The long-period theory of employment

by

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Mr. Keynes' General Theory of Employment has been developed mainly in terms of short-period analysis, and the background of equilibrium theory which corresponds to it is largely unexplored. The purpose of this article is to outline a method by which Mr. Keynes' system of analysis may be extended into the regions of the long period and by which it may become possible to examine the long-period influences which are at work at any moment of time. Only a small section of the subject is here discussed, and the discussion is carried on in the highly abstract terms which are inevitable in the early stages of such an enquiry. But the importance of the subject is not merely academic and even a highly formalised treatment of it may be worth the attempt.

1.

Consider a closed community, living under a capitalist system, with population stable in respect to numbers and to age distribution, and with given tastes and technical knowledge. The problem with which we shall be concerned is the effect upon equilibrium conditions in such a community of changes in the rate of interest. Let us first suppose that a certain rate of interest has been established and is maintained at an unvarying level[1]). In this situation, provided that the given conditions have endured for sufficient time, investment will have ceased. For, as long as capital goods continue to accumulate, their profitability at the margin declines and the incentive to further investment is continuously weakened[2]). Investment is always tending to bring itself to an end, and in the stable conditions that we are considering nothing happens to revive the inducement to invest as it flags. In conditions of equilibrium the stock of capital is adjusted to the given rate of interest, and no further accumulation takes place. The marginal efficiency of capital[3]) correspond-

[1]) The static conditions here postulated must not, of course, be taken to present a picture of a situation which would ever be likely to occur in actuality. They are adopted as a theoretical construction which may enable us to isolate certain tendencies whose influence in any actual situation are disturbed by innumerable cross-currents.

[2]) The movement towards equilibrium is examined below, see p. 89.

[3]) Keynes: General Theory of Employment, Interest and Money, See p. 135.

ing to zero net investment is equal to the rate of interest and if, by chance, positive or negative investment were to occur, the marginal efficiency of capital would cease to be equal to the given rate of interest. If new investment were to take place capital would be increased and its earnings at the margin would fall. The marginal efficiency of capital would then be less than the rate of interest. The investment would turn out to have been unprofitable, capital goods would not be worth replacement and a movement back to equilibrium would set in with a decline in the stock of capital. On the other hand, if, in equilibrium, the stock of capital goods were allowed to deteriorate the marginal efficiency of capital would rise above the rate of interest and investment would take place until the stock of capital was restored to its former level[1]). The familiar phrase "long-period equilibrium" may be adopted to describe this situation. For, in the ordinary sense, a firm or an industry which is under an inducement to expand or contract the plant which it employs is not in equilibrium, and long-period conditions are established only when investment has come to an end[2]).

The short-period analysis of the level of employment can readily be adapted to describe the forces which determine employment in our static community. The rate of interest determines the amount of capital per unit of labour employed[3]) (the length of the period of production). To each level of employment, therefore, there corresponds a certain long-period level of total output. The rate of saving corresponding to a given total output depends, if the propensities of individuals to save are given, upon the distribution of total income between classes. Let us postulate that the degree of monopoly in the economic system is given[4]), that the institutional factors governing the distribution of wealth are stereotyped and that fiscal policy is not altered. Then to each level of total output

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[1]) In the static conditions that we are considering each capital instrument, in equilibrium, is renewed as it wears out, production proceeds in a continuous flow, and to-day is merely a repetition of yesterday. In such conditions the logical difficulty inherent in the notion of a constant stock of capital does not arise. A change in the ratio of capital to labour is likely to be accompanied by a change in the nature of the capital goods employed, but so long as tastes and knowledge are unaltered there is no ambiguity about the direction of a change in the amount of capital.

[2]) Mr. Keynes (General Theory, p. 48, note) uses "long-period equilibrium" in a slightly more extended sense. My long-period equilibrium is a special case of Mr. Keynes' equilibrium, and in my terminology Mr. Keynes' position of long-period equilibrium with investment going on is a situation in which the equilibrium position is moving ahead of the actual position at a steady and foreseen rate.

[3]) In order to simplify the argument it may be assumed that the hours, intensity and personal efficiency of work are stereotyped so that a man-day may be taken as the unit of employment (cf. General Theory, p. 42).

[4]) The degree of monopoly determines the ratio of real wages to the marginal physical productivity of labour. (See Economics of Imperfect Competition, p. 315.)

will correspond a given system of distribution of real income between classes[1]). Thus to each level of output, there corresponds a certain rate of saving, which must be imagined to occur if that level of output is imagined to obtain. It is possible to draw up a schedule relating each level of output with the amount of saving (in real terms) which would take place if that output were attained under long-period conditions.

It is natural to assume that the typical individual will save more (the rate of interest being given) the larger his real income[2]). From this it follows that a higher level of saving will correspond in the schedule to a higher level of output[3]). This schedule depicts the thriftiness of the community at the given rate of interest in long-period conditions[4]). But in equilibrium the rate of net investment is zero. There is therefore only one level of total output which will give equilibrium — the output at which net saving is zero. Any addition to total output above this level would bring with it, in long-period conditions, a smaller increase in total consumption, for part of the increment of incomes would be devoted to saving. Supply would have increased more than demand, and equilibrium would not obtain. Conversely, if total output were to fall below this level demand would have fallen less than supply and equilibrium would be restored by an increase of total income[5]). With zero investment, output, consumption and income, for the community as a whole, are synonymous.

We have now seen how employment is determined in the long period. There is one level of output at which saving is zero, and one level of employment corresponding to that level of output. The level of employment, determined in this way, is by no means the same thing as the amount of work which the community is willing to perform, and there is no reason to suppose that our static community will be free from unemployment.

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[1]) For long-period analysis it is natural to abstract from the changes in distribution which are brought about by changes in prices when certain incomes are fixed in money by long-term contracts.

[2]) (General Theory, p. 96.) It is not, of course, necessary to assume that every individual conforms to this rule, but the assumption that a reduction of real income leads to a reduction in saving must be fulfilled for sufficiently large changes in income (in the extreme, individuals cannot continue to save when income falls to starvation levels). If it should happen not to be fulfilled over certain ranges, so that the rate of saving of an individual falls with his real income over those ranges, and if such cases are sufficiently numerous, there may be certain values of total output at which equilibrium is impossible.

[3]) This would not necessarily follow if the distribution of income corresponding to a smaller total were more unequal than the distribution corresponding to a larger total. But in the given conditions this cannot be supposed to occur, unless some very unnatural assumption is made about fiscal policy.

[4]) For our present purposes it is more convenient to think in terms of the schedule of thriftiness rather than the propensity to consume (General Theory, p. 11). For the purposes of the treatment which follows it is assumed that saving is a function of income, not of wealth.

[5]) General Theory, p. 30.

If, at the level of total real income corresponding to full employment, the rate of saving would be greater than zero, that level of total income cannot be attained[1]). There is therefore no guarantee that full employment will be secured. If, when there is unemployment, the unemployed workers are supported by borrowing, either privately or by the state, the incomes of the rest of the community will be just so much greater than they would otherwise have been as to induce a rate of positive saving equal to the negative saving represented by borrowing on behalf of the unemployed[2]). If, on the other hand, the unemployed are supported at the expense of the consumption of other classes, the net income of the rest of the community, after deducting what is handed over to the unemployed, will be reduced to such a level that, on balance, they neither save nor dissave[3]). The amount of unemployment corresponding to a given level of employment will therefore have an important influence on the thriftiness of the community, and generally speaking, the level of employment will be higher, other things equal, the larger is the available supply of labour. In any case, the amount of unemployment, in equilibrium, will be whatever is sufficient to reduce net saving to zero for the community as a whole.

It is to be observed that, in equilibrium conditions, a spontaneous increase in the desire to save will reduce the level of total output, for it will reduce the level of output corresponding to zero saving. Moreover, it will reduce the total stock of capital that will be maintained at a given rate of interest. For with a reduction in output there will be a reduction in employment, and if the stock of capital were maintained, there would be a rise in the marginal productivity of labour and a fall in the marginal efficiency of capital. But if the rate of interest is unchanged the marginal efficiency of capital cannot alter. Therefore, in face of an increase in

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[1]) On the other hand, in a poor or spendthrift community, the level of real income corresponding to full employment, at a given rate of interest, may produce a negative rate of saving. In such a case the equilibrium level of employment would exceed the available supply of labour, which is an impossible situation. The solution of the problem lies in the fact that the rate of interest cannot be maintained at a value at which the demand for labour overruns the limits set by the available supply, for the attempt to maintain it would lead to cumulative inflation (General Theory, pp. 202 and 303).

[2]) In this case it is not exactly true that in stationary conditions to-day is a simple repetition of yesterday, for to-day inherits yesterday's debts. If the amount of unemployment is considerable, this introduces a possible source of disturbance into the equilibrium situation, for the ever-mounting burden of debt must sooner or later reach a point at which it becomes intolerable, so that some means have to be found to curb the exactions of creditors. In such a case the institution of a Jubilee Year, at which all debts are forgiven, might fend off political upheavals and enable the community to continue indefinitely supporting the burden of long-period unemployment.

[3]) Taxation, or charity, designed to support the unemployed, which is paid at the expense of what, if it did not exist, would be the saving of the individual tax-payer or charitable person, is equivalent to a loan to the unemployed which is written off as soon as it is made.

thriftiness the stock of capital will decline to the point at which, with zero net investment, its marginal efficiency is restored to the former level. Thus thriftiness tends to reduce the size of the equilibrium stock of capital. "This was sometime a paradox, but now the time gives it proof."

2.

We may now consider the change in the position of long-period equilibrium corresponding to an alteration in the rate of interest.

In the short period a fall in the rate of interest (provided its influence is not offset by some other change) will necessarily lead to an increase of employment and of total income[1]). But this increase of income can only last as long as the investment which causes it, and meanwhile other influences come into play. There are three aspects of the accumulation of capital. While investment is going on it causes an increase in effective demand, and from a strictly short period point of view this is the only aspect of accumulation that is important. The increase in current total income brought about by building a Tower of Babel is just as great as the increase brought about by investing an equal sum in electrifying a railway system. As soon as we overstep the narrowest boundary of the short period a second aspect of accumulation must be brought into account. The greater the extent to which the amount of capital has increased in any period, the lower will be the marginal efficiency of capital, with a given rate of investment, in the next period, and the harder will it be to maintain a given rate of investment[2]). But this also belongs to the field of short-period analysis. The third aspect of accumulation is the effect of an increase in the stock of capital upon the rate of consumption, and so of employment, corresponding to a given rate of investment; it is through this channel that the specifically long-period effects of accumulation begin to be felt as soon as investment has proceeded for a certain time. In a discussion of equilibrium conditions the influence of the current rate of investment upon effective demand disappears from the picture, since in equilibrium investment is equal to zero, and it is with the long-period effects of a fall in the rate of interest upon consumption that we are alone concerned.

At first sight there appears to be a strong contrast between the part which the rate of interest plays in the short period Theory of Employment and the part which it plays in the traditional long-period Theory of Distribution. For instance, in the short period a fall in the rate of interest will lead to an increase of output, and since with fixed equipment the marginal productivity of labour declines as employment increases, a fall in the rate of interest is associated with a fall in real wages. But the increase in capital per head consequent upon a lower rate of interest is likely, in the long run, to raise the level of real wages. Or, a fall in the rate

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[1]) Unless full employment already obtains, in which case the reduction in the rate of interest cannot persist.

[2]) General Theory, p. 106. See also below p. 90.

of interest is associated with an increase in employment, with given plant, so that the proportion of labour to capital rises when the rate of interest falls, but in the long run a fall in the rate of interest tends to reduce the proportion of labour to capital. It is one function of the long-period Theory of Employment to reconcile this apparent contradiction, and to fit the propositions of the traditional Theory of Distribution into their place in the analysis of employment.

The problem with which we are faced is somewhat intricate, and in order to reduce it to manageable proportions it is necessary at the first stage to introduce a drastic simplification. We will examine first a case in which land and entrepreneurship are superabundant, so that in effect there are only two factors to consider — labour and capital, and we will suppose that constant physical returns prevail, in the sense that an equal proportional increase in labour and capital will produce the same proportional increase in output. Further, it is convenient to make the traditional assumption that output is divided into a number of distinct commodities, the production of each of which is conducted under conditions of perfect competition.

Let us suppose that a fall in the rate of interest takes place and remains in force for sufficient time to allow equilibrium, with zero investment, to be attained. What will be the effect upon the equilibrium level of output?

The first point to be considered is the reaction of lowering the rate of interest upon the desire of individuals to save. The effect will differ from one individual to another, according to their circumstances and their psychology. Some will save more, out of a given real income, when the rate of interest falls, others will save less[1]). If, for the community as a whole, a fall in the rate of interest reduces the desire to save, the total real income at which net saving is zero will tend to be greater the lower the rate of interest. But it may be, at least until very low levels are reached, that every fall in the rate of interest will lead to an increased desire to save. In this case a fall in the rate of interest will tend to reduce total income.

To consider every alternative at each stage in the argument would be wearisome and we will assume for the moment that the direct effect of a change in the rate of interest upon the desire to save is, on balance, neutral, so that the amount saved by the typical individual out of a given real income remains the same whatever the rate of interest. Then, if the rate of interest had no other influence upon thriftiness, there would be only one level of total real income at which saving is zero, and a fall in the rate of interest would leave total real income unaltered.

But there is a further effect to be considered. A fall in the rate of interest will increase capital per head (or lengthen the period of production), so that a given output is produced by fewer workers using more "roundabout" methods. The marginal physical productivity of capital

[1]) In other words, a curve connecting the rate of saving from a given individual income may be either rising or backward rising.

will be reduced and of labour increased, and the rate of real wages will rise. Now a change in the distribution of income between workers and capitalists will have an important effect upon the thriftiness of the community as a whole. It may be postulated that in our community the capitalists are a small, and the workers a numerous class, while the shares of labour and of capital in the total income are not widely different. The capitalists, in short, are much richer individuals than the workers[1]), and are consequently more addicted to saving. As a first approximation we may assume that wage incomes are devoted entirely to consumption and that all saving is done by capitalists. It follows that any change in distribution which increases the share of labour in a given total income will reduce the amount of saving corresponding to that level of income[2]).

If a fall in the rate of interest produced this effect, the equilibrium level of total income would increase as the rate of interest fell, for the income corresponding to zero saving would be greater the lower the rate of interest. But it is by no means necessary that a fall in the rate of interest should have a favourable effect upon the share of labour in total income. The rate of earnings of labour is increased, but the amount of labour employed per unit of output is reduced. The rate of earnings of capital is reduced, but the amount of capital per unit of output is increased[3]). Thus two contrary tendencies are at work, and the net result may be either an increase or a decrease in the income of labour corresponding to a given total income.

Upon the simple assumptions which we have made the result can be formulated in terms of the elasticity of substitution. If the elasticity of substitution between labour and capital is less than unity, the proportional reduction in labour per unit of output corresponding to a small fall in the rate of interest will be less than the proportional increase in

[1]) It is not, of course, necessary to suppose that every capitalist is richer than every worker. All we require is that the typical capitalist income should be considerably greater than the typical worker's income.

[2]) We have so far assumed that the typical individual will save the more the larger his real income. It does not follow from this that any reduction in the inequality of distribution will reduce the thriftiness of the community. If saving were a constant proportion of income, a transference of income from a richer to a poorer man would reduce the savings of the one by exactly the same amount as it increased the savings of the other. Only on the assumption that the proportion of saving increases with income will a reduction in inequality inevitably reduce thriftiness. And this is an unnecessarily stringent assumption. But it is a common opinion that inequality of distribution promotes saving, and this would not be the case if saving were proportional to income over the whole range of incomes. Our argument only requires that the proportion saved of a very small income should be less than of a much larger income. For instance, if a typical man saves £ 1 out of an income of £ 100 a year, we require to assume that a typical man with £ 5000 a year saves more than £ 50.

[3]) The importance of this fact was pointed out by Professor Knight, "Statik und Dynamik", Zeitschrift für Nationalökonomie, vol. II, 1930, p. 24 (translated in Ethics of Competition, p. 183).

the rate of real wages, and the share of labour in a given output will be increased[1]). In this case a fall in the rate of interest will reduce the amount of saving corresponding to a given total income, the level of income corresponding to zero saving is raised, and the equilibrium income consequently increased. But if the elasticity of substitution is greater than unity labour will lose on the roundabouts more than it gains on the swings, the amount of saving from a given total income will increase with the increased share of the capitalists, the level of income corresponding to zero saving is reduced, and the equilibrium income consequently declines.

We have now reached the conclusion that the equilibrium level of total output will tend to be raised or lowered by a fall in the rate of interest, according as the direct effect of the fall in interest upon the desire of individuals to save is negative or positive, and according as the elasticity of substitution between labour and capital is less or greater than unity. The effect upon the stock of capital and employment has still to be considered.

A fall in the rate of interest will necessarily increase the equilibrium stock of capital, provided that the direct effect upon the desire to save is not highly positive. In those cases in which output is increased, the stock of capital is increased a fortiori. But even if output is reduced it is reduced precisely because the capitalists have been enriched, and since the rate of interest has fallen the level of income of capitalists can only be raised if the stock of capital has increased. If, however, a fall in the rate of interest leads to a sufficiently great increase in the desire of individuals to save it may actually be associated with a decline in the stock of capital.

In those conditions in which total income is reduced by a fall in the rate of interest, employment will be reduced a fortiori, for not only is there less output, but there is less employment per unit of output. But in those cases in which total output is increased it does not necessarily follow that employment is increased. The diminution in employment per unit of output due to the increase in capital per head may more than offset the increase in output, so that the larger total output may be produced by fewer workers.

It may be convenient to provide a formula to represent the contrary pulls of increased total output and increased output per head upon the amount of employment. We have already discussed the manner in which output alters in response to a change in the rate of interest. Imagine that a curve is drawn up connecting the rate of interest with the equilibrium level of total output. Let the elasticity of this curve be Θ. This elasticity, as we have seen, involves a complexity of factors and must be regarded as a useful shorthand term rather than as a concept which is of interest in itself. Let c be the rate of interest and O the total output. Then

$$\Theta = -\frac{\frac{dO}{O}}{\frac{dc}{c}}$$

[1]) See Hicks, Theory of Wages, p. 117.

The proportional increase in employment, due to a small change in the rate of interest, which would come about if the ratio of the factors was unchanged, is equal to $-\Theta \cdot \frac{dc}{c}$. The proportional increase in employment per unit of output is equal to $\frac{\eta}{k} \cdot \frac{dc}{c}$ where is η the elasticity of substitution and k is the ratio of the cost of labour to the cost of capital[1]).

Thus the proportional increase in employment due to a change in the rate of interest is equal to $-\frac{dc}{c} \cdot \frac{1}{k}(k\Theta - \eta)$.

In the simplest case, where the direct effect of changes in the rate of interest upon the desire to save is neutral and the elasticity of substitution is equal to unity, there is, as we have seen, no increase in total output in response to a fall in the rate of interest. Thus Θ is equal to zero, and there will be a proportional decline in employment equal to the proportional fall in the rate of interest divided by the ratio of labour to capital.

If it is true that "the most plausible estimate of the elasticity of substitution is unity"[2]), it appears that a fall in the rate of interest is more likely to reduce the equilibrium level of employment than to increase it.

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[1]) Let C be the total amount of capital and L the total amount of labour and l the rate of wages:

Now, $$C\Delta c + L\Delta l = 0$$

and $$c\Delta C + l\Delta L = 0$$

$$k = \frac{Ll}{Cc}$$

$$\eta = -\frac{\frac{\Delta C}{C} - \frac{\Delta L}{L}}{\frac{\Delta c}{c} - \frac{\Delta l}{l}} = \frac{\frac{\Delta L}{L}\left(1 + \frac{lL}{cC}\right)}{\frac{\Delta c}{c}\left(1 + \frac{cC}{lL}\right)}$$

$$= \frac{\frac{\Delta L}{L}}{\frac{\Delta c}{c}} \cdot \frac{Ll}{Cc}$$

$$\lambda \frac{\frac{\Delta L}{L}}{\frac{\Delta c}{c}} = \frac{\eta}{k}$$

[2]) Champerowne, Economic Journal, June 1935, p. 255. Professor Douglas comes to the conclusion that the elasticity of substitution between labour and capital in the U. S. A. is equal to unity (Theory of Wages, p. 133 et seq.) though he does not specifically use the conception of elasticity of substitution and, indeed, seems to have misunderstood its nature (loc. cit., p. 59). Evidence for unit elasticity is also provided by the apparent constancy (over long periods) of the share of labour in total income (see Douglas, loc. cit., p. 221, Hicks, op. cit., p. 131). But, of course, there is a wide gap between conclusions drawn from our static community and conclusions applicable to nations of the real world.

3.

We must now meet the argument that it is unnatural to suppose that the rate of interest can be permanently maintained at a level at which unemployment occurs. It is sometimes held that so long as unemployment exists forces are set at work tending to depress the rate of interest. First, it may be argued that unemployment will naturally lead to a fall in money wages[1]). The direct effect of a fall in money wages is merely to produce a corresponding fall in prices and does not by itself have any influence upon the level of employment[2]). But its indirect effects through reactions upon the monetary factors in the situation cannot be neglected. A fall in prices leads to a reduction in the demand for money. If the monetary authorities wish to keep the rate of interest unchanged they can do so by reducing the supply of money correspondingly, but if the supply of money is held constant the rate of interest must fall. Money released from active circulation must find a home in savings balances, and, with a given state of preferences for money over other means of holding wealth, this can only occur if the rate of interest falls[3]).

There is thus some basis for the argument that the assumption of a constant rate of interest is incompatible with the existence of unemployment, that the position which we have described is not one of final equilibrium, and that the level of money wages, and with it the rate of interest, will continue to fall either until unemployment disappears, or until either the rate of interest, or the level of money wages, reaches a point below which it can fall no further. When one of these three points is reached the tendency for a fall in money wages to drag down the rate of interest must come to an end. But we have discovered that it is not necessarily always true that the first point must be reached before the second or third, for we have found that in some cases a fall in the rate of interest merely increases the long-period level of unemployment. In a community with perfectly plastic money wages the level of prices may be always moving toward zero without setting up any tendency permanently to reverse the situation which is causing prices to fall. It is thus impossible to argue that there is any self- righting mechanism in the economic system which makes the existence of unemployment impossible, even in the longest of runs.

At best the process of forcing down the rate of interest, even with highly plastic wages, would be both slow and uncertain in its operation.

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[1]) There is no reason to suppose that in the position of long-period equilibrium corresponding to a given rate of interest the level of prices is constant. In one sense, therefore, our long-period position is not one of complete equilibrium.

[2]) General Theory, p. 262. An alteration in relative wages may, of course, lead to some change in employment and an expectation that future wages will differ from present wages and will have important consequences (loc. cit., p. 263). The above argument applies in its simplest form only to an equal all round fall in wages which is expected the permanent.

[3]) General Theory, p. 171.

A fall in the rate of interest would be followed by a period of investment, and while investment continued the level of employment would be raised. The pressure on money wages would consequently be relaxed. And if the rate of investment were ever great enough to carry the community temporarily to the point of full employment, a rise in money wages would be likely to occur[1]). Thus the run required to reduce the rate of interest to a given extent, by this route, is likely to be far longer than the period in which equilibrium to a given rate of interest can be established. In short, on the assumption of perfectly plastic wages, our position of long-period equilibrium with a given rate of interest exists within a longer-still period, in which the rate of interest is determined by the level of money wages, and we have found that even in the longer-still period unemployment may not be tending to disappear.

The assumption of perfectly plastic money wages is highly unrealistic. A community in which money wages fall without limit so long as unemployment exists is very unlike the real world, even the pre-trade-union world, and the absurdity of contemplating a system in which prices are always moving towards zero is merely the result of the unnatural assumption on which it is based.

But an alternative line of argument presents itself. If the monetary authorities in our static community are in a position to control the rate of interest by acting upon the quantity of money[2]), it may be held that in the face of unemployment they will be likely to adopt a policy of easy money. Actual monetary authorities are hampered by the necessity to protect the international equilibrium of their system. The monetary authorities of a closed community, though free from this difficulty, may be restrained from lowering the rate of interest by a tender regard for banking profits or for the interests of the rentier class. But we will suppose

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[1]) General Theory, p. 303. There is no contradiction in contemplating a world subject to a chronic tendency to unemployment in which at the same time there is a secular rise of wages and prices. The underlying tendency to force wages downwards may be more than counterbalanced by the upward pressure of a short burst of high investment. An earthquake, a war, or a major invention may undo in a year the work of centuries of chronic unemployment. This consideration re-inforces the argument advanced by Mr. Keynes in the General Theory, p. 307.

[2]) In a primitive system with metallic currency the quantity of money is fixed by the stock of the precious metal, and a fall in the rate of interest can only be imagined to occur through a fall in money wages. When money wages fall the price of the metal, alone of all prices, remains unchanged and mining is encouraged. Thus the tendency for a fall in money wages to lower the rate of interest is reinforced — the supply of money increasing as the demand for it falls. But there is some awkwardness in fitting the occupation of mining into completely stationary conditions. If yesterday is like to-day in every respect except that to-day has inherited a larger accumulation of gold, to-day's rate of interest will be lower than yesterday's. But there is little profit in studying this unnatural cross between a stationary and an actual world.

that their policy is directed towards reducing unemployment so far as it is possible for them to do so. In any given situation a temporary increase in employment occurs when the rate of interest is lowered and investment set on foot. Thus the monetary authorities in our static community will be under recurring pressure to reduce the rate of interest whenever equilibrium with a given rate entails unemployment.

But except during the passing phase of positive net investment an increase in employment is not necessarily a result of a fall in the rate of interest, for, as we have seen, there are three stages at which there may be a slip between the cup and the lip.

First a fall in the rate of interest may increase the desire to save, and so tend to reduce total income. Second, the change in distribution may be unfavourable to labour, and so tend to reduce total income. Thirdly, even if total income increases, employment may be reduced, because of the increase in output per head. In certain communities, therefore, a policy of lowering the rate of interest in order to reduce unemployment will frustrate itself. The temporary relief obtained while investment is at its height will gradually dwindle and the last state will be worse than the first. Each burst of investment, as the rate of interest is gradually reduced, will leave behind it the legacy of an enhanced maldistribution of income and an increased level of output per head. A high temporary level of employment becomes progressively harder and harder to attain, and the equilibrium level of employment sinks further and further.

In such a case, a rise in the rate of interest may be advocated. But 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 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. Even 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 then the long-period, and even the well-known hardihood 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. At best, the long-period benefit of a policy of raising the rate of interest is dubious. The rate of real wages for the employed workers would be reduced by it. And apart from a possibility of a negative reaction on the desire to save, a rise in the rate of interest can increase the equilibrium level of employment only at the expense of other long-run advantages. In so far as it produces its effect by reducing the amount of capital per head, it is keeping productivity at a lower level than might be attained and curing unemployment merely by „making work". On the other hand, in so far as it increases employment by reducing the share of capitalists in

total income it provides very superficial treatment for a deep-seated disease. The most effective remedy for a community which finds itself in such a situation is to make a direct attack upon the maldistribution of income which is the cause of excessive thriftiness.

But even if the policy of raising the rate of interest were adopted, it could not be guaranteed to secure full employment, for it is likely that there will be a limited range of values over which a rise in the rate of interest will increase employment, and beyond this range a rise will reduce it again. There will then be a certain maximum level of employment which can be attained by operating upon the rate of interest, and this maximum may fall short of full employment[1]). For some communities, therefore, full employment may lie beyond the reach of even the most powerful and most enlightened of monetary authorities.

In certain communities, on the other hand, which are poorer, more egalitarian, more spendthrift, more easily discouraged from saving by a fall in interest, or in which the elasticity of substitution is low, the monetary authorities may be in a position to secure full employment in the long period by setting the rate of interest at the appropriate level. It may be contended that we have been guilty of an over-formalised argument in suggesting that all communities are not of this kind. It is formally true (on our assumptions) that when the elasticity of substitution is greater than unity, and the direct effect of a fall in the rate of interest on the desire to save positive, lowering the rate of interest causes a decrease in total income and in employment, but it may be argued that at very low levels of the rate of interest (as Professor Cassel contended) the desire to save must be checked, and that at very high levels of capital per head the elasticity of substitution must fall below unity. Thus, it may be argued, a sufficient reduction in the rate of interest will always increase employment[2]). A priori argument on such points is of little value, and it may very well be that actual investigations would support this contention.

But even if this view is correct it does not follow that full employment can always be reached by lowering the rate of interest. For, first, it may be that no rate short of zero will be sufficiently low to secure full employment[3]), and second, even if the rate of interest corresponding to

[1]) A curve may be drawn connecting the rate of interest with the equilibrium level of employment, the rate of interest being measured on the y axis and employment on the x axis. In the case described above this curve would fall from left to right over the higher values of y, reach a point of zero elasticity, and fall back from right to left over lower values. This curve may lie over its whole length inside the limits of the available supply of labour. Full employment is then unobtainable.

[2]) Upon this view the curve described in the preceding footnote would reach a second point of zero elasticity and fall from left to right over the lowest values of the rate of interest.

[3]) The curve may cut the x axis before it has reached the limits of the available supply of labour.

full employment is positive, it may be so low that it is impracticable for the monetary authorities to establish it by any device within their power[1]). It is therefore impossible to maintain that the existence of unemployment is incompatible with conditions of final equilibrium[2]).

4.

Our analysis has no far been conducted upon the assumption that there are no scarce factors of production. It will be found that our main conclusions are not affected by the introduction into our analysis of a fixed supply of land and other natural resources.

Consider, first, how the existence of a scarce factor influences the effect upon output of a change in the rate of interest. In order to simplify the argument we will once more confine ourselves to the case in which the direct effect of the rate of interest upon the desire to save is neutral. An increase in total output will raise the demand for land and increase the share of landowners in total income. The extent of the increase in output will therefore depend upon the saving propensities of the landowners. If landlords are a very numerous body, so that their level of income is closer to that of workers than of capitalists, and so that each receives a small share in the increment of the total income of their class, or if they are spendthrift by nature, a given increase in output will correspond to a smaller increase in saving when land is scarce than when it is superabundant, and the increase in output due to a given change in the rate of interest will consequently be greater. This is a paradoxical conclusion, for the fixed amount of land may impose an upper limit upon the output which it is technically possible to produce, and when this limit is approached it would be absurd to maintain that a tendency for output to expand is enhanced by the scarcity of land. How can this contradiction be resolved? Let us suppose that a change in the rate of interest which impoverishes the capitalists occurs when equilibrium output is already near the maximum imposed by the limited supply of land, and let us suppose that the whole of the landlords' income is always spent upon current consumption, no matter what their income

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[1]) General Theory, p. 309.

[2]) It is tempting to say that many of the propositions of "Classical" economics (General Theory, p. 3, note) which break down in the face of unemployment, are valid upon the assumption that full employment is always maintained (General Theory, p. 112). For instance, the view that habits of thrift are calculated to promote the accumulation of capital is, in general, the reverse of the truth, but it is tempting to justify it by inserting the assumption that the rate of interest is always set at the level which gives full employment. But if no practicable level of the rate of interest will give full employment this method of rationalising the Classical propositions falls to the ground, while in situations in which a rise in the rate of interest is required to offset the effect of a spontaneous increase in thriftiness, the Classical propositions require to be reversed, even upon the assumption that full employment is maintained.

may be. Thriftiness is reduced by the fall in capitalist incomes and output tends to expand. Owing to the operation of diminishing returns costs at the margin are raised and the income of the landlords is increased. So long as the landlords continue to spend the whole of their incomes the pressure to expand output continues to grow and the incomes of landlords continue to increase. But sooner or later a point must be reached at which the landlords become so inordinately wealthy that they are induced to join the class of savers[1]). The assumption of rapidly diminishing returns is therefore incompatible with the assumption that there is no level of total output at which landlords save part of their income. Thus the conclusion that there are circumstances in which the operation of diminishing returns may enhance the tendency for output to expand can be reconciled with the fact that an upper limit is always set to the expansion of output by the „niggardliness of nature".

It seems, however, more natural to assume that in our community the landlords are similar to the capitalists, both in respect to the range of incomes which they receive and in respect to their individual desire to save. Upon this assumption it can be seen that the responsiveness of output to changes in the rate of interest is smaller when land is scarce. If a fall in the rate of interest increases output by impoverishing capitalists, it will enrich landlors[2]). And if a fall in the rate of interest reduces output by enriching capitalists it will impoverish landlords. The equilibrium total income, with zero saving, will therefore alter by less, in response to a given change in interest, when land is scarce than when it is superabundant. The direction of the change will not be affected.

The influence of fixed natural resources upon changes in the level of real wages must also be considered. When land is scarce it will no longer be true that a fall in the rate of interest necessarily raises the rate of real wages. Capital per head is still likely to be increased by a fall in the rate of interest, but in those cases in which output expands when the rate of interest falls, land per head will be reduced, and the net effect may be to lower the marginal physical productivity of labour. In the opposite case, where output declines as a result of a fall in the rate of interest, land per head is increased and real wages are raised by so much the more.

[1]) If the landlords persist in spending the whole of their incomes, no matter how great they become, then either the system will be plunged into an inflation, prices rising without limit, or the rate of interest will be raised, in order to check the inflation, to the point at which the initial tendency for output to expand is reversed. There is thus an alternative route by which the scarcity of land may limit the expansion of output.

[2]) This is not quite accurate, for though the increase in output tends to raise landlords' incomes, the increase in capital per unit of output consequent upon a fall in the rate of interest will be partly at the expense of land. There may therefore be a certain range of outputs over which the landlords are impoverished. But what the landlords lose by a high elasticity of substitution between land and capital, the capitalists gain, and on the assumption that both classes have the same degree of thriftiness, a transference of income between them has no effect upon total output.

The effect of fixed natural resources upon employment is in general to reinforce the influence of changes in output. A given increase in output requires more labour when land is scarce then when it is superabundant and a given decline causes more unemployment. The case in which total output increases but employment declines is therefore less likely to arise when land is scarce.

5.

We have discussed movements in the position of long-period equilibrium consequent upon changes in the rate of interest. The equilibrium position will be shifted also by an alteration in the thriftiness of the community[1]), whether due to a change in institutional influences on the distribution of wealth, to a change in fiscal policy such as an alteration in methods of supporting the unemployed, to a change in the degree of monopoly, or to numerous other causes. The position of equilibrium will move with movements in population and with changes in technique. To explore these subjects would carry us far afield and no further attempt is here made to discuss them. But before leaving the subject of changes in the rate of interest we may briefly examine the process of movement from one position of equilibrium to another, supposing the transition to come about perfectly smoothly, without the oscillations to which any change in the real world is likely to give rise. Let us suppose that a once-and-for-all reduction in the rate of interest takes place and consider how output, employment and real wages are adjusted to the change. We will return to the simplifying assumptions that labour and capital are the only factors of production and that the direct effect of the rate of interest upon the desire to save is neutral. We will assume that money-wage rates are constant and we will choose for illustration a case in which the elasticity of substitution is greater than unity, so that the increase in the amount of capital due to the fall in the rate of interest is more than proportional to the reduction in its rate of earnings, the thriftiness of the community is increased, and output and employment are smaller in the second position of equilibrium than in the first. To simplify the analysis of investment we will postulate that in our community there are only three stages of production; capital goods to make capital goods, typified by blast furnaces; capital goods to make consumption goods[2]), typified by machines[3]); and consumption goods which cannot be stored[4]).

[1]) See above, p. 77.

[2]) Houses are best regarded as belonging to this class, that is, as capital goods designed to produce the consumption good room-days.

[3]) It is further assumed that the renewal of stocks of each type of good takes the form of complete replacement, so that the process of making new capital goods in indistinguishable from the process of renewing old ones of the same type.

[4]) An effort of imagination is required to visualise this simplified scheme of production, since stocks and outputs of raw materials are not overtly included in it. They have been left out of account in order to avoid intricacies of exposition. But the sinking of coal mines, for instance, may easily be imagined

When the rate of interest falls the price of all existing capital goods is raised and schemes of investment become profitable. Men will be set to work[1]) making both blast furnaces and machines[2]). The output of each type of good will expand to the point at which its cost at the margin is raised to equality with the new price. If, in the first position of equilibrium, the capacity of the machine-making industries was exactly adjusted to their current output for renewals, so that the supply of machines was perfectly inelastic, their cost at the margin would rise without any increase of output, and investment would at first be confined to the blast-furnace industries. But normally some increase in the output of machines would take place immediately.

As the stock of blast furnaces increases their price will fall, and the rate of investment in blast furnaces will decline. In general, the rate of investment in them will be greater, and the period over which it continues will be shorter, the greater the elasticity of supply in the blast-furnace industries[3]). While the rate of output of blast-furnaces is slackening the output of machines is expanding. For as soon as the first batch of blast-furnaces is ready for use the short-period supply price of a given rate of output of machines is lowered. The crest of the wave of investment therefore moves forward from the first to the second stage of production. The rate of output required to equate the supply price of machines to a given demand price is increased, but meanwhile the stock of machines in existence is expanding and demand price is falling. After a time, therefore, the rate of investment in machines, in its turn, begins to fall off. Meanwhile the total rate of investment, after rising to a certain maximum has already begun to decline. The marginal efficiency of capital at each stage of production is immediately reduced to equality with the lower rate of interest by the rise in supply price of capital goods due to the increase

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as an industry of the first stage, parallel with constructing blast furnaces, and mining coal as parallel with making machines.

The degree of integration between industries makes no difference to the argument, but verbal simplicity is secured by assuming that each industry sells its products to the next, so that we may speak of prices and demands for the output of each industry.

[1]) It is assumed that in the first position of equilibrium unemployment was so great that there is no danger that full employment will be reached during the period of transition. If it were reached a temporary rise in the rate of interest would occur and the assumption of a once-and-for-all fall would be untenable.

[2]) The new capital goods may not be exactly like those already in existence, as the processes of production are now being adapted to a lower rate of interest; see above p. 75, note 1. It is assumed that old capital goods are wearing out at a steady rate, so that the transition can be made smoothly.

[3]) In the extreme case, if the elasticity of supply is infinite, the greatest possible rate of investment will be reached immediately and investment in the first stage of production will come to an end as soon as the first batch of blast furnaces is ready for use. The same argument will apply to the machine-making industries in their turn.

in the rate of output. As the stock of capital goods at any stage increases their prospective earnings per unit fall. A corresponding reduction in their supply price is brought about by the consequent slackening of the rate of investment, and equality between the marginal efficiency of capital at each stage and the rate of interest is continuously preserved.

While investment is proceeding the output of consumption goods also expands and their prices rise[1]), for the increased incomes of members of the investment industries are being partly spent upon increased consumption. Employment is increased not only in the capital good industries, but in the consumption good industries also. But soon the effect of an increase in capitalist wealth begins to make itself felt. At first the rate of current earnings of existing blast furnaces rises with the increased demand for machines, but earnings for a given rate of output begin to decline as more blast furnaces come into use, so that even before the output of machines has begun to slacken the rate of earnings of blast furnaces begins to fall off. Similarly the rate of earnings of machines at first rises and then falls. Capitalist incomes are swollen by the increase in outputs and prices, and the rate of saving is raised to equality with the rate of investment. But the gradual increase in the stock of capital goods at each stage, which is more than proportional to the gradual fall in their rate of earnings for a given level of output, raises the level of capitalist incomes corresponding to a given level of output at each stage. The rate of saving corresponding to a given level of output is therefore increased, and the rate of consumption (which on our assumptions is equivalent to the output of consumption goods) corresponding to a given level of investment is reduced. The rate of saving falls off with the rate of investment, and the rate of consumption falls faster than the rate of saving. Thus rising thriftiness exerts a drag of ever increasing weight upon the upward pressure of investment, the rate of consumption is continuously increasing and the output of consumption goods ceases to rise and begins to decline before investment has passed its zenith. As the rate of investment gradually falls off consumption declines further and further. It has fallen back to its original level before the force of investment is entirely spent, and sinks below its former level as the rate of investment finally subsides to zero.

The level of employment rises with the level of output at each stage and declines when it begins to decline. But as soon as new capital goods of one stage come into use employment per unit of output at the next stage is reduced. Workers are displaced by capital goods and a given rate of demand at each stage is satisfied by the product of a smaller amount of labour. Thus employment reaches its maximum before output, and falls off faster than output, at each stage of production. As time goes by the declining rate of investment, the declining level of consumption for a given rate of investment and the rising level of output per head, combine

[1]) If supply is perfectly inelastic, the expansion of output must await the production of additional machines, and at first the whole effect is seen in prices alone, cf. above, p. 90.

to throw back into unemployment the workers temporarily absorbed into industry under the passing influence of investment. In the final position, when the rate of investment has fallen to zero, the decline in employment below its former level is greater than in proportion to the decline in output, to an extent determined by the rise in productivity which is due to the increased stock of capital goods.

The level of real wages at first falls, with the rise in price of consumption goods. But as soon as new machines come into use the supply price of a given output of consumption goods begins to fall. Prices therefore begin to fall below their maximum level and real wages to rise above their minimum, before the rate of consumption has begun to decline. As consumption declines prices fall by so much the more and reach their former level while output is still sinking towards it. In the final position of equilibrium, prices are lower and real wages higher than in the first position to an extent which is determined by the increase in productivity.

The process of adjustment in response to a rise in the rate of interest is symmetrical with the process of adjustment in response to a fall[1]). With a rise in the rate of interest the prices of capital goods fall and renewals cease to be profitable. As blast furnaces fall out of use the cost of renewing machines is raised and the wave of disinvestment moves forward. As machines wear out their price begins to recover and the rate of disinvestment slackens. The output of consumption goods and the level of employment each in turn fall to a minimum and then in turn begin to rise. Real wages rise as consumption falls off and sink back as consumption recovers and as capital equipment declines. Finally, in the case which we have chosen to consider, consumption rises above its former level and real wages sink below it, as the rate of disinvestment gradually falls to zero. In the final position the increase in employment is greater than the increase in consumption to an extent determined by the decline in productivity due to the reduced stock of capital goods.

Even this highly stylised account of the process of transition serves to show that long-period influences are of the utmost importance at any moment of time. Our static community in full equilibrium is a very remote abstraction, and for any real community in a changing world the position of equilibrium is shifting faster than the system adapts itself to change. But the motive for studying equilibrium positions is to discover forces which are at work when the system is out of equilibrium, and the long-period tendencies which we have discussed are set to work by any change as soon as the change is made. When investment has been going on for a few months new capital goods come into existence. Labour is displaced by their use; prices are lowered and the rate of real wages raised as soon as their product is added to the supply of consumption goods. Changes in the distribution of income, raising or lowering the level of consumption, begin to be felt as soon as new dividends begin to be paid.

[1]) The assumption made above, p. 89, note 3, is necessary for complete symmetry.

Moreover the time required for the long-period effects of a given change to outweigh the short-period effects may not be very long. Suppose that the effect of a fall in the rate of interest is considerably to reduce the equilibrium level of employment. Then when a fall in the rate of interest takes place it may be only a matter of a year or two before the level of employment sinks below what it would have been if the rate of interest had been maintained at the higher level, in spite of the fact that schemes of investment made profitable by the fall in the rate of interest may continue to be carried out for many years on end. Or, again, since a fall in the rate of interest is likely to set up a long-period tendency for real wages to rise, there will be a certain length of time, following an initial fall in the rate of interest, after which real wages will be higher then they would otherwise have been, in spite of the fact that a high level of employment, tending to depress current real wage rates, is still being maintained.

In any actual situation long-period tendencies show themselves in the statistics concurrently with short-period effects, and it would be impossible to make a comparison of output, employment and wages between one year and the next if long-period tendencies were not brought into account.