Chapter 6

THE DEFINITION OF INCOME, SAVING AND INVESTMENT

1. *Income*

During any period of time an entrepreneur will have sold finished output to consumers or to other entrepreneurs for a certain sum which we will designate as A. He will also have spent a certain sum, designated by A_1, on purchasing finished output from other entrepreneurs. And he will end up with a capital equipment, which term includes both his stocks of unfinished goods or working capital and his stocks of finished goods, having a value G.

Some part, however, of $A + G - A_1$ will be attributable, not to the activities of the period in question, but to the capital equipment which he had at the beginning of the period. We must, therefore, in order to arrive at what we mean by the *income* of the current period, deduct from $A + G - A_1$ a certain sum, to represent that part of its value which has been (in some sense) contributed by the equipment inherited from the previous period. The problem of defining income is solved as soon as we have found a satisfactory method for calculating this deduction.

There are two possible principles for calculating it, each of which has a certain significance;—one of them in connection with production, and the other in connection with consumption. Let us consider them in turn.

(i) The actual value G of the capital equipment at

the end of the period is the net result of the entrepreneur, on the one hand, having maintained and improved it during the period, both by purchases from other entrepreneurs and by work done upon it by himself, and, on the other hand, having exhausted or depreciated it through using it to produce output. If he had decided *not* to use it to produce output, there is, nevertheless, a certain optimum sum which it would have paid him to spend on maintaining and improving it. Let us suppose that, in this event, he would have spent B' on its maintenance and improvement, and that, having had this spent on it, it would have been worth G' at the end of the period. That is to say, $G' - B'$ is the maximum net value which might have been conserved from the previous period, if it had not been used to produce A. The excess of this potential value of the equipment over $G - A_1$ is the measure of what has been sacrificed (one way or another) to produce A. Let us call this quantity, namely

$$(G' - B') - (G - A_1),$$

which measures the sacrifice of value involved in the production of A, the *user cost* of A. *User cost* will be written U.[1] The amount paid out by the entrepreneur to the other factors of production in return for their services, which from their point of view is their income, we will call the *factor cost* of A. The sum of the factor cost F and the user cost U we shall call the *prime cost* of the output A.

We can then define the *income*[2] of the entrepreneur as being the excess of the value of his finished output sold during the period over his prime cost. The entrepreneur's income, that is to say, is taken as being equal to the quantity, depending on his scale of production, which he endeavours to maximise, i.e. to his gross profit

[1] Some further observations on user cost are given in an Appendix to this chapter.

[2] As distinguished from his *net income* which we shall define below.

in the ordinary sense of this term;—which agrees with common sense. Hence, since the income of the rest of the community is equal to the entrepreneur's factor cost, aggregate income is equal to $A - U$.

Income, thus defined, is a completely unambiguous quantity. Moreover, since it is the entrepreneur's expectation of the excess of this quantity over his outgoings to the other factors of production which he endeavours to maximise when he decides how much employment to give to the other factors of production, it is the quantity which is causally significant for employment.

It is conceivable, of course, that $G - A_1$ may exceed $G' - B'$, so that user cost will be negative. For example, this may well be the case if we happen to choose our period in such a way that input has been increasing during the period but without there having been time for the increased output to reach the stage of being finished and sold. It will also be the case, whenever there is positive investment, if we imagine industry to be so much integrated that entrepreneurs make most of their equipment for themselves. Since, however, user cost is only negative when the entrepreneur has been increasing his capital equipment by his own labour, we can, in an economy where capital equipment is largely manufactured by different firms from those which use it, normally think of user cost as being positive. Moreover, it is difficult to conceive of a case where *marginal* user cost associated with an increase in A, i.e. $\frac{dU}{dA}$, will be other than positive.

It may be convenient to mention here, in anticipation of the latter part of this chapter, that, for the community as a whole, the aggregate *consumption* (C) of the period is equal to $\Sigma(A - A_1)$, and the aggregate *investment* (I) is equal to $\Sigma(A_1 - U)$. Moreover, U is the individual entrepreneur's disinvestment (and $-U$ his investment) in respect of his own equipment exclusive

of what he buys from other entrepreneurs. Thus in a completely integrated system (where $A_1 = 0$) consumption is equal to A and investment to $-U$, i.e. to $G-(G'-B')$. The slight complication of the above, through the introduction of A_1, is simply due to the desirability of providing in a generalised way for the case of a non-integrated system of production.

Furthermore, the *effective demand* is simply the aggregate income (or proceeds) which the entrepreneurs expect to receive, inclusive of the incomes which they will hand on to the other factors of production, from the amount of current employment which they decide to give. The aggregate demand function relates various hypothetical quantities of employment to the proceeds which their outputs are expected to yield; and the effective demand is the point on the aggregate demand function which becomes effective because, taken in conjunction with the conditions of supply, it corresponds to the level of employment which maximises the entrepreneur's expectation of profit.

This set of definitions also has the advantage that we can equate the marginal proceeds (or income) to the marginal factor cost; and thus arrive at the same sort of propositions relating marginal proceeds thus defined to marginal factor costs as have been stated by those economists who, by ignoring user cost or assuming it to be zero, have equated supply price[1] to marginal factor cost.[2]

[1] *Supply price* is, I think, an incompletely defined term, if the problem of defining user cost has been ignored. The matter is further discussed in the appendix to this chapter, where I argue that the exclusion of user cost from supply price, whilst sometimes appropriate in the case of aggregate supply price, is inappropriate to the problems of the supply price of a unit of output for an individual firm.

[2] For example, let us take $Z_w = \phi(N)$, or alternatively $Z = W.\phi(N)$ as the aggregate supply function (where W is the wage-unit and $W.Z_w = Z$). Then, since the proceeds of the marginal product is equal to the marginal factor-cost at every point on the aggregate supply curve, we have

$$\Delta N = \Delta A_w - \Delta U_w = \Delta Z_w = \Delta\phi(N),$$

that is to say $\phi'(N) = 1$; provided that factor cost bears a constant ratio to wage cost, and that the aggregate supply function for each firm (the number

(ii) We turn, next, to the second of the principles referred to above. We have dealt so far with that part of the change in the value of the capital equipment at the end of the period as compared with its value at the beginning which is due to the *voluntary* decisions of the entrepreneur in seeking to maximise his profit. But there may, in addition, be an *involuntary* loss (or gain) in the value of his capital equipment, occurring for reasons beyond his control and irrespective of his current decisions, on account of (e.g.) a change in market values, wastage by obsolescence or the mere passage of time, or destruction by catastrophe such as war or earthquake. Now some part of these involuntary losses, whilst they are unavoidable, are—broadly speaking—not unexpected; such as losses through the lapse of time irrespective of use, and also 'normal' obsolescence which, as Professor Pigou expresses it, 'is sufficiently regular to be foreseen, if not in detail, at least in the large', including, we may add, those losses to the community as a whole which are sufficiently regular to be commonly regarded as 'insurable risks'. Let us ignore for the moment the fact that the amount of the expected loss depends on when the expectation is assumed to be framed, and let us call the depreciation of the equipment, which is involuntary but not unexpected, i.e. the excess of the expected depreciation over the user cost, the *supplementary cost*, which will be written V. It is, perhaps, hardly necessary to point out that this definition is not the same as Marshall's definition of supplementary cost, though the underlying idea, namely, of dealing with that part of the expected depreciation which does not enter into prime cost, is similar.

of which is assumed to be constant) is independent of the number of men employed in other industries, so that the terms of the above equation, which hold good for each individual entrepreneur, can be summed for the entrepreneurs as a whole. This means that, if wages are constant and other factor costs are a constant proportion of the wages-bill, the aggregate supply function is linear with a slope given by the reciprocal of the money-wage.

In reckoning, therefore, the *net income* and the *net profit* of the entrepreneur it is usual to deduct the estimated amount of the supplementary cost from his income and gross profit as defined above. For the psychological effect on the entrepreneur, when he is considering what he is free to spend and to save, of the supplementary cost is virtually the same as though it came off his gross profit. In his capacity as a *producer* deciding whether or not to use the equipment, prime cost and gross profit, as defined above, are the significant concepts. But in his capacity as a *consumer* the amount of the supplementary cost works on his mind in the same way as if it were a part of the prime cost. Hence we shall not only come nearest to common usage but will also arrive at a concept which is relevant to the amount of consumption, if, in defining aggregate *net* income, we deduct the supplementary cost as well as the user cost, so that aggregate *net income* is equal to $A - U - V$.

There remains the change in the value of the equipment, due to unforeseen changes in market values, exceptional obsolescence or destruction by catastrophe, which is both involuntary and—in a broad sense—unforeseen. The actual loss under this head, which we disregard even in reckoning net income and charge to capital account, may be called the *windfall loss*.

The *causal* significance of net income lies in the psychological influence of the magnitude of V on the amount of current consumption, since *net income* is what we suppose the ordinary man to reckon his available income to be when he is deciding how much to spend on current consumption. This is not, of course, the only factor of which he takes account when he is deciding how much to spend. It makes a considerable difference, for example, how much windfall gain or loss he is making on capital account. But there is a difference between the supplementary cost and a windfall loss in that changes in the former are apt to affect

him *in just the same way* as changes in his gross profit. It is the excess of the proceeds of the current output over the *sum* of the prime cost and the supplementary cost which is relevant to the entrepreneur's consumption; whereas, although the windfall loss (or gain) enters into his decisions, it does not enter into them on the same scale—a given windfall loss does not have the same effect as an equal supplementary cost.

We must now recur, however, to the point that the line between supplementary costs and windfall losses, i.e. between those unavoidable losses which we think it proper to debit to income account and those which it is reasonable to reckon as a windfall loss (or gain) on capital account, is partly a conventional or psychological one, depending on what are the commonly accepted criteria for estimating the former. For no unique principle can be established for the estimation of supplementary cost, and its amount will depend on our choice of an accounting method. The expected value of the supplementary cost, when the equipment was originally produced, is a definite quantity. But if it is re-estimated subsequently, its amount over the remainder of the life of the equipment may have changed as a result of a change in the meantime in our expectations; the windfall capital loss being the discounted value of the difference between the former and the revised expectation of the prospective series of $U+V$. It is a widely approved principle of business accounting, endorsed by the Inland Revenue authorities, to establish a figure for the sum of the supplementary cost and the user cost when the equipment is acquired and to maintain this unaltered during the life of the equipment, irrespective of subsequent changes in expectation. In this case the supplementary cost over any period must be taken as the excess of this predetermined figure over the actual user cost. This has the advantage of ensuring that the windfall gain or loss shall be zero over the life of the

equipment taken as a whole. But it is also reasonable in certain circumstances to recalculate the allowance for supplementary cost on the basis of current values and expectations at an arbitrary accounting interval, e.g. annually. Business men in fact differ as to which course they adopt. It may be convenient to call the initial expectation of supplementary cost when the equipment is first acquired the *basic supplementary cost*, and the same quantity recalculated up to date on the basis of current values and expectations the *current supplementary cost*.

Thus we cannot get closer to a quantitative definition of supplementary cost than that it comprises those deductions from his income which a typical entrepreneur makes before reckoning what he considers his *net* income for the purpose of declaring a dividend (in the case of a corporation) or of deciding the scale of his current consumption (in the case of an individual). Since windfall charges on capital account are not going to be ruled out of the picture, it is clearly better, in case of doubt, to assign an item to capital account, and to include in supplementary cost only what rather obviously belongs there. For any overloading of the former can be corrected by allowing it more influence on the rate of current consumption than it would otherwise have had.

It will be seen that our definition of *net income* comes very close to Marshall's definition of *income*, when he decided to take refuge in the practices of the Income Tax Commissioners and—broadly speaking to regard as income whatever they, with their experience, choose to treat as such. For the fabric of their decisions can be regarded as the result of the most careful and extensive investigation which is available, to interpret what, in practice, it is usual to treat as net income. It also corresponds to the money value of Professor Pigou's most recent definition of the national dividend.[1]

[1] *Economic Journal*, June 1935, p. 235.

It remains true, however, that net income, being based on an equivocal criterion which different authorities might interpret differently, is not perfectly clear-cut. Professor Hayek, for example, has suggested that an individual owner of capital goods might aim at keeping the income he derives from his possessions constant, so that he would not feel himself free to spend his income on consumption until he had set aside sufficient to offset any tendency of his investment-income to decline for whatever reason.[1] I doubt if such an individual exists; but, obviously, no theoretical objection can be raised against this deduction as providing a possible psychological criterion of net income. But when Professor Hayek infers that the concepts of saving and investment suffer from a corresponding vagueness, he is only right if he means *net saving* and *net investment*. The *saving* and the *investment*, which are relevant to the theory of employment, are clear of this defect, and are capable of objective definition, as we have shown above.

Thus it is a mistake to put all the emphasis on *net income*, which is only relevant to decisions concerning consumption, and is, moreover, only separated from various other factors affecting consumption by a narrow line; and to overlook (as has been usual) the concept of *income* proper, which is the concept relevant to decisions concerning current production and is quite unambiguous.

The above definitions of income and of net income are intended to conform as closely as possible to common usage. It is necessary, therefore, that I should at once remind the reader that in my *Treatise on Money* I defined income in a special sense. The peculiarity in my former definition related to that part of aggregate income which accrues to the entrepreneurs, since I took neither the profit (whether gross or net) actually realised from their current operations nor the profit which they expected when they decided to under-

[1] 'The Maintenance of Capital', *Economica*, August 1935, p. 241 *et seq.*

take their current operations, but in some sense (not, as I now think, sufficiently defined if we allow for the possibility of changes in the scale of output) a normal or equilibrium profit; with the result that on this definition saving exceeded investment by the amount of the excess of normal profit over the actual profit. I am afraid that this use of terms has caused considerable confusion, especially in the case of the correlative use of saving; since conclusions (relating, in particular, to the excess of saving over investment), which were only valid if the terms employed were interpreted in my special sense, have been frequently adopted in popular discussion as though the terms were being employed in their more familiar sense. For this reason, and also because I no longer require my former terms to express my ideas accurately, I have decided to discard them—with much regret for the confusion which they have caused.

II. *Saving and Investment*

Amidst the welter of divergent usages of terms, it is agreeable to discover one fixed point. So far as I know, everyone is agreed that *saving* means the excess of income over expenditure on consumption. Thus any doubts about the meaning of *saving* must arise from doubts about the meaning either of *income* or of *consumption*. *Income* we have defined above. Expenditure on consumption during any period must mean the value of goods sold to consumers during that period, which throws us back to the question of what is meant by a consumer-purchaser. Any reasonable definition of the line between consumer-purchasers and investor-purchasers will serve us equally well, provided that it is consistently applied. Such problem as there is, e.g. whether it is right to regard the purchase of a motor-car as a consumer-purchase and the purchase of a house as an investor-purchase, has been frequently discussed and I have nothing material to add to the discussion.

The criterion must obviously correspond to where we draw the line between the consumer and the entrepreneur. Thus when we have defined A_1 as the value of what one entrepreneur has purchased from another, we have implicitly settled the question. It follows that expenditure on consumption can be unambiguously defined as $\Sigma(A - A_1)$, where ΣA is the total sales made during the period and ΣA_1 is the total sales made by one entrepreneur to another. In what follows it will be convenient, as a rule, to omit Σ and write A for the aggregate sales of all kinds, A_1 for the aggregate sales from one entrepreneur to another and U for the aggregate user costs of the entrepreneurs.

Having now defined both *income* and *consumption*, the definition of *saving*, which is the excess of income over consumption, naturally follows. Since income is equal to $A - U$ and consumption is equal to $A - A_1$, it follows that saving is equal to $A_1 - U$. Similarly, we have *net saving* for the excess of *net income* over consumption, equal to $A_1 - U - V$.

Our definition of income also leads at once to the definition of *current investment*. For we must mean by this the current addition to the value of the capital equipment which has resulted from the productive activity of the period. This is, clearly, equal to what we have just defined as saving. For it is that part of the income of the period which has not passed into consumption. We have seen above that as the result of the production of any period entrepreneurs end up with having sold finished output having a value A and with a capital equipment which has suffered a deterioration measured by U (or an improvement measured by $-U$ where U is negative) as a result of having produced and parted with A, after allowing for purchases A_1 from other entrepreneurs. During the same period finished output having a value $A - A_1$ will have passed into consumption. The excess of $A - U$ over $A - A_1$, namely $A_1 - U$, is the addition to capital

equipment as a result of the productive activities of the period and is, therefore, the *investment* of the period. Similarly $A_1 - U - V$, which is the *net* addition to capital equipment, after allowing for normal impairment in the value of capital apart from its being used and apart from windfall changes in the value of the equipment chargeable to capital account, is the *net investment* of the period.

Whilst, therefore, the amount of saving is an outcome of the collective behaviour of individual consumers and the amount of investment of the collective behaviour of individual entrepreneurs, these two amounts are necessarily equal, since each of them is equal to the excess of income over consumption. Moreover, this conclusion in no way depends on any subtleties or peculiarities in the definition of income given above. Provided it is agreed that income is equal to the value of current output, that current investment is equal to the value of that part of current output which is not consumed, and that saving is equal to the excess of income over consumption—all of which is conformable both to common sense and to the traditional usage of the great majority of economists—the equality of saving and investment necessarily follows. In short—

Income = value of output = consumption + investment.
Saving = income − consumption.
Therefore saving = investment.

Thus *any* set of definitions which satisfy the above conditions leads to the same conclusion. It is only by denying the validity of one or other of them that the conclusion can be avoided.

The equivalence between the quantity of saving and the quantity of investment emerges from the *bilateral* character of the transactions between the producer on the one hand and, on the other hand, the consumer or the purchaser of capital equipment.

Income is created by the value in excess of user cost which the producer obtains for the output he has sold; but the whole of this output must obviously have been sold either to a consumer or to another entrepreneur; and each entrepreneur's current investment is equal to the excess of the equipment which he has purchased from other entrepreneurs over his own user cost. Hence, in the aggregate the excess of income over consumption, which we call saving, cannot differ from the addition to capital equipment which we call investment. And similarly with net saving and net investment. Saving, in fact, is a mere residual. The decisions to consume and the decisions to invest between them determine incomes. Assuming that the decisions to invest become effective, they must in doing so either curtail consumption or expand income. Thus the act of investment in itself cannot help causing the residual or margin, which we call saving, to increase by a corresponding amount.

It might be, of course, that individuals were so *tête montée* in their decisions as to how much they themselves would save and invest respectively, that there would be no point of price equilibrium at which transactions could take place. In this case our terms would cease to be applicable, since output would no longer have a definite market value, prices would find no resting-place between zero and infinity. Experience shows, however, that this, in fact, is not so; and that there are habits of psychological response which allow of an equilibrium being reached at which the readiness to buy is equal to the readiness to sell. That there should be such a thing as a market value for output is, at the same time, a necessary condition for money-income to possess a definite value and a sufficient condition for the aggregate amount which saving individuals decide to save to be equal to the aggregate amount which investing individuals decide to invest.

Clearness of mind on this matter is best reached,

perhaps, by thinking in terms of decisions to consume (or to refrain from consuming) rather than of decisions to save. A decision to consume or not to consume truly lies within the power of the individual; so does a decision to invest or not to invest. The amounts of aggregate income and of aggregate saving are the *results* of the free choices of individuals whether or not to consume and whether or not to invest; but they are neither of them capable of assuming an independent value resulting from a separate set of decisions taken irrespective of the decisions concerning consumption and investment. In accordance with this principle, the conception of the *propensity to consume* will, in what follows, take the place of the propensity or disposition to save.

Appendix on User Cost

I

User cost has, I think, an importance for the classical theory of value which has been overlooked. There is more to be said about it than would be relevant or appropriate in this place. But, as a digression, we will examine it somewhat further in this appendix.

An entrepreneur's user cost is by definition equal to

$$A_1 + (G' - B') - G,$$

where A_1 is the amount of our entrepreneur's purchases from other entrepreneurs, G the actual value of his capital equipment at the end of the period, and G' the value it might have had at the end of the period if he had refrained from using it and had spent the optimum sum B' on its maintenance and improvement. Now $G-(G'-B')$, namely the increment in the value of the entrepreneur's equipment beyond the net value which he has inherited from the previous period, represents the entrepreneur's current investment in his equipment and can be written I. Thus U, the user cost of his sales-turnover A, is equal to $A_1 - I$ where A_1 is what he has bought from other entrepreneurs and I is what he has currently invested in his own equipment. A little reflection will show that all this is no more than common sense. Some part of his outgoings to other entrepreneurs is balanced by the value of his current investment in his own equipment, and the rest represents the sacrifice which the output he has sold must have cost him over and above the total sum which he has paid out to the factors of production. If the reader tries to express the substance of this otherwise, he will find that its advantage lies in its avoidance of insoluble (and unnecessary) accounting problems. There is, I think, no other way of analysing the current proceeds of production unambiguously. If industry is completely integrated or if the entrepreneur has bought nothing from outside, so that $A_1 = 0$, the

user cost is simply the equivalent of the current disinvestment involved in using the equipment; but we are still left with the advantage that we do not require at any stage of the analysis to allocate the factor cost between the goods which are sold and the equipment which is retained. Thus we can regard the employment given by a firm, whether integrated or individual, as depending on a single consolidated decision—a procedure which corresponds to the actual interlocking character of the production of what is currently sold with total production.

The concept of user cost enables us, moreover, to give a clearer definition than that usually adopted of the short-period supply price of a unit of a firm's saleable output. For the short-period supply price is the sum of the marginal factor cost and the marginal user cost.

Now in the modern theory of value it has been a usual practice to equate the short-period supply price to the marginal factor cost alone. It is obvious, however, that this is only legitimate if marginal user cost is zero or if supply price is specially defined so as to be net of marginal user cost, just as I have defined (p. 24 above) 'proceeds' and 'aggregate supply price' as being net of aggregate user cost. But, whereas it may be occasionally convenient in dealing with *output as a whole* to deduct user cost, this procedure deprives our analysis of all reality if it is habitually (and tacitly) applied to the output of a single industry or firm, since it divorces the 'supply price' of an article from any ordinary sense of its 'price'; and some confusion may have resulted from the practice of doing so. It seems to have been assumed that 'supply price' has an obvious meaning as applied to a unit of the saleable output of an individual firm, and the matter has not been deemed to require discussion. Yet the treatment both of what is purchased from other firms and of the wastage of the firm's own equipment as a consequence of producing the marginal output involves the whole pack of perplexities which attend the definition of income. For, even if we assume that the marginal cost of purchases from other firms involved in selling an additional unit of output has to be deducted from the sale-proceeds per unit in order to give us what we mean by our firm's supply price, we still have to allow for the marginal disinvestment in the firm's own equipment involved in producing the marginal output. Even if all production is carried on by a completely integrated firm, it is still illegitimate to suppose that the marginal user cost is zero, i.e. that the marginal disinvestment in equipment due to the production of the marginal output can generally be neglected.

The concepts of user cost and of supplementary cost also enable us to establish a clearer relationship between long-period supply price and short-period supply price. Long-period cost must obviously include an amount to cover the basic supplementary cost as well as the expected prime cost appropriately averaged over the life of the equipment. That is to say, the long-period cost of the output is equal to the expected sum of the prime cost and the supplementary cost; and, furthermore, in order to yield a normal profit, the long-period supply price must exceed the long-period cost thus calculated by an amount determined by the current rate of interest on loans of comparable term and risk, reckoned as a percentage of the cost of the equipment. Or if we prefer to take a standard 'pure' rate of interest, we must include in the long-period cost a third term which we might call the *risk-cost* to cover the unknown possibilities of the actual yield differing from the expected yield. Thus the long-period supply price is equal to the sum of the prime cost, the supplementary cost, the risk cost and the interest cost, into which several components it can be analysed. The short-period supply price, on the other hand, is equal to the *marginal* prime cost. The entrepreneur must, therefore, expect, when he buys or constructs his equipment, to cover his supplementary cost, his risk cost and his interest cost out of the excess of the marginal value of the prime cost over its average value; so that in long-period equilibrium the excess of the marginal prime cost over the average prime cost is equal to the sum of the supplementary, risk and interest costs.[1]

The level of output, at which marginal prime cost is exactly equal to the sum of the average prime and supplementary costs, has a special importance, because it is the point at which the entrepreneur's trading account breaks even. It corresponds,

[1] This way of putting it depends on the convenient assumption that the marginal prime cost curve is continuous throughout its length for changes in output. In fact, this assumption is often unrealistic, and there may be one or more points of discontinuity, especially when we reach an output corresponding to the technical full capacity of the equipment. In this case the marginal analysis partially breaks down; and the price may *exceed* the marginal prime cost, where the latter is reckoned in respect of a small *decrease* of output. (Similarly there may often be a discontinuity in the downward direction, i.e. for a reduction in output *below* a certain point.) This is important when we are considering the short-period supply price in long-period equilibrium, since in that case any discontinuities, which may exist corresponding to a point of technical full capacity, must be supposed to be in operation. Thus the short-period supply price in long-period equilibrium may have to exceed the marginal prime cost (reckoned in terms of a small *decrease* of output).

that is to say, to the point of zero net profit; whilst with a smaller output than this he is trading at a net loss.

The extent to which the supplementary cost has to be provided for apart from the prime cost varies very much from one type of equipment to another. Two extreme cases are the following:

(i) Some part of the maintenance of the equipment must necessarily take place *pari passu* with the act of using it (e.g. oiling the machine). The expense of this (apart from outside purchases) is included in the factor cost. If, for physical reasons, the exact amount of the whole of the current depreciation has necessarily to be made good in this way, the amount of the user cost (apart from outside purchases) would be equal and opposite to that of the supplementary cost; and in long-period equilibrium the marginal factor cost would exceed the average factor cost by an amount equal to the risk and interest cost.

(ii) Some part of the deterioration in the value of the equipment only occurs if it is used. The cost of this is charged in user cost, in so far as it is not made good *pari passu* with the act of using it. If loss in the value of the equipment could only occur in this way, supplementary cost would be zero.

It may be worth pointing out that an entrepreneur does not use his oldest and worst equipment first, merely because its user cost is low; since its low user cost may be outweighed by its relative inefficiency, i.e. by its high factor cost. Thus an entrepreneur uses by preference that part of his equipment for which the user cost *plus* factor cost is least per unit of output.[1] It follows that for any given volume of output of the product in question there is a corresponding user cost,[2] but that this total user cost does not bear a uniform relation to the marginal user cost, i.e. to the increment of user cost due to an increment in the rate of output.

II

User cost constitutes one of the links between the present and the future. For in deciding his scale of production an

[1] Since user cost partly depends on expectations as to the future level of wages, a reduction in the wage-unit which is expected to be short-lived will cause factor cost and user cost to move in different proportions and so affect what equipment is used, and, conceivably, the level of effective demand, since factor cost may enter into the determination of effective demand in a different way from user cost.

[2] The user cost of the equipment which is first brought into use is not necessarily independent of the total volume of output (see below); i.e. the user cost may be affected all along the line when the total volume of output is changed.

entrepreneur has to exercise a choice between using up his equipment now and preserving it to be used later on. It is the expected sacrifice of future benefit involved in present use which determines the amount of the user cost, and it is the marginal amount of this sacrifice which, together with the marginal factor cost and the expectation of the marginal proceeds, determines his scale of production. How, then, is the user cost of an act of production calculated by the entrepreneur?

We have defined the user cost as the reduction in the value of the equipment due to using it as compared with not using it, after allowing for the cost of the maintenance and improvements which it would be worth while to undertake and for purchases from other entrepreneurs. It must be arrived at, therefore, by calculating the discounted value of the additional prospective yield which would be obtained at some later date if it were not used now. Now this must be at least equal to the present value of the opportunity to postpone replacement which will result from laying up the equipment; and it may be more.[1]

If there is no surplus or redundant stock, so that more units of similar equipment are being newly produced every year either as an addition or in replacement, it is evident that marginal user cost will be calculable by reference to the amount by which the life or efficiency of the equipment will be shortened if it is used, and the current replacement cost. If, however, there is redundant equipment, then the user cost will also depend on the rate of interest and the current (i.e. re-estimated) supplementary cost over the period of time before the redundancy is expected to be absorbed through wastage, etc. In this way interest cost and current supplementary cost enter indirectly into the calculation of user cost.

The calculation is exhibited in its simplest and most intelligible form when the factor cost is zero, e.g. in the case of a redundant stock of a raw material such as copper, on the lines which I have worked out in my *Treatise on Money*, vol. ii. chap. 29. Let us take the prospective values of copper at various future dates, a series which will be governed by the rate at which redundancy is being absorbed and gradually approaches the estimated normal cost. The present value or user cost of a ton of surplus copper will then be equal to the greatest of the values obtainable by subtracting from the estimated future value at any

[1] It will be more when it is expected that a more than normal yield can be obtained at some later date, which, however, is not expected to last long enough to justify (or give time for) the production of new equipment. To-day's user cost is equal to the maximum of the discounted values of the potential expected yields of all the to-morrows.

given date of a ton of copper the interest cost and the current supplementary cost on a ton of copper between that date and the present.

In the same way the user cost of a ship or factory or machine, when these equipments are in redundant supply, is its estimated replacement cost discounted at the percentage rate of its interest and current supplementary costs to the prospective date of absorption of the redundancy.

We have assumed above that the equipment will be replaced in due course by an identical article. If the equipment in question will not be renewed identically when it is worn out, then its user cost has to be calculated by taking a proportion of the user cost of the new equipment, which will be erected to do its work when it is discarded, given by its comparative efficiency.

III

The reader should notice that, where the equipment is not obsolescent but merely redundant for the time being, the difference between the actual user cost and its normal value (i.e. the value when there is no redundant equipment) varies with the interval of time which is expected to elapse before the redundancy is absorbed. Thus if the type of equipment in question is of all ages and not 'bunched', so that a fair proportion is reaching the end of its life annually, the marginal user cost will not decline greatly unless the redundancy is exceptionally excessive. In the case of a general slump, marginal user cost will depend on how long entrepreneurs expect the slump to last. Thus the rise in the supply price when affairs begin to mend may be partly due to a sharp increase in marginal user cost due to a revision of their expectations.

It has sometimes been argued, contrary to the opinion of business men, that organised schemes for scrapping redundant plant cannot have the desired effect of raising prices unless they apply to the *whole* of the redundant plant. But the concept of user cost shows how the scrapping of (say) half the redundant plant may have the effect of raising prices immediately. For by bringing the date of the absorption of the redundancy nearer, this policy raises marginal user cost and consequently increases the current supply price. Thus business men would seem to have the notion of user cost implicitly in mind, though they do not formulate it distinctly.

If the supplementary cost is heavy, it follows that the marginal user cost will be low when there is surplus equipment. Moreover,

when there is surplus equipment, the marginal factor and user costs are unlikely to be much in excess of their average value. If both these conditions are fulfilled, the existence of surplus equipment is likely to lead to the entrepreneur's working at a net loss, and perhaps at a heavy net loss. There will not be a sudden transition from this state of affairs to a normal profit, taking place at the moment when the redundancy is absorbed. As the redundancy becomes less, the user cost will gradually increase; and the excess of marginal over average factor and user cost may also gradually increase.

IV

In Marshall's *Principles of Economics* (6th ed. p. 360) a part of user cost is included in prime cost under the heading of 'extra wear-and-tear of plant'. But no guidance is given as to how this item is to be calculated or as to its importance. In his *Theory of Unemployment* (p. 42) Professor Pigou expressly assumes that the marginal disinvestment in equipment due to the marginal output can, in general, be neglected: 'The differences in the quantity of wear-and-tear suffered by equipment and in the costs of non-manual labour employed, that are associated with differences in output, are ignored, as being, in general, of secondary importance'.[1] Indeed, the notion that the disinvestment in equipment is zero at the margin of production runs through a good deal of recent economic theory. But the whole problem is brought to an obvious head as soon as it is thought necessary to explain exactly what is meant by the supply price of an individual firm.

It is true that the cost of maintenance of idle plant may often, for the reasons given above, reduce the magnitude of marginal user cost, especially in a slump which is expected to last a long time. Nevertheless a very low user cost at the margin is not a characteristic of the short period as such, but of particular situations and types of equipment where the cost of maintaining idle plant happens to be heavy, and of those disequilibria which are characterised by very rapid obsolescence or great redundancy, especially if it is coupled with a large proportion of comparatively new plant.

In the case of raw materials the necessity of allowing for user cost is obvious;—if a ton of copper is used up to-day it cannot be

[1] Mr Hawtrey (*Economica*, May 1934, p. 145) has called attention to Prof. Pigou's identification of supply price with marginal labour cost, and has contended that Prof. Pigou's argument is thereby seriously vitiated.

used to-morrow, and the value which the copper would have for the purposes of to-morrow must clearly be reckoned as a part of the marginal cost. But the fact has been overlooked that copper is only an extreme case of what occurs whenever capital equipment is used to produce. The assumption that there is a sharp division between raw materials where we must allow for the disinvestment due to using them and fixed capital where we can safely neglect it does not correspond to the facts;—especially in normal conditions where equipment is falling due for replacement every year and the use of equipment brings nearer the date at which replacement is necessary.

It is an advantage of the concepts of user cost and supplementary cost that they are as applicable to working and liquid capital as to fixed capital. The essential difference between raw materials and fixed capital lies not in their liability to user and supplementary costs, but in the fact that the return to liquid capital consists of a single term; whereas in the case of fixed capital, which is durable and used up gradually, the return consists of a series of user costs and profits earned in successive periods.