



OXFORD JOURNALS
OXFORD UNIVERSITY PRESS

The long-period theory of employment

Author(s): John Eatwell

Source: *Cambridge Journal of Economics*, Sept./Dec. 1983, Vol. 7, No. 3/4 (Sept./Dec. 1983), pp. 269-285

Published by: Oxford University Press

Stable URL: <https://www.jstor.org/stable/23596587>

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



Oxford University Press is collaborating with JSTOR to digitize, preserve and extend access to *Cambridge Journal of Economics*

JSTOR

The long-period theory of employment

John Eatwell*

While prosperity ruled, the deeper insights of the Keynesian Revolution were lost to view... Say's Law is artificially restored, and under its shelter all the old doctrines creep back again, even the doctrine that a given stock of capital will provide employment for any amount of labour at the appropriate equilibrium real-wage rate. If so, unemployment occurs only because wages are being held above the equilibrium level (Joan Robinson and Frank Wilkinson, What has become of employment policy? *Cambridge Journal of Economics*, 1977).

I

The centenary of the birth of J. M. Keynes has been the occasion for an extraordinary number of seminars, symposia and conferences, celebrating and evaluating Keynes's contributions to economics. The general air of celebration has, however, been laced with irony, for at no time since the publication of *The General Theory* have Keynes's innovations in economic theory been more widely rejected. Even in those circles which might be regarded as sympathetic to Keynesian ideas, the general view seems to be that whilst Keynes was undoubtedly an outstanding practical economist, alive to the problems of the day and aware of the limitations of economic theory, his contributions to the core of pure theory were negligible, his critique of orthodox theory ineffectual, and, all-in-all, *The General Theory* was a temporary, even unfortunate, detour in the forward march of economic theory.¹

A large number of factors have contributed to the decline of Keynesian economics, and to the remarkable atavism of orthodox theorists. Broadly they may be gathered under three headings.

- (i) Despite the power of Keynes's insights into the nature of effective demand his overall achievement was marred by analytical deficiencies within his argument, the most important being his failure to produce a conclusive critique of orthodox theory, and the Trojan Horse introduced into his argument by his use of a demand schedule for investment elastic with respect to variations in the rate of interest (see Garegnani, 1978, 1979).
- (ii) Many of Keynes's followers failed to identify and overcome the limitations of his argument, and hence tended to defend indefensible positions, so weakening the ultimate impact of the new ideas. An important example of such failure may be found

*Trinity College, Cambridge.

¹This, for example, is the broad conclusion that may be drawn from the papers presented at the Keynes Centenary Conference held at King's College, Cambridge, in July 1983. With a few notable exceptions the authors define 'Keynesian economics' as a special case of orthodox theory, exhibiting the influence of uncertainty, complex and sticky adjustment processes, and similar imperfections in the market mechanism (see Worswick and Trevithick, 1983). On such imperfectionist interpretations of *The General Theory* see chapters 1 and 15 of Eatwell and Milgate (1983).

in the liquidity–preference *versus* loanable–funds controversies which exercised monetary theorists in the early fifties (the issues are carefully dissected by Kahn, 1954). The weight placed on liquidity preference as a device for ensuring that the rate of interest did not fall to that level which the marginal efficiency of capital schedule associated with full employment was more than it could bear. Liquidity-preference theory may provide some insights into the short-term dynamics of money markets but it is neither a satisfactory critique of orthodox theory nor, in itself, a new theory of the rate of interest (Eatwell, 1983, p. 109).

- (iii) The ‘interventionist’ political interpretation of Keynes’s analysis of the inadequacy of the market was clearly a potential threat to the vested interests of the market economy; some demonstration that the all too clearly practical conception of macro-economic management was compatible with ‘free markets’ was required.^{1,2}

The modern revival of neoclassical theory provides good grounds for cynicism concerning the criteria by which economic ideas are deemed ‘correct’ or ‘appropriate’. None the less, it must be admitted that the analytical imperfections in Keynes’s theory have contributed to the decline. The structure needed to be reworked; the new, innovative elements (the principle of effective demand) retained, and the insidious remnants of orthodox theory discarded. This did not happen. Instead the history of Keynesian theory has been a tale of analytical retreat.

One of the basic weaknesses derived from the failure of *The General Theory* to provide a satisfactory critique of the orthodox theory of output. This gap has now been filled by the critique of orthodox capital theory (Robinson, 1953; Symposium, 1966) which demonstrates the logical deficiencies of the orthodox theory of value and distribution *and* of the orthodox theory of output and employment—since the two theories are, of course, one

¹Of course Keynes himself contributed to the diminution of the radical impact of his theory by suggesting that the old arguments would hold once suitable measures had been taken to establish full employment. But in the context of Keynes’s own theory his well-known proposition that ‘If we suppose the volume of output to be given, *i.e.* to be determined by forces outside the classical scheme of thought, then there is no objection to be raised against the classical analysis of the manner in which private self-interest will determine what in particular is produced, in what proportions factors of production will be combined to produce it, and how the value of the final product will be distributed between them’, (Keynes, 1936, pp. 378–379) is a considerable *non sequitur*. If the mechanisms proposed in ‘classical analysis’ can allocate resources efficiently then they can simultaneously, by the same means, ensure that those resources are fully employed. When Keynes’s theory is transformed into the neo-classical synthesis, however, the *non sequitur* disappears; all that is required is that the inhibition to the workings of the market, say, sticky money-wages, be removed or circumvented, by say, a suitable monetary policy (Modigliani, 1944). This transformation proved to be very influential in the formation of economic policy, particularly in Britain. The clear implication was that, once government has taken steps to maintain full employment, the other decisions of economic life, including the allocation of resources between manufacturing and services, expenditure on research, and so on, could be left to the market (see Eatwell, 1982A, ch. 4).

²There are interesting similarities between the decline of Keynesian economics and decline of Ricardo’s economics. Just eight years after Ricardo’s death Torrens declared that ‘... all the great principles of Ricardo’s work have been successively abandoned, and his theories of Value, Rent and Profits are now generally acknowledged to have been erroneous’ (Robert Torrens, 13 January, 1831; quoted in Meek, 1950). Explanations of this earlier fall from intellectual grace are also typically composed of three elements:

- (i) The analytical difficulties which beset Ricardo’s surplus approach to the analysis of value and distribution; difficulties which were encapsulated in his dependence on the labour theory of value and his search for an invariable standard of value (see Sraffa, 1951);
- (ii) the failure of Ricardo’s followers to fully grasp the content and significance of his fundamental ideas (see Bharadwaj, 1983);
- (iii) the ‘unfortunate’ social and political lessons which might be drawn from Ricardo’s demonstration of the nature of profits as surplus (Marx, 1873; Meek, 1950).

The dis-similarity of this list to that classifying the forces underlying the decline in the Keynesian economics clearly arises from the presence *within* Keynes’s theory of, to put the matter strongly, self-destructive elements. Whereas Ricardo’s analysis was sound in construction but incomplete in exposition, Keynes’s analysis was imperfect in construction.

and the same. The inability of orthodox theory to provide a logically consistent theory of the general rate of profit is mirrored by its inability to provide a logically consistent theory of the normal level of output and employment (Garegnani, 1970, 1978, 1979; Milgate, 1982).¹ With orthodox theory and its apparatus of demand schedules for labour and for investment effectively disposed of, the way is now clear for lost ground to be recovered and the positive task of building a satisfactory theory of employment on the foundation of the principle of effective demand recommenced. But can the foundation bear the weight?

In this essay I shall examine one facet of the answer to this question: the problem of determining the components of the *long-period* theory of employment; that is, the theory of output which may be considered the concomitant of the long-period or 'normal' theory of value and distribution. Long-period positions of the economy are defined with respect to the uniformity of the general rate of profit that the forces of competition will tend to establish in a capitalist economy (see Eatwell, 1982B). Uniformity of the rate of profit (between those firms employing the socially necessary technique) requires that the scale and composition of output and the size and composition of capacity are adjusted one to the other. Thus the long-run normal position of the economy must embody a conception of the relation between output and capacity as a corollary of the conception of the normal relation between prices and distribution.

In the analysis of long-period positions by the classical economists the premise of Say's Law, that 'saving *is* investment', was translated into the proposition that demand could not set a permanent limit to production, or as Ricardo put it 'demand is only limited by production' (Ricardo, 1951, p. 290). This view implied that whatever capacity might be, demand would be sufficient in the long run to ensure the full utilisation of that capacity. Thus under long-run normal conditions demand and capacity are balanced. There was, however, no presumption that the scale of activity would be such as to ensure the full employment of labour.

In marked contrast to this, the neoclassical writers presented a well-developed *theory* to explain how the balance between capacity and demand was brought about in the long run. These writers provided the outline of a mechanism which would result in the adjustment of demand to capacity—a mechanism which would ensure that the stocks comprising the endowment of the economy (including labour) were fully utilised. The mechanism was, of course, the price mechanism, defined in terms of the market resolution of individual utility and profit maximisation subject to the constraints of endowments and technology. The competitive tendency of prices to the normal levels determined by utility and profit maximisation would, in the long run, be accompanied by a tendency toward levels of output consistent with full utilisation of all factors of production (other than free goods). It was *not* argued that the economy would always be in full-employment equilibrium. There were plenty of models of short-run deviations from equilibrium and of the trade cycle, the analysis of the *Treatise on Money* being a prominent representative of this kind of thought (Milgate, 1982, chs 5, 10). If, then, Keynes was to present a positive challenge to orthodox theory, he had to challenge it on its own ground. He had, that is, to present a new theory of the normal long-run determination of output. Yet there are many parts of *The General*

¹It is one of the more remarkable aspects of modern economics that a result generally agreed upon in 1966 is today assiduously ignored in 'macroeconomics'. Investment functions and demand curves for labour abound, their logical foundations unquestioned. Indeed it is the common acceptance of orthodox neoclassical analysis by 'Keynesians', monetarists and 'new classical' theorists alike which lends such an air of unreality to their debates. It also accounts for the revival of enthusiasm for Keynes's orthodox pre-*General Theory* works, such as *A Tract on Monetary Reform* and the *Treatise on Money*. It would appear that the economics profession does not willingly undertake 'a struggle of escape from habitual modes of thought and expression'.

Theory which either do not address this problem, or, indeed, directly contradict the notion of a long-period theory. So much is this the case that it frequently appears that Keynes is simply presenting a theory a capacity utilisation, *i.e.* a theory of those short-period positions in which there has been no adjustment between capacity and output, rather than a theory of long-period balance between capacity and output at less-than-full employment.¹

The 'short-run' interpretation of *The General Theory* provided a convenient means of absorbing 'Keynesian economics' into the mainstream of orthodox theory. Within a few years it was generally accepted that the propositions of *The General Theory* rested upon imperfections of the price mechanism, notably, but not exclusively, inflexibility of money wages (Modigliani, 1944; Malinvaud, 1977; Solow, 1980)—imperfections which Keynes's orthodox opponents could readily admit as elements which might precipitate unemployment in their models, at least in the short run. However, these 'imperfectorist' interpretations of *The General Theory* collapse once the long-run analyses from which they are derived are shown to be based on a logically incoherent theory of capital (Eatwell and Milgate, 1983, ch. 1).

But even if orthodox theory is left aside the problem remains of formulating the principle of effective demand in the context of a long-period position of the economy. For not only is there a need to relate the theory of output to a coherent long-run theory of value and distribution (based, presumably, on the foundations laid by Sraffa, 1960), but also a long-run position is that which the forces of competition will tend on average to enforce. A short-run position of imbalance between capacity and demand, though it may prove to be a temporary centre of gravitation, is ultimately a position from which competitive forces will cause the economy to move away. If Keynes's objective of constructing a theory

... adequate to explain the outstanding features of our actual experience;—namely, that we oscillate, avoiding the gravest extremes of fluctuation in employment and in prices in both directions, round an intermediate position appreciably below full employment and appreciably above the minimum employment a decline below which would endanger life (Keynes, 1936, p. 254)

is to be achieved fully, then the principle of effective demand must be placed in a long-run setting. In the second part of this essay I shall examine Joan Robinson's approach to this problem, but first Keynes's long-period arguments within *The General Theory* itself, and prior to its publication, must be examined.

One of the important steps on the journey from the *Treatise on Money*, and its study of short-period fluctuations, to *The General Theory* was Keynes's realisation of the need to develop a new long-run theory. In his lectures of late 1932, Keynes pondered on the distinction between his emerging theory of a monetary economy and orthodox theory (or, as he termed it, the theory of the real wage economy):

Is the distinction between the Monetary Economy and the Real Wage Economy partly the same as that between short-period economics and long-period economics, the fundamental assumption of the Real-Wage Economy being one which is in fact satisfied in the 'long period'? The answer to this question is complicated by the doubt as to just what we mean, in this context, by 'long-period equilibrium',—a matter which Marshall has not explicitly settled for us. For there are three suggestions conveyed by the term, which are differently dominant on different occasions of its use. The first suggestion conveyed by the term 'long period' is that it relates to a position towards which forces

¹A neat analysis of capacity utilisation requires the assumption that the commodity composition of full-employment demand corresponds to the productive capacities of individual industries (Garegnani, 1978, p. 337n). Even so, at less than full-employment levels of demand the disjuncture between capacity and demand will be greater in some industries than in others, perhaps setting in train powerful forces of adjustment.

spring up to influence the short-period position whenever the latter has diverged from it. The second suggestion conveyed is that the long-period position differs from short-period positions in being a stable position capable *cet. par.* of being sustained, whilst short-period positions are *cet. par.* unstable and cannot be sustained. The third suggestion is that the long-period position is, in some sense, an optimum or ideal position from the point of view of production, *i.e.* a position in which the forces of production are disposed and utilised to their best possible advantage.

Nevertheless, whilst the answer is complicated by these ambiguities, we may endeavour to reach it without exploring them further. For the root of the objection which I find to the theory under discussion, if it is propounded as a long-period theory, lies in the fact that, on the one hand, it cannot be held that the position towards which the economic system is tending or the position at which it would be at rest or the optimum position (*i.e.* optimum competitively with other given circumstances), whichever of these tendencies we have in view, is entirely independent of the policy of the monetary authority; whilst, on the other hand, it cannot be maintained that there is a unique policy which, in the long run, the monetary authority is bound to pursue. Thus I conclude that this theory is not really dealing with a generalised doctrine of the long period, but is concerned, rather, with a special case; *i.e.* with a long-period position corresponding, in some or all of the senses of this term, to a particular assumed policy on the part of the monetary authority.

On my view, there is no unique long-period position of equilibrium equally valid regardless of the character of the policy of the monetary authority. On the contrary there are a number of such positions corresponding to different policies. Moreover there is no reason to suppose that positions of long-period equilibrium have an inherent tendency or likelihood to be positions of optimum output (*J.M.K.* XXIX, p. 54–55).

Keynes had taken a major step away from the orthodox framework of the *Treatise*. Whilst unemployment is still related in *Treatise*-like manner to inappropriate monetary policies, the less than full employment position of the economy is a long-run position. Clearly Keynes has now rejected the identification of long-period equilibrium with ‘positions of optimum output’ which he had maintained in the *Treatise*. There, in an attempt to give substance to his short-run analyses of market disequilibrium, he had argued that

A ‘short-period’, it would seem, thinks nothing of living longer than a man. A ‘short-period’ is quite long enough to include (and, perhaps to contrive) the rise and fall of the greatness of a nation (*J.M.K.* VI, p. 141).

If the short period is to be of such longevity then what meaning can be attached to the long period with respect to which it is defined, and which excludes consideration of secular phenomena (Marshall, 1890, Book 5, ch. 5, para 8)? Once Keynes abandoned his attempt to explain unemployment as a short-period phenomenon such cumbersome evasions could be dispensed with, and he could turn to the task of building a new long-period theory of employment.

That Keynes perceived the necessity for such a task is clear enough, but this then raises the question of why, in *The General Theory*, he did not devote his efforts to the construction of an explicitly long-period theory. Three explanations may be suggested.

First, as we have seen in both classical and neoclassical theories, the long-run balance between capacity and demand is attained by the adjustment of demand—in the former presumed to be sufficient to employ capacity and in the latter guided by the price mechanism. In the analysis of *The General Theory* demand is the independent variable. So the normal position of the economy must be attained by the adjustment of capacity to demand. This is an entirely new problem. Second, having rejected the automatic mechanisms of orthodox theory Keynes found that his principle of effective demand could provide a powerful, readily comprehensible, and readily acceptable theory of capacity utilisation. Finally, construction of a long-period theory would require him to present a solution of the problem

of the relationship between the theory of value and distribution and the theory of output—were variations in relative prices to be associated with variations in quantities, and if so were these variations to be in the direction of full employment output? By focusing on the short run Keynes could leave these difficult issues aside. When he turned to long-run considerations, and discussed the relationship between capacity and demand, they could not be ignored.

The pitfalls inherent in the formulation of a long-period theory are evident in Keynes's analysis of the relationship between the size and composition of investment as presented in Chapter 17 of *The General Theory*. Here Keynes outlines a process whereby capacity is adjusted to demand to ensure a uniform rate of return on all assets:

... in equilibrium the demand-prices of houses and wheat will be such that there is nothing to choose in the way of advantage between the alternatives. . . . Now those assets of which the normal supply-price is less than the demand-price will be newly produced; and these will be those assets of which the marginal efficiency would be greater (on the basis of their normal supply-price) than the rate of interest. . . . As the stock of the assets, which begin by having a marginal efficiency at least equal to the rate of interest, is increased, their marginal efficiency (for reasons, sufficiently obvious, already given) tends to fall. Thus a point will come at which it no longer pays to produce them, *unless the rate of interest falls* *pari passu*. When there is *no* asset of which the marginal efficiency reaches the rate of interest, the further production of capital-assets will come to a standstill (Keynes, 1936, pp. 227–8).

Keynes's story is clear, but it contains a crucial weakness—the lack of a theory of the general rate of interest toward which others are adjusted. This weakness led Keynes to fall back on the essentially short-period liquidity preference theory to prevent his entire analysis being undermined:

Thus in the absence of money and in the absence—we must, of course, also suppose—of any other commodity with the assumed characteristics of money, the rates of interest would only reach equilibrium when there is full employment (Keynes, 1936, p. 235).

Keynes has accepted implicitly the orthodox theory of the interest rate and of output which he was attempting to refute. This derives from his confusion between the process whereby the quantities of capital are adjusted to the configuration appropriate to the long-period rate of interest, and the relation between the volume of investment and different values of the normal rate of interest. The former is simply the process by which competition establishes normal prices; the latter is the neoclassical demand curve for investment. None the less, without an alternative theory of the rate of interest, and in particular without the logical critique of the neoclassical theory of capital and investment under his belt, Keynes could only adopt the defensive position of calling on inflexibility in the money interest rate to prevent the economy tending to full employment by sliding down the investment demand curve:

It is, therefore, on the effect of a falling wage- and price-level on the demand for money that those who believe in the self-regulating quality of the economic system must rest the weight of their argument; though I am not aware that they have done so (Keynes, 1936, p. 266).

To stave off this argument Keynes first called on the effects of variations in 'confidence' on the operations of the market (1936, p. 267) and later turned to the more general disruptive influence of 'uncertainty' (1937). The attractions of an analysis of capacity utilisation over the apparently unfortunate implications of long-run analysis are evident.

However, in the earlier, more confident chapters of *The General Theory* Keynes had dealt with the problem of the long-period position of the economy in a manner which eschewed orthodox concepts. In the discussion of expectation and employment he outlined the changes in capacity consequent upon a change in what he termed 'long-term expectation', *i.e.* a change in the circumstances determining the volume of investment and hence the level of demand, and distinguished between the need to adjust the level of capacity to the level of demand and the short-run instability the process might precipitate:

... every state of expectation has its definite corresponding level of long-period employment.

Let us consider, first of all, the process of transition to a long-period position due to a change in expectation, which is not confused or interrupted by any further change in expectation. We will first suppose that the change is of such a character that the new long-period employment will be greater than the old. Now, as a rule, it will only be the rate of input which will be much affected at the beginning, that is to say, the volume of work on the earlier stages of new processes of production, whilst the output of consumption-goods and the amount of employment on the later stages of processes which were started before the change will remain much the same as before. Insofar as there were stocks of finished goods, this conclusion may be modified; though it is likely to remain true that the initial increase in employment will be modest. As, however, the days pass by, employment will gradually increase. Moreover, it is easy to conceive of conditions which will cause it to increase at some stage to a *higher* level than the new long-period employment. For the process of building up capital to satisfy the new stage of expectation may lead to more employment and also to more current consumption than will occur when the long-period has been reached

... Or again, if the new long-period employment is less than the old, the level of employment in the transition may fall for a time *below* what the new long-period level is going to be. Thus a mere change in expectation is capable of producing an oscillation of the same kind of shape as a cyclical movement, in the course of working itself out. It was movements of this kind which I discussed in my *Treatise on Money* . . . (Keynes, 1936, pp. 48–49).

Here Keynes has provided the basic structure of his long-period theory of employment. The 'state of expectation' is the independent variable. A change in the state of expectation results in a change in the overall level of demand and hence in the level of long-period employment. Capacity is adjusted toward this new, higher level of demand, *but long-period demand and employment are presumed to be given and unchanged in this process of adjustment*. The adjustment process may 'overshoot' and lead to oscillations around the level of long-period employment, but that level is not deemed to be affected by such oscillations. In any concrete situation the stock of capacity will contain many 'fossils' inherited from the past: 'the economic machine is occupied at any given time with a number of overlapping activities, the existence of which is due to various past states of expectation' (Keynes, 1936, p. 50). But, none the less, the long term is the key to understanding the path of the economy, and 'cannot be even approximately eliminated or replaced by realised results' (p. 51).

As we shall see, Keynes has provided most of the necessary components for a long-run theory of employment. Nevertheless, the passages quoted above may readily be juxtaposed with passages in which Keynes is clearly addressing the short-period question of capacity utilisation, as for example in his list of independent variables which includes 'the existing quality and quantity of available equipment' (p. 245). If demand is to be an independent variable *and* capacity is to be an independent variable then no adjustment between them is on the agenda. Joan Robinson saw the ambiguity right away and attempted to resolve it. Her attempt eventually induced her to redefine the whole problem, in effect to declare the issue of the relationship between demand and capacity to be a non-issue.

II

In the process of argument and counter-argument which marked the path to *The General*

Theory, Joan Robinson too had seen that the problem was to develop a new long-period theory of output:

A second example of Mr. Keynes' failure to realise the nature of the revolution that he was carrying through [in the *Treatise on Money*] is to be found in the emphasis which he lays upon the relationship of the quantity of investment to the quantity of saving. He points out that if savings exceed investment, consumption goods can only be sold at a loss. Their output will consequently decline until the real income of the population is reduced to such a low level that savings are perforce reduced to equality with investment. But he completely overlooks the significance of this discovery, and throws it out in the most casual way without pausing to remark that he has proved that output may be in equilibrium at any number of different levels, and that while there is a natural tendency towards equilibrium between savings and investment (in a very long run), there is no natural tendency towards full employment of the factors of production. The mechanism of thought involved in the equations of saving and investment compels its exponent to talk only of short-period disequilibrium positions. And it was only with disequilibrium positions that Mr. Keynes was consciously concerned when he wrote the *Treatise*. He failed to notice that he had incidentally evolved a new theory of the long-period analysis of output (Robinson, 1933, p. 55–56).

However, as we have seen, when *The General Theory* came to be written the argument was still expressed 'mainly in terms of short-period analysis, and the background of equilibrium theory which corresponds to it is largely unexplored' (Robinson, 1937, p. 105). In a remarkable essay entitled 'The long-period theory of unemployment' Joan Robinson explored something of that background and attempted to provide the foundations for a long-period analysis. As we shall see, the attempt was not successful, but the arguments of the 1937 essay mapped out the scope and content of Joan Robinson's work for many years to come.

Joan Robinson presented her analysis in the context of a closed economy with a stable population, and with given tastes and technical knowledge. She defined the long-run position as a stationary state, determined by the fact that for any given rate of interest 'as long as capital goods continue to accumulate, their profitability at the margin declines and the incentive to further investment is continuously weakened' (1937, p. 106), so that eventually net investment will cease. This definition of a long-period position is, as she admits, different from that used by Keynes. In his discussion, part of which was quoted above, Keynes analyses the 'long run positions' associated with different *positive* levels of net investment. The use of her limiting definition of a stationary state enables Joan Robinson to deal with the dimly perceived rudiments of a problem which was to become fashionable ten years later—the two-sided character of investment: investment as demand and investment as capacity creation. The latter aspect was ignored in Keynes's definition of the long period.

In a stationary state net investment is zero, and hence the level and distribution of income must be such that net saving is zero. In Joan Robinson's model the level of income is determined by the amount of capital per head and the level of employment. The distribution of income depends upon the amount of capital per head and the rates of interest and wages. The amount of capital per head depends in orthodox manner upon the rate of interest and the characteristics of the production function defining the techniques of production available in the economy.

So the structure of the model is: given the rate of interest, output per head and the distribution of income are determined; the savings propensities of recipients of wages and profits and the dis-saving of the unemployed must then be such as to result in zero net saving.

Suppose for example that output per head is y , the proportion of output per head saved is s and the amount of income dis-saved by each unemployed person is a . Then net saving (which must be zero) is

$$syE - a(L - E) = 0 \tag{1}$$

where E is employment and L the supply of labour. Given values of s , y , a , and L the equation may be solved for E .

To investigate the effect of changes in the rate of interest, i , on the level of employment Joan Robinson supposes that the technology of the economy is characterised by an orthodox, well-behaved neoclassical production function. From (1) it is clear that

$$\frac{dE}{di} = - \frac{aL(s_i y + y_i s)}{[sy + a]^2} \tag{2}$$

where $ds/di = s_i$ and $dy/di = y_i$. For a well-behaved production function $y_i < 0$. The sign of s_i will depend on the overall consequence of a change in i for the level and distribution of income.

To investigate the general characteristics of this problem the orthodox technology may be expressed as the wage-profit frontier of a surrogate production function (Samuelson, 1962; Garegnani, 1970):

$$w = f(i) \tag{3}$$

where w is the wage, $f' = -k$, the amount of capital per head, and $f'' > 0$. Equation 1 can now be rewritten explicitly separating the savings propensities of wage recipients (s_w) and of profit recipients (s_p):¹

$$(s_w f - s_p i f') E - a(L - E) = 0$$

and

$$\frac{dE}{di} = \frac{-aL[s_w f' - s_p (i f'' + f')]}{d^2_1} \tag{2a}$$

where d^2_1 is the (necessarily) positive denominator. To investigate the sign of (2a) we may suppose f to be the wage-profit frontier of a standard c.e.s. production function. Then the ratio of wages to profits,

$$\frac{f}{-i f'} = \frac{1 - \delta}{\delta} (-f')^\rho$$

and the general expression for the effect of the rate of interest on employment may be written (see Appendix) as

$$\frac{dE}{di} = \frac{-aL[s_w f' + s_p z f' (-f')^{-\rho} + s_p z f f'' \rho (-f')^{-\rho-1}]}{d^2_2} \tag{4}$$

where $z = \delta/(1 - \delta)$ and d^2_2 is the positive denominator. Since $f' < 0$ and $0 < \delta < 1$ then

¹The problem of workers' accumulation of capital and their saving from their profits (Pasinetti, 1962) will be ignored.

the first two terms in the square bracket are less than zero. The sign of the third term is dependent on the value of ρ . If $\rho \leq 0$ then the third term will be either zero or of negative sign and hence the value of dE/di will be positive. These are the cases in which the elasticity of substitution is equal to or greater than one. If, however, $\rho > 0$ then the third term is positive and the sign of dE/di may be positive or negative. This ambiguous case arises when the elasticity of substitution is less than one.

What all this amounts to is that so long as the elasticity of substitution is greater than one then employment is a positive function of the rate of interest, and a negative function of the wage. The well-behaved demand curve for labour defines the adjustment of demand to capacity, where capacity is the available labour force.¹ The zero net saving condition together with the saving propensities of interest and wage recipients endogenously define a capital stock appropriate to full employment in the stationary state and simultaneously ensure that the level of demand is also appropriate.² If labour is unemployed, a fall in the wage will lead to a reduction in the capital-labour ratio, a fall in output per head, less thriftiness and more demand.

If any conclusion other than this strikingly orthodox result is to be derived from Joan Robinson's model then the elasticity of substitution of the production function must be less than one (p. 116). Suppose, for example, that there are fixed coefficients in production. Then $f''=0$ and it may be seen immediately from (2a) that the effect of a change in i on the level of employment will depend on the difference in savings propensities from profits and wages. If $s_w < s_p$ then an increase in i will lead to a fall in employment, and *vice versa*. If $s_w = s_p$ then no change in distribution can lead to a change in employment. Joan Robinson's case against the orthodox theory of employment rests on the elasticity of substitution being low, though similar unsatisfactory cases could be constructed by making appropriate assumptions on the form of the savings functions. Since Keynes's theory of employment clearly does not rest on insufficient elasticity in the demands for labour and capital then the model cannot be said to capture Keynes's argument.³

But if the elasticity of substitution is greater than, or equal to, one then it is not possible to argue that there will not be some value of the wage at which there will be full employment. Joan Robinson wards off this unfortunate conclusion by suggesting that the movement toward full-employment equilibrium might, in itself, be so disruptive as to prevent full employment being reached:

to attempt to cure unemployment by raising the rate of interest would present itself at any moment as a very paradoxical policy. For the immediate effect of a rise in the rate of interest would always

¹Joan Robinson claims that this relationship between the wage and the demand for labour

... has some affinities with the conception of a demand curve, since it relates the level of employment to the corresponding wage rate. But it is fundamentally different in nature from an ordinary curve. The rate of wages is not an independent, and the amount of employment the dependent variable. Both are dependent upon variations in the rate of interest or the level of thriftiness. If circumstances are such that the level of employment is x , then the same circumstances produce a real wage of y . For lack of a better term the curve will be described as a demand curve for labour, but it is important to bear in mind the distinction between this curve and an ordinary demand curve (1937, p. 124).

This argument is incorrect, unless the 'ordinary demand curve' is taken to mean the *partial-equilibrium* demand curve for labour. The *general equilibrium* demand curve will have exactly the characteristics she describes.

²Thus in this model, unlike Keynes's discussion of the long run, demand is adjusted to capacity. The given condition of zero net investment replaces the endowment of capital as a datum of the model and demand is adjusted to accord with the endowment of labour and this zero net investment condition.

³In the context of neoclassical synthesis models it used often to be argued that variation in the rate of interest had little effect on the level of income because the marginal efficiency of capital schedule was 'interest inelastic'. It should be noted that if a relationship is completely inelastic, then it is not there at all. Some other theory of the determinants of investment is required.

be to cause disinvestment and to increase unemployment. It is only after the lapse of time that a decline in the stock of capital could make its influence felt in reducing thriftiness, by impoverishing capitalists, and in raising the amount of labour required for a given output. The most devoted apostle of long-run benefits would find it hard to advocate the increased distress which would have to be endured before any advantage began to appear. Moreover, the short-period situation is always easier to diagnose than the long-period, and even the well-known handiwork of economists trained in the school of equilibrium analysis might not be sufficient to make them reject a bird in the short-period hand for a pair of which they may have managed to catch a glimpse in the long-period bush (p. 124).

The need to retreat to the short-period to avoid the unfortunate full-employment consequences of the long-run model had been forced on Joan Robinson by the assumption of a well-behaved production function, just as the retreat into the short period and the disruptive effects of uncertainty and expectations were forced on Keynes by his assumption of a marginal efficiency of capital schedule elastic with respect to the rate of interest. Identical models to hers were used by Pigou (1943) and Hicks (1946, pp. 118–119) to investigate the characteristics of long-run full-employment equilibrium and short-run deviations from it. So long as well-behaved functions are assumed, the assumption of zero net savings (or indeed of any given positive growth rate) allows implicit determination of the appropriate stock of capital so long as individual saving propensities are known or may be derived from given preferences. The model solves simultaneously for full employment values of wages and the rate of interest.

When, after the Second World War, Joan Robinson turned again to the question of the general theory in the long run (Robinson, 1952) she was still prepared to countenance the idea of ‘a full-employment value of the rate of interest, in a given short period situation’ (p. 8). ‘But it is by no means easy to see how the monetary mechanism is supposed to ensure that the rate of interest actually assumes its full-employment value. If the economy is conceived to have experienced the operation of this mechanism within living memory it must be supposed that people expect a fall in wages and prices when unemployment threatens to appear. Under the influence of such expectations investment plans are postponed’ (*ibid*). And when she constructs an analysis of steady accumulation the steady state ‘cannot correctly be described as “equilibrium” for it has not the property of restoring itself in the face of a chance shock’ (p. 26).

Joan Robinson’s rejection of long-run theory as a guide to the behaviour of the economy persisted, indeed was accentuated, after her rejection of the production function and the orthodox theory of capital and distribution (Robinson, 1953).¹ The notion of movement toward a normal position was then identified with ‘malleability of capital’ which in turn was identified with adherence to the discredited notion of a production function:

The well-behaved production function in labour and stuff was invented, I think, to answer the question: what is a quantity of capital? But the real point of it is to abolish the distinction between a short-period utilisation function and a long-period isoquant (Robinson, 1975, p. 80).

Ultimately Joan Robinson came to view the conception of the adjustment of an economy toward an equilibrium position as a *greater* weakness in orthodox theory than the logical problem of specifying the quantity of capital independently of distribution:

The problem of the ‘measurement of capital’ is a minor element in the criticism of the neoclassical

¹When Joan Robinson attacked ‘The dominance in neo-classical economic teaching of the concept of a production function’ (1953, p. 114), she was, in part, denouncing her former self. However, the main ‘inspiration’ for her critique of capital theory was Stigler (1946).

doctrines. The major point is that what they pretend to offer as an alternative or rival to the post-Keynesian theory of accumulation is nothing but an error in methodology—a confusion between comparisons of imagined equilibrium positions and a process of accumulation going on through history (Robinson, 1974, p. 58).

And even non-neoclassical theories were said to exist only in ‘logical time’:

The specification of a self-reproducing or self-expanding system such as that of Sraffa or von Neumann exists in logical time, not in history. Any point of it entails its past just as completely as it entails its future. To confront it with a question such as: what would happen if demand changed? is nonsensical . . . we cannot say anything at all before we have introduced a whole fresh system specifying how the economy behaves in short-period disequilibrium (Robinson, 1974, p. 50).

Any conception of the adjustment of capacity to demand in the establishment of a normal ‘long run’ position of the economy has been ruled out of court, for that adjustment is associated by Joan Robinson with the orthodox concept of capital. And in the same manner as she was apparently unwilling to accept Keynes’s notion of the long run—for her the long run could only be a stationary state—so Joan Robinson also refuses to accept Sraffa’s analysis of normal prices, other than in a stationary state (including in this term proportionately expanding systems). In rejecting long-period analysis as the method of economic theorising she is therefore rejecting her *own* version of the long period as spelled out in 1937. The crucial question is, then, can the long-period theory of employment be erected on firmer foundations than those erected and (quite rightly) rejected by Joan Robinson?

III

Joan Robinson’s criticism of the notion of a long-run normal position of the economy and her identification of the idea of adjustment of the economy to such a position with the discredited neoclassical theory consigns Keynesian theory to the short period and to the study of historical processes, both areas in which anecdote and description replace the derivation of general analytical principles. What is needed instead is the integration of historical and institutional factors *within* theoretical analysis. It is just such an integration which is an important characteristic of classical economics, notably in the theory of value and distribution in which the real wage, taken at any one time to be given, is determined by social and historical elements. A similar integration of institutional and theoretical elements may be found in Keynes’s concept of the ‘conventional’ rate of interest (Keynes, 1936, pp. 203–204), which lies at the core of his theory of liquidity preference. Both cases are very different from that of neoclassical theory in which all institutions (other than, perhaps, private property and the anonymous, perfect market) are imperfections, imposed on the theory from without. Orthodox theory portrays the adjustment of demand to capacity as a purely mechanical process, devoid of institutional content. However, the relationship between capacity and demand can be formulated in other terms.

An alternative formulation which might have satisfied Joan Robinson must eschew all neoclassical characteristics of the adjustment process. The well-known deficiencies of orthodox capital theory ensure that there is no logical foundation to the idea of a demand curve for labour elastic with respect to the real wage, nor a demand curve for capital, nor indeed demand curves for individual commodities. Hence the adjustment of demand to capacity by substitution in consumption and production as a function of relative prices is deprived of theoretical credence.

However, the inadequacies of demand and supply theory should be carefully distinguished from the workings of competition which tend to establish normal prices and quantities in a capitalist economy. The idea, first clearly presented by Adam Smith in Chapter 7 of Book 1 of the *Wealth of Nations*, that, if the quantity of a good available is less than the quantity which would be bought at the normal price, its price will tend to be above normal and so resources will be attracted into the industry and output expanded, is quite independent of any theory of what determines that normal price and the associated normal quantity (see Eatwell, 1982B). This 'law of supply and demand' is merely a characterisation of market competition, it is the process by which the behavioural mechanisms of a capitalist economy are consistently enforced. It is not a theory, or even a summary, of those mechanisms. It was the mistake of the nineteenth-century 'vulgar economists' to believe that the process of competition was in itself a theory of price formation. None the less, if an explanation of the determination of normal price and quantity can be provided, then we may look to competition as the mechanism which enforces the establishment of that price and quantity.

The classical theory of price formation proposes that normal prices are determined by the conditions of reproduction of commodities and the distribution of the surplus over the wage as a normal rate of profit on the value of capital invested in each particular line (Sraffa, 1960). For the purpose of the determination of relative prices the size and composition of output are taken as given quantities. This is not to say that these quantities might not change, say as a consequence of a change in distribution. But these ramifications are not relevant to the determination of the normal prices associated with any given wage and set of conditions of production, and hence their effects may be traced out separately. Variation in normal prices will not, therefore, play a role in the adjustment of capacity and demand. Nor will there be any presumption that labour is fully employed.

Once the idea of the demand function for a commodity is abandoned, Keynes's notion of effective demand may be seen to be as much a 'microeconomic' as a 'macroeconomic' concept. Indeed the latter is simply the sum of the former. The level of effective demand, as determined by the interaction of autonomous spending decisions and the multipliers associated with the spending and saving behaviour of individuals and institutions, will have not only magnitude but also composition. That composition of demand will be determined by a variety of institutional, social, historical and economic factors.¹

The classical theory of value and distribution may now be combined with the principle of effective demand to provide the rudiments of a theory of normal output. The concept of normal output at the aggregate level is just the same as that at the level of the individual industry. Demand and capacity must be adjusted to one another. Since demand at the aggregate and the industry level is the independent variable, then the adjustment must be of capacity. Of course the relationship between capacity and output is not precise. Capacity utilisation may, through the cycle, be above or below normal. But there will be a tendency to adjust normal capacity to the level of demand (see Robinson and Eatwell, 1973, pp.

¹Marx (1984, pp. 181–182) laid great stress on the role of the social distribution of income in the determination of the composition of demand:

It should be here noted in passing that the 'social demand', *i.e.* the factor which regulates the principle of demand, is essentially subject to the mutual relationship of the different classes and their respective economic position, notably therefore to, firstly, the ratio of total surplus-value to wages, and, secondly, to the relation of the various parts into which surplus-value is split up (profit, interest, ground rent, taxes, etc.). And this thus again shows how absolutely nothing can be explained by the relation of supply to demand before ascertaining the basis on which this relationship rests.

This importance attributed to the distribution of income in turn derives from the presumption that the *desired* (as opposed to *realisable*) spending patterns of different classes are given by social and historical circumstances.

168–169). For ease of exposition we will begin by assuming that the production process exhibits constant returns to scale. For any given real wage, the socially necessary technique, the rate of profit and normal prices are determined. Suppose that \mathbf{b} is the vector of wage-goods per hour of work, \mathbf{a}_0 the vector of labour coefficients and \mathbf{A} the matrix of unit input coefficients, then normal prices and the associated rate of profit are given by the n equations.

$$\mathbf{p}'\mathbf{A}(1+i) + \mathbf{p}'\mathbf{b} = \mathbf{p}'\mathbf{a}_0 \quad (5)$$

If \mathbf{n}_I is the vector of net investment demands then

$$\mathbf{p}'[\mathbf{I} - \mathbf{A}]\mathbf{x} = \mathbf{p}'\mathbf{n}_I \frac{1}{s} \quad (6)$$

where s is the propensity to save and \mathbf{x} the vector of gross outputs. For any given composition of \mathbf{x} its scale may be determined from (6) if we assume constant returns to scale.¹ Employment will be $\mathbf{a}_0'\mathbf{x}$. If there is no saving from wages then (6) may be rewritten

$$i\mathbf{p}'\mathbf{A}\mathbf{x} = \mathbf{p}'\mathbf{n}_I \frac{1}{sp} \quad (6a)$$

So given the volume of investment and normal prices the normal level of a given composition of output is determined. This level of demand is Smith's effectual demand (Smith, 1776, p. 73).

However, this tells us nothing of the adjustment of the capacity to produce \mathbf{x} to the level of demand. In any one industry the normal price and rate of profit will both be realised only if output *and* capacity are appropriate to the effectual demand. If, for example, output and/or capacity fall short of the effectual demand then the pressure on resources in that industry will set up the competitive tendency to expand capacity in that industry. Similarly, if an excess of capacity is available, competitive pressures will tend to lead to a reduction of capacity. This is all very reminiscent of the passage from pages 48–49 of the *General Theory* quoted above.

The process is one of the adjustment of capacity to demand. Here the analysis encounters a difficulty. Demand has been supposed to be the independent variable, yet the process of adjustment of sectoral capacity to demand must involve changes in investment, one of the components of autonomous demand. At the aggregate level this difficulty is manifest in the instability of Harrod's warranted rate of growth. The 'two-sided' character of investment—that it creates capacity and determines demand—results in a cumulative process of expansion or decline, with no tendency for the mutual adjustment of capacity and demand, quite the contrary.

The origin of the problem is that on the one hand investment is assumed to be the independent variable, whilst on the other hand variation in the composition and perhaps the overall size of investment is the mechanism by which capacity is adjusted to demand. The solution may be found in Keynes's own analysis of long-period employment; it is *not* investment which is the independent variable, it is the 'state of long-term expectations':

If we suppose a state of expectation to continue for a sufficient length of time for the effect on employment to have worked itself out so completely that there is, broadly speaking, no piece of employment going on which would not have taken place if the new state of expectation had always

¹If there are not constant returns then the relationship between \mathbf{A} and \mathbf{X} must be included in the specification of (6). Since it might be expected in the case of increasing returns that profits will be an increasing function of output then the level of output will be determinate. In the case of diminishing returns the level of output will also depend on the spending behaviour of the class which owns the fixed input (say, land) which is responsible for the diminution.

existed, the steady level of employment thus attained may be called the long period employment corresponding to that state of expectation (Keynes, 1936, p. 48).

There will be a level of capacity (embodying the socially necessary technique) corresponding to any given level of long-term expectation. If existing capacity is above or below this level then the prospect of profit will induce investment to change the level of capacity to that appropriate to the state of expectation. The process may overshoot, as Keynes points out in the passage quoted above (p. 275), but so long as the state of expectation may be supposed to be given then competition will tend to push the level of capacity toward that which is appropriate to sustain the long-term level of employment (or, in a dynamic setting, will push the rate of growth of capacity toward that rate compatible with the rate of growth of output implicit in the state of long-term expectation; see Keynes, 1936, p. 48n). There is no reason to suppose that this will be a smooth process, but the usual oscillations and instabilities of multiplier-accelerator models will be damped by the *fixed* level of demand associated with the state of long-term expectation.

An immediate reaction to this might be that far too much weight is being placed on the idea of a given state of long-term expectation. This reaction is surely correct. As in his analysis of liquidity preference, where conventional and institutional factors provide only a background to an apparently individualistic analysis of asset choice, so here again Keynes has presented his argument in a manner which encourages an individualistic interpretation. Expectations are, after all, held by individuals. Yet in a modern capitalist economy those individuals operate within a complex structure of institutions, financial and industrial, national and international, public and private. The stability of expectations derives from the stability of the institutional environment.

Suppose, for example, that a comparison is made between the expected levels of future demand in Britain and West Germany, and of the way in which changes in particular variables effect levels of investment. The factors taken into account might be the role of the state, the relationship between finance and industry, the recent history of competitiveness and technological change, the state of industrial relations and so on. All these define the 'state of long-term expectation' prevailing in either economy; just as the activities of the banks and the government in the money markets define Keynes's 'conventional' rate of interest. Moreover, these conditions would be expected to change relatively slowly (in the absence of major shocks), and to be revised but little in the light of cyclical fluctuations in demand. Entrepreneurs will not, for example, revise their investment plans in the face of what is clearly a temporary consumption boom fed by a relaxation of credit. Hence the competitive process which tends continually to adjust capacity to demand, will have sufficient scope in which to effect its task of moving the economy toward a fixed point.

The 'open-ended' character of Keynesian theory encourages the integration of institutional (and, indeed, political) factors into the core of the analysis. This does not mean that the model is simply descriptive, for the behavioural mechanisms of the economy rest on a firm theoretical foundation. What it does mean is that the analysis of long-period employment must be located within a concrete analysis of accumulation—surely just what Joan Robinson was looking for in the study of 'historical processes'.

IV

Joan Robinson's quest for a long-period theory of employment led her into unwarranted use of the orthodox production function, and to the inappropriate definition of the long

run as a stationary state. She quite rightly rejected this sterile and inconsistent approach. None the less, her instinct for the significant problem was sound. *The General Theory* was deficient in that the long-period aspects of the new ideas were either not spelt out, or were muddled in with destructive orthodox concepts. Liberated from these latter remnants the decline of *The General Theory* may be arrested, and the task of identifying the precise role of Keynes's ideas in the development of a satisfactory theory of the capitalist economy recommenced. The construction of a coherent long-run theory of output, and the investigation of its links with the congruent classical theory of value and distribution is a necessary part of the rehabilitation of that concrete body of economic analysis to which Joan Robinson devoted her life.

Bibliography

- Bharadwaj, K. 1983. Ricardian theory and Ricardianism, *Contributions to Political Economy*, vol. 2
- Eatwell, J. 1982A. *Whatever Happened to Britain?*, London, Duckworth
- Eatwell, J. 1982B. Competition, in Bradley, I. and Howard, M. (eds), *Classical and Marxian Political Economy*, London, Macmillan
- Eatwell, J. 1983. Theories of value, output and employment, in Eatwell & Milgate (1983)
- Eatwell, J. and Milgate, M. (eds) 1983. *Keynes's Economics and the Theory of Value and Distribution*, London, Duckworth
- Garegnani, P. 1970. Heterogenous capital, the production function and the theory of distribution, *Review of Economic Studies*
- Garegnani, P. 1978. Notes on consumption, investment and effective demand: I. *Cambridge Journal of Economics*, vol. 2, no. 4
- Garegnani, P. 1979. Notes on consumption, investment and effective demand: II. *Cambridge Journal of Economics*, vol. 3, no. 1
- Hicks, J. R. 1946. *Value and Capital*, Oxford, OUP
- Kahn, R. F. 1954. Some notes on liquidity preference, *Manchester School*
- Keynes, J. M. 1936. *The General Theory of Employment, Interest and Money*, London, Macmillan
- Keynes, J. M. 1937. The general theory of employment, *Quarterly Journal of Economics*
- Keynes, J. M. 1973 *et seq.* *The Collected Writings of J. M. Keynes*, London, Macmillan (volumes are referred to as *J.M.K.*)
- Malinvaud, E. 1977. *The Theory of Unemployment Reconsidered*, Oxford, Blackwell
- Marshall, A. 1890. *Principles of Economics*, London, Macmillan
- Marx, K. 1873. Afterword to the second edition of *Capital*
- Marx, K. 1894. *Capital*, Vol. 3, New York, International Publishers, 1967
- Meek, R. L. 1950. The decline of Ricardian economics in England, *Economica*
- Milgate, M. 1982. *Capital and Employment*, London, Academic Press
- Modigliani, F. 1944. Liquidity preference and the theory of interest and money, *Econometrica*
- Pasinetti, L. L. 1962. Rate of profit and income distribution in relation to the rate of economic growth, *Review of Economic Studies*
- Pigou, A. C. 1943. The classical stationary state, *Economic Journal*
- Ricardo D. 1951. *Principles of Political Economy and Taxation*, (Sraffa edition), Cambridge, CUP
- Robinson, J. 1933. The theory of money and the analysis of output, *Review of Economic Studies*; as reprinted in *Collected Economic Papers*, Vol. 1, Oxford, Blackwell, 1978
- Robinson, J. 1937. The long-period theory of employment, in *Essays in the Theory of Employment*, London, Macmillan
- Robinson, J. 1952. The generalisation of the General Theory, as reprinted in *The Generalisation of the General Theory and other Essays*, London, Macmillan, 1979
- Robinson, J. 1953. The production function and the theory of capital, *Review of Economic Studies*
- Robinson, J. 1974. History versus equilibrium, *Thames Papers in Political Economy*, as reprinted in *Collected Economic Papers*, vol. 5, Oxford, Blackwell, 1979
- Robinson, J. 1975. The unimportance of reswitching, *Quarterly Journal of Economics*; as reprinted in *Collected Economic Papers*, vol. 5, Oxford, Blackwell, 1979

- Samuelson, P. A. 1962. Parable and realism in capital theory: the surrogate production function, *Review of Economic Studies*
- Smith, A. 1776. *An Inquiry into the Nature and Causes of the Wealth of Nations*. Glasgow edition, Oxford, OUP, 1976
- Solow, R. M. 1980. On theories of unemployment, *American Economic Review*
- Sraffa, P. 1951. Introduction to Ricardo (1951)
- Sraffa, P. 1960. *Production of Commodities by Means of Commodities*, Cambridge, CUP
- Stigler, G. 1946. *Production and Distribution Theories*, New York, Macmillan
- Worswick, G. D. N. and Trevithick, J. A. 1983. *Keynes and the Modern World*, Cambridge, CUP
- Symposium, 1966. Paradoxes in capital theory, *Quarterly Journal of Economics*

Appendix

The general form of the constant elasticity of substitution production function (see Arrow, Chenery, Minhas and Solow, 1961) is:

$$y = \gamma [\delta k^{-\rho} + (1 - \delta) L^{-\rho}]^{-b/\rho}$$

The ratio of wages to profits in an economy characterised by this function is

$$\frac{1 - \delta}{\delta} \left(\frac{K}{L} \right)^\rho$$

Since for a surrogate production function $K/L = -f'$, where $w = f(i)$, then

$$\frac{f}{-if'} = \frac{1 - \delta}{\delta} (-f')^\rho$$

Setting $z = \delta/(1 - \delta)$ and substituting for $-if'$ in equation (1a) gives

$$\left(s_w f + s_p \frac{zf}{(-f')^\rho} \right) E - a(L - E) = 0$$

Equation (4) results from the differentiation of E with respect to i. For the Cobb–Douglas production function discussed by Joan Robinson (1937, p. 119n) $\rho = 0$ and (4) reduces to

$$\frac{dE}{di} = - \frac{aL[(s_w + s_p z)f']}{d^2_2} > 0$$