socialism, and Democracy*, 4th edition, London: Allen and Unwin.
Scott, M. F-G. (1989). *A New View of Economic Growth*, Oxford: Oxford University Press.
Shell, K. (1973). 'Inventive activity, industrial organisation and economic growth.' In *Models of Economic Growth*, (J. A. Mirrlees and N. H. Stern eds.), London: Macmillan.
Sheshinski, E. (1967). 'Optimal accumulation with learning by doing.' In *Essays on the Theory of Optimal Growth*, (K. Shell eds.), Cambridge, Mass.: MIT Press.
Solow, R. (1956). 'A contribution to the theory of economic growth.' *Quarterly Journal of Economics*, vol. 70, pp. 65–94.
—— (1957). 'Technical change and the aggregate production function.' *Review of Economics and Statistics*, vol. 39, pp. 312–20.
Spence, A. M. (1984). 'Cost reduction, competition and industry performance.' *Econometrica*, vol. 52, pp. 101–21.
Stern, N. H. (1989). 'The economics of development: a survey.' Economic Journal, vol. 99, pp. 597–685.
—— (1991). 'Public policy and the economics of development.' *European Economic Review* (forthcoming).
Summers, R. and Heston, A. (1988). 'A new set of international comparisons of real product and price levels estimates for 130 countries, 1950–1985.' *Review of Income and Wealth*, pp. 1–25.
Targetti, F. and Thirlwall, A. P. (eds.) (1989). *The Essential Kaldor*, London: Duckworth.
Thomas, J. (1991). *Informal Economic Activity*, Deddington, Philip Allan, forthcoming.
Tirole, J. (1988). *The Theory of Industrial Organisation*, Cambridge: MIT Press.
UNIDO (1990). *India: New Dimensions of Industrial Growth*, Oxford: Basil Blackwell.
Uzawa, H. (1965). 'Optimum technical change in an aggregative model of economic growth.' *International Economic Review*, vol. 6, pp. 18–31.
Vickers, J. and Yarrow, G. (1988). *Privatization: An Economic Analysis*, Cambridge: MIT Press.