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contents

'Normal' Positions and Capital Utilisation *

Heinz D. Kurz

1. THE PROBLEM

There appears to exist general agreement that the classical approach to the theory of value and distribution is concerned with 'normal' or 'long-period' positions of the economy. Moreover, few economists working in the classical tradition would deny that the concept of the 'normal' position involves some notion of the associated rate of capital utilisation. However, there is much less agreement as to the determination of this 'normal' rate of utilisation of productive capacity. Indeed, there does not even seem to exist clarity about the logical stage within the analytical scheme of the classical approach at which the problem under consideration has to be decided.

The purpose of this paper will be to try to contribute to a clarification of the issues involved. Section 2 raises the question of whether the traditional concept of normal positions should be considered obsolete because it was formulated on the premise that economic activity as a whole cannot be constrained by aggregate demand. In section 3 it is shown with reference to Marx that this conclusion need not be drawn, i.e. that the rejection of Say's "Law of Markets" does not imply the abandonment of the classical method of analysing the problem of income distribution in terms of 'normal' positions. Moreover, it is argued that in Marx the 'normal' posi-

* The present paper is partly based on the author's contribution to the Conference on "Sraffa's *Production of Commodities by Means of Commodities* after 25 Years", Florence, August 1985, entitled "Accumulation, Distribution and the 'Keynesian Hypothesis'"; see also H. D. KURZ, "Akkumulation, Einkommensverteilung und effektive Nachfrage", in H. HAGEMANN and H. D. KURZ (eds.), *Beschäftigung, Verteilung und Konjunktur*, Festschrift in honour of Adolph Lowe, Bremen, Bremen Universitätsverlag, 1984, pp. 161-185. I am grateful to P. Kalmbach, D. Kattermann, U. Krause, A. Landsman, A. Lowe, I. Steedman and G. Vaggi for helpful discussions and comments. The usual caveats apply.

tion and thus the 'normal' degree of capital utilisation refers to the cost-minimising system of production. Section 4 is devoted to a discussion of the problem under consideration in terms of Sraffa's reformulation of the classical approach to the theory of value and distribution. It is stressed that the choice of the system of operation of plant and equipment forms an integral part of the choice of technique problem. The cost-minimising degree of capital utilisation is demonstrated to depend on income distribution, i.e. the basic wage rate (or, alternatively, the rate of profits) and the wage differentials to be paid for differently intensive work and work outside of ordinary working hours. In addition, it is pointed out that there exists the possibility of the return of the same system of operation of plant and equipment, i.e. a variant of the phenomenon of the reswitching of techniques. Some alternative attempts to define the concept of 'normal' utilisation are commented upon in the concluding section 5.

Unless otherwise stated, the argument in the analytical parts of the present paper is developed in terms of the following simplifying assumptions. There are constant returns to scale throughout the economy, in particular there are no scarce natural resources, such as land; there is no joint production proper; the items of fixed capital exhibit constant efficiency throughout their lifetime; all commodities are basic (excluding old items of durable capital). Moreover, apart from incidental reference, we shall set aside the problem of technological change. Most importantly, perhaps, we shall assume that there is free competition. It will be shown that even under these premises the output produced from normal capital utilisation will typically fall short of the potential maximum output. Additional output could therefore be produced at higher levels of aggregate demand by more intensive capital utilisation, provided it be profitable to do so.

Accordingly, we shall not deal with any of the more specific causes of intended idle capacity dealt with in the literature, for example in oligopoly where idle capacity is said to be carried in order to deter potential competitors from entering the market. This does not mean that these causes are considered unimportant. However, they are set aside for the sake of focusing the attention on some of the more basic aspects of the problem under consideration. Since it is in regard to them that a confusing diversity of views can be found in the literature.

2. "NORMAL" POSITIONS AND EFFECTIVE DEMAND

According to the principle of effective demand, as it will be understood in this paper, aggregate demand may fall short of, or exceed, the output produced from normal utilisation of the existing capital stock. This is in open contradiction to one of the basic premises of the doctrine of the

old classical economists, which, in Ricardo's words, implied that "demand is only limited by production" [1]. Indeed, because of their inclination to identify decisions to save with decisions to invest, the only discrepancies between actual productive capacity and 'effectual demand' the classical authors were willing to admit, were those relating to "particular employments of capital" [2]. Due to the 'accidental' nature of the causes that were considered responsible for these discrepancies, the latter were regarded as 'temporary' phenomena only, which, for the economy as a whole, were more or less compensating one another. Thus, they were seen to have no influence on "the general price of commodities, wages, or profits"; the conclusion was close at hand that they were best left "entirely out of consideration" [3].

Now, there is no reason not to follow the classical economists in setting aside the accidental and temporary causes that lead to deviations of the 'market' levels of the price and distribution variables from their 'natural' or normal levels, and to concentrate on the persistent or non-temporary causes shaping the state of the economy. It appears to be less clear what consequences, if any, follow for the classical method of long-period analysis in view of the fact that the 'entrepreneur economy', to use Keynes's term, is *persistently* subject to the principle of effective demand.

According to one group of authors, the finding that the economy is demand-constrained of necessity leads to the abandonment of the traditional method of analysis. This view is particularly prominent among Post-Keynesians of various orientations. It was advocated at times by Joan Robinson, who in one place objected to long-period analysis that its key concept, i.e. the normal rate of profits, "float[s] above historical time as a Platonic Idea" [4]. In a similar vein, Professor J. Steindl in a contribution to the recent Conference on Sraffa called the notion of the centre of gravitation in the classical approach, a "mythical concept" [5].

A second kind of response to the challenge mentioned above consists in the attempt to re-define the concept of 'normal' positions by taking into account the state of long-run aggregate demand as it is reflected by some measure of the average rate of capacity utilisation. Hence, in addition to the causes contemplated by the classical economists in the theory of value and distribution, i.e., the socially dominant technique, the size and com-

[1] *The Works and Correspondence of David Ricardo*, edited by P. Sraffa in collaboration with M. H. Dobb, Cambridge, C.U.P., 1951-1973, Vol. I (*Principles*), p. 290.

[2] *Ibid.*, Vol. I, p. 91.

[3] *Ibid.*, Vol. I, pp. 91-2.

[4] See J. ROBINSON, "Comment on Garegnani", *Cambridge Journal of Economics*, 3, June 1979, p. 180.

[5] Cf. J. STEINDL, "Comment on Kurz", paper presented to the Sraffa Conference.

position of the social product and the ruling real wage (or, as in recent reformulations of the approach, the rate of profit), the 'normal' position is seen to depend on the average rate of capital utilisation.

Finally, there is the view that the discovery of the principle of effective demand cannot invalidate the usefulness of the traditional concept of 'normal' positions. First, it is argued that the forces envisaged by the classical economists as pushing the system towards that centre of gravitation are still effective. Secondly, the concept is taken to be indispensable in the analysis of accumulation and distribution since it provides a benchmark which allows us to ascertain the order of magnitude of effective demand failures in terms of their impact on the economic performance of the system and the distribution of the product. However, whereas in classical theory the process of gravitation around the (slowly moving) centre was assumed to follow a path sufficiently close to the one described by the centre itself, it can no longer be presumed that this is the case. Indeed, it cannot be precluded that deviations of the actual situation from the 'normal' one, may become large, and remain so for a long period of time.

As is well known, Marx preserved the basic elements of the classical surplus approach to the theory of distribution. Yet he rejected Say's Law. Therefore, it is of some interest to see whether in his view this rejection involved the abandonment or at least the modification of the traditional concept of 'normal' positions.

3. THE CONCEPT OF 'NORMAL' POSITIONS IN MARX

According to Marx one of the main features of the modern industrial system is its *elasticity*:

"So soon... as the factory system has gained a certain breadth of footing and a definite degree of maturity, and, especially, so soon as its technical basis, machinery, is itself produced by machinery..., this mode of production acquires an elasticity, a capacity for sudden extension by leaps and bounds that finds no hindrance except in the supply of raw material and in the disposal of the produce [Absatzmarkt]" [6].

Thus demand is considered a limiting factor of production. The elasticity of the system is seen to provide the basis for the industrial cycle, that is, the sequence of "periods of moderate activity, prosperity, overproduction, crisis and stagnation" [7].

[6] K. MARX, *Capital*, Vol. I, London, Lawrence & Wishart, 1954, p. 424.
[7] *Ibid.*, p. 427.

However, in Marx's opinion the uncertainty and instability to which the modern industrial system subjects the level of economic activity and employment do not necessitate a modification of the concept of normal positions of the economy. In Vol. II of *Capital*, Marx in his investigation of the turnover of capital under normal conditions explicitly decides to set aside cyclical fluctuations in output, employment and capacity utilisation:

"When there is a hitch in production, when the markets are overstocked, and when raw materials rise in price, etc., the normal outlay of circulating capital is restricted — once the pattern of the fixed capital has been set — by cutting down working time to, say, one half. On the other hand, in times of prosperity, the pattern of fixed capital given, there is an abnormal expansion of the circulating capital, partly through the extension of working time and partly through its intensification... However, *such abnormal fluctuations are not considered here, where we assume normal conditions*" [8].

Careful scrutiny of Marx's reasoning shows that his decision to abstract altogether from cyclical fluctuations in the specification of 'normality', i.e. not to identify some average rate of capital utilisation with the 'normal' rate, was motivated as follows. Economic fluctuations lack sufficient regularity. The duration and intensity of booms and slumps differ widely between trade cycles. Averaging out between any pair of successive booms and slumps would generally yield vastly different images of 'normality'. Moreover, since these averages reflect the impact of a multiplicity of accidental and temporary factors at work in the respective period, there is no presumption that any of them will represent with sufficient approximation the going centre of gravitation. Indeed, there is no reason to suppose that the actual position of the economy will ever get very close to the 'normal' one.

How, then, are the 'normal' position and particularly the associated 'normal' degree of capital utilisation conceived by Marx? So far, the only thing we know is that abnormal fluctuations have no role to play in their determination.

In the Chapter on 'Machinery and Modern Industry' in Vol. I of *Capital* Marx points out:

"[I]n the form of machinery, the implements of labour become automatic, things moving and working independent of the workman. They are thenceforth an industrial *perpetuum mobile*, that would go on producing forever, did it not meet

[8] K. MARX, *Capital*, Vol. II, London, Lawrence & Wishart, 1956, p. 262; emphasis added. The translation of the German "auf gegebner Grundlage des fixen Kapitals" with "once the pattern of the fixed capital has been set" is somewhat unfortunate. What is meant is that in the short run the available plant and equipment is given.

with certain natural obstructions in the weak bodies and the strong wills of its human attendants"[9].

He continues that the capitalist employment of machinery "supplies new and powerful motives to an excessive lengthening of the working-day" and "sweeps away every moral and natural restriction"[10] on the latter. First, the prolongation of the daily labour-process and thus of the daily working-time of machinery would in general reduce both the time period in which the value of the machine is reproduced and the time period in which a given amount of surplus-value is generated. Secondly, due to technological advances the fixed capital items undergo what Marx called 'moral depreciation'. The danger of this kind of depreciation provides an additional incentive to shorten the period taken to reproduce the machine's value, i.e. to lengthen and intensify the working-day. The conclusion is close at hand:

"To appropriate labour during all the 24 hours of the day is, therefore, the *inherent tendency of capitalist production*. But as it is physically impossible to exploit the same individual labour-power constantly during the night as well as the day, to overcome this physical hindrance, an alternation becomes necessary between the workpeople whose powers are exhausted by day, and those who are used up by night"[11].

This could be effected in different ways, e.g., in terms of the relay system or shift-work. The 'inherent tendency' is discernible in numerous organisational and technological changes that aim at the better, i.e. more profitable, utilisation of the different parts of capital. Attempts to increase the rate of utilisation of fixed capital are also dealt with under the entry 'economy in the employment of constant capital', particularly in Vol. III of *Capital*[12].

[9] K. MARX, *Capital*, Vol. I, *op. cit.*, p. 380.

[10] *Ibid.*, p. 384.

[11] *Ibid.*, p. 245; emphasis added. The inherent tendency Marx spoke of was widely acknowledged by nineteenth century economists. For example, J. S. Mill in dealing with some of Babbage's ideas went so far as to argue that keeping machines working through the twenty-four hours "is evidently the only economical mode of employing them"; cf. J. S. MILL [1848], *Principles of Political Economy*, Vol. II of the *Collected Works of John Stuart Mill*, ed. by J. M. Robson, Toronto, University of Toronto Press, 1965, p. 131. We shall see below that in general Mill's opinion cannot be sustained.

[12] Cf. K. MARX, *Capital*, Vol. III, London, Lawrence & Wishart, 1959, Chap. V. Clearly, the interest in operating the capital stock the maximum possible time per year is still present in modern times. Thus innovations related to the 'microelectronic revolution' are frequently said to exhibit a capital saving bias and to render more efficient the operation of plant and equipment; a case in point is the robotisation of production in manufacturing. See, for example, W. LENTIEF and F. DUCHIN, *The Future Impact of Automation on Workers*, New York and Oxford, O.U.P., 1986.

Despite the interest of the proprietors to utilise the capital stock for the maximum possible time per period, under any given historical circumstances the intended 'full' utilisation is prevented by a variety of technological, customary and institutional factors. Several of these factors express the current bargaining position of workers relative to employers. Now, under competitive conditions entrepreneurs are assumed to maximise extra profits subject to the data of the economic system, including the given customary and institutional factors[13]. The competitive decisions of entrepreneurs are then seen to result in the adoption of the *cost-minimising* system of production. The latter constitutes the respective 'normal' position of the economy. By implication, the 'normal' rates of utilisation of the various items of plant and equipment are conceived to be in compliance with the principle of cost minimisation.

It is this notion of 'normal' utilisation of productive capacity that appears to underlie Marx's discussion of the economy in the employment of constant capital. There Marx writes with regard to fixed capital:

"The volume of the fixed portion of constant capital, such as factory buildings, machinery, etc., remains the same, no matter whether these serve the labour-process 16 or 12 hours. A prolongation of the working-day does not entail any fresh expenditures in this, the most expensive portion of constant capital. Furthermore, the value of the fixed capital is thereby reproduced in a smaller number of turnover periods, so that the time for which it must be advanced to make a certain profit is abbreviated. A prolongation of the working-day therefore increases the profit, *even if overtime is paid, or even if, up to a certain point, it is better paid than the normal hours of labour*" [14].

Marx refers to an important institutional feature of the modern industrial system that may prevent profit-maximising entrepreneurs from choosing a higher planned rate of utilisation of the durable means of production. This consists of the fact that in order to utilise plant and equipment outside of ordinary working hours[15], i.e. by the use of overtime and multiple-shift systems, firms must generally pay higher wages to workers: they must pay the going basic wage rate and a wage premium or differential to financially compensate workers for their work during abnormal hours. The levels of the basic wage and the wage differentials may be envisaged as reflecting the current balance of power of the two

[13] For a discussion of the 'givens' in the surplus approach to the theory of value and distribution cf. P. GAREGNANI, "Value and Distribution in the Classical Economists and Marx", *Oxford Economic Papers*, 36, June 1984, p. 293; see also section 4 below.

[14] K. MARX, *Capital*, Vol. III, *op. cit.*, p. 77; emphasis added.

[15] Clearly, what in a given historical situation of a certain economy are to be considered 'ordinary working hours' is itself an institutional datum that plays some role in defining the normal position of that economy.

parties involved. Clearly, the prolongation of the working-day and thus the more intensive utilisation of productive capacity will be profitable if the reduction in the value of invested capital per unit of output is at least as large as the reduction in profits per unit of output. Since the larger the wage premium the smaller the profit margin, we may, *ceteris paribus*, determine the 'certain point' Marx speaks of, up to which the premium can rise without necessitating a reduction in the desired rate of capital utilisation.

To summarize, Marx clearly expressed the view that the problem of the choice of technique involves the choice of the rate of capital utilisation. Under competitive conditions those methods of production and those degrees of utilisation of plant and equipment will be chosen which minimise average unit costs and maximise the rate of profit. The 'normal' position of the economy is defined in terms of the cost-minimising system of production of given levels of outputs. Accordingly, the productive capacities installed in the different sectors are assumed to be fully adjusted to these outputs. Despite the 'inherent tendency of capitalist production' to lengthen the working-day and to increase the rate of utilisation of capital, in any given situation the 'normal' utilisation of the various items of fixed capital will in general fall short of the maximum one possible under the given circumstances. Among the factors acting as deterrents to planning for maximum utilisation, the wage differentials to be paid outside of ordinary working hours, figure prominently. The 'elasticity' of the industrial system is greatly due to the existence of margins of underutilised capacity which can be exploited under conditions favourable to profit-seeking entrepreneurs.

In what follows we shall discuss the problem under consideration in more general terms. The reformulation of the surplus approach to the theory of value and distribution by Piero Sraffa[16] provides an adequate framework for the analysis. Our main concern will be to answer the question raised in recent contributions to the problem of accumulation and distribution[17] of whether Sraffa's price equations involve some implicit assumption as to the degree of utilisation of productive capacity.

4. THE CHOICE OF TECHNIQUE AND CAPITAL UTILISATION

It can hardly be denied that the problem of capacity utilisation is of great practical importance. When a producer plans to build a new industrial plant, this involves some decision as to the desired normal rates of

[16] Cf. P. SRAFFA, *Production of Commodities by Means of Commodities*, Cambridge, C.U.P., 1960.

[17] Cf. F. VIANELLO, "The Pace of Accumulation", *Political Economy - Studies in the Surplus Approach*, N. 1, Vol. I, 1985. See also R. CICCONE's contribution in the present issue.

utilisation of the various items of fixed capital. Otherwise it would not be possible to decide how much of these items to install in order to match the average expected demand for the product. It follows that the theory of production and the analysis of the choice of technique is seriously incomplete without a proper treatment of capital utilisation[18].

Surprisingly enough, this problem played no role whatsoever in the recent debates on the theory of capital. Most of the contributions were concerned with circulating capital only, or, when fixed capital was taken into account at all, it was *implicitly* assumed in general that the degree of utilisation of an instrument is given and constant, i.e. independent of income distribution. The only aspect of the use of capital investigated was the one relating to the economic lifetime of machines the efficiency of which varies with the age of the machines. It was shown that with decreasing or changing efficiency a problem of the choice of technique, i.e. of the optimal truncation date, arises. Cost minimisation implies that for a given level of the rate of profit (or, alternatively, the real wage rate) premature truncation is advantageous as soon as the price (book value) of a partly worn out instrument of production becomes negative[19]. With regard to this aspect of the employment of capital the total use of the various parts of the capital stock is directly proportional to their endogenously determined economic lifetimes.

The neglect of an *explicit* treatment of the other aspects of capital utilisation is also characteristic of Sraffa's analysis, the *locus classicus* from which the capital theoretic critique of the marginalist approach was developed. In fact, the only direct indication given by him of the possibility to use the same instrument of production at different intensities refers to the case of a certain type of machine employed in several industries[20]. However, it is not difficult to infer from Sraffa's general argument how the analysis could be extended explicitly to cover the various aspects of capital utilisation. In his discussion of the problem of the choice of technique, Sraffa stresses that under competitive conditions this choice "will be exclusively grounded on cheapness"[21]. The implication is close at hand that the same criterion has to be envisaged as governing the choice of the

[18] This was emphasized by R. MARRIS in his classic study *The Economics of Capital Utilisation*, Cambridge, C.U.P., 1964.

[19] See in particular B. SCHEFOLD, "Fixed Capital as a Joint Product and the Analysis of Accumulation with Different Forms of Technical Progress", in L. L. PASINETTI (ed.), *Essays on the Theory of Joint Production*, London and Basingstoke, Macmillan, 1980, pp. 171-188; cf. also H. HAGEMANN and H. D. KURZ, "The Return of the Same Truncation Period and Reswitching of Techniques in Neo-Austrian and More General Models", *Kyklos*, 29, December 1976, pp. 687-697.

[20] He points out that consequently "[t]he same type of machine (e.g. a lorry) ... may be subject to greater wear and tear when employed in one [industry] than in the other and have a shorter life"; see P. SRAFFA, *op. cit.*, p. 66.

[21] P. SRAFFA, *op. cit.*, p. 83.

system of operation of plant and equipment which forms an integral part of the choice of technique. Hence, according to this interpretation, there is a close affinity between the 'normal position' analyses of Sraffa and of Marx.

A proper treatment of normal capital utilisation within the analytical framework of the surplus approach presupposes a reformulation of the three sets of data of that approach, as they are conventionally specified, i.e., (i) the methods of production available, (ii) the ruling distribution of income, and (iii) the level and composition of output.

A full description of a 'method of production' includes not only a description of the quantities of the different kinds of means of production used up (i.e. circulating capital), the quantities of the different kinds of labour employed, and the quantity of the respective product produced, but also of the quantities and rates of utilisation of the different items of fixed capital operated. The rate of utilisation of an item of durable capital depends on the intensity of operation per unit of active time (hour) and on the number of time units within a given time period (year) during which the item is actually operated. Hence capital utilisation per time period can be increased by speeding up the rate of operation of the durable capital good or by stretching out the duration of its operation. According to the view advocated in this paper, different feasible modes of operation of the same plant and equipment should be conceived as different methods of production[22].

In correspondence to the more elaborate description of the technological alternatives assumed to be available in given circumstances, we need a more detailed account of the set of given distribution variables. In particular, it no longer suffices to start from a given real wage rate (a set of real wages in the case of heterogeneous labour) or, alternatively, a given rate of profit. In addition to the 'basic' wage rate (the set of 'basic' wage rates) or the rate of profit we need some information about the going wage premiums and differentials for differently intensive work and work outside of ordinary working hours[23]. On the basis of this information we may

[22] It has been argued in the literature that variations in the two dimensions involved, i.e. intensity and duration, may have rather different and sometimes even opposite economic implications; cf., for example, G. C. WINSTON, "The Theory of Capital Utilization and Idleness", *Journal of Economic Literature*, XII, December 1974. For practical reasons it is often appropriate to concentrate on the duration of equipment operation within a given time period and to define the rate of utilisation of an item of equipment as the annual operating hours of that item. Accordingly, to study the problem of capital utilisation is essentially to study the problem of overtime and shift-work. See R. MARRIS, *op. cit.*, and R. R. BETANCOURT and C. K. CLAGUE, *Capital Utilisation - A Theoretical and Empirical Analysis*, Cambridge, C.U.P., 1981.

[23] Despite the difficulty of providing a unique measure of the intensity of work, there appears to be a close relationship between the latter and the mode of operation of machinery. In this context it is noteworthy that due to the openness of the labour contract an increase in the intensity of work need not be accompanied by an increase in wages. Hence, in terms of efficiency units the real wage need not be constant.

follow Sraffa's suggestion, i.e. reduce any differences in the quality of labour to equivalent differences in quantity so that each unit of labour receives the same wage[24].

Finally, we have to specify more carefully what is meant by given amounts of the various commodities to be produced. It has been argued that the normal position of the economy is characterised by an adjustment of output generated from normal utilisation of productive capacity to the level and composition of 'effectual demand'. What we now have to take into consideration is the obvious fact that even in normal conditions both output and demand generally fluctuate in a more or less well-known manner[25].

Empirically most important are perhaps product demand variations that come in fairly regular rhythms, predictable peak loads. These normal fluctuations justify planned idle capacity even in the absence of uncertainty. Rhythmic variations in the level of output are either reflections of rhythmic variations in demand or the result of separate factors impeding production at a steady rate. For example, in the case of services and products that cannot be stored the adjustment of output to variable demand patterns necessitates the carrying of idle capacity. Autonomous seasonal fluctuations in the rate of production are ubiquitous in many branches of primary production and other outdoor activities such as construction. Frequently, the observed rhythmic variations in output are themselves the result of the complex interaction between the three sets of 'givens', i.e. those factors that appear as independent variables, and the dependent variables, i.e. one of the distributive variables and relative prices. Thus in manufacturing, much of the observed idleness of productive capacity can be explained in terms of rhythmic variations in input prices, some of which are the result of and, in turn, give rise to rhythmic fluctuations in demand (cf. for example the demand pattern of electricity during day and night). Where the storage of the product is possible, fluctuations in demand can be matched by contrary fluctuations in inventories, while production is carried out at a fairly steady rate.

Actually the problem is more complicated since in general the extent of the various markets is not a given and constant magnitude, rather the majority of markets are growing while some are shrinking. Therefore, one could think of defining the long-period position in terms of given 'normal' rates of growth of the markets. However, to take as given an entire 'regime of normal growth' would raise a number of serious conceptual problems. One of these problems concerns the relationship and interaction among the 'givens' and between them and the dependent variables. Although this problem is also felt with regard to the traditional specifica-

[24] Cf. P. Sraffa, *op. cit.*, p. 10.

[25] Cf. G. C. Winston, *op. cit.*, pp. 1302-1304, and R. Marris, *op. cit.*, pp. 94-97.

tion of the independent variables of the classical approach, it is put into sharp relief in the present case. Indeed, it is hardly sensible to start from a given regime of growth independently of the rate of profits, the rate and bias of technical progress etc.

We may now illustrate the choice of the cost-minimising mode of operation of plant and equipment in terms of an exceedingly simple example. In particular, we shall set aside fluctuations in normal demand and production.

Suppose that a producer has the choice of operating a machine (a factory) under a single or a double-shift system. Suppose that the physical conditions of production under the second shift are the same as under the first[26]. Hence, under the double-shift system the same daily output could be produced by working half of the machinery twice as long each day as under the single-shift system. The machine is assumed to exhibit constant efficiency throughout its life which is taken to last two years under the single and one year under the double-shift system. Obviously, the producer can compare the cheapness of the two modes of operation of plant and equipment only for a given system of prices and distribution. We shall assume that the comparison is carried out in terms of the normal levels of these variables that obtain when the single-shift system is in use. Let p_m be the price of the new machine, M the number of machines required to produce annually the quantity Q of a commodity 'q', the price of which is p_Q, K_Q the value of the means of production used up (circulating capital), L_Q the amount of labour employed, r the uniform rate of profit and w the basic wage rate. Then, under the single-shift system, the price equation representing the production of commodity 'q' will be[27]

$$Mp_m \frac{r(1+r)^2}{(1+r)^2-1} + K_Q(1+r) + L_Q w = Qp_Q \qquad [1]$$

Under the double-shift system the entrepreneur would be able to economise on his fixed capital by one half. On the other hand he would incur higher wage costs due to the going shift differential α, $\alpha \geq 0$, to be paid to workers during the second shift. Total wage costs would thus amount to

$$\frac{L_Q}{2} w + \frac{L_Q}{2}(1+\alpha)\ w = L_Q\left(1+\frac{\alpha}{2}\right) w = L_Q w^{28}.$$

[26] This assumption is unnecessarily restrictive. In particular, the difference between the day-shift and night-shift wage-bills need not be referred solely to a wage differential. Thus the amount of labour per unit of output could be larger on the night-shift, thus reinforcing the differential.

[27] Cf. P. SRAFFA, *op. cit.*, p. 66; wages are assumed to be paid at the end of the production period.

[28] Instead of developing the argument in terms of the shift differential we could follow Sraffa's proposal and translate differences in the wage rate into equivalent differences in the quantity of labour employed.

Let π denote the extra profits he could make under the double-shift system, where π is determined by

$$\frac{M}{2} p_m (1+r) + K_Q (1+r) + L_Q \left(1+\frac{\alpha}{2}\right) w + \pi = Q p_Q \qquad [2]$$

Subtracting equation [1] from [2] gives

$$\pi = M p_m \left[\frac{r+r^2}{2(2+r)}\right] - L_Q \frac{\alpha}{2} w \qquad [3]$$

Hence

$$\pi \gtreqless 0 \quad \text{if} \quad M p_m \left[\frac{r+r^2}{2+r}\right] \gtreqless L_Q \alpha w \qquad [4]^{29}$$

Double shifts would be adopted if $\pi > 0$; for $\pi = 0$ producers would be indifferent, while for $\pi < 0$ they would maintain single shifts (provided there is no fear of premature obsolescence of the machine due to technical progress). As Marris put it, "it is difficult to see why one should ever choose a particular rate of capital utilisation if another would yield a higher profit rate"[30].

While the example given may suffice to illustrate the choice of technique problem at issue and to explain the fact that firms plan intentionally to leave their capital stock idle over substantial stretches of time, it hides of course many of the complications involved. In general, different methods of operation of plant and equipment will differ in several of the physical characteristics of the respective processes of production. An increase in the rate of utilisation may increase or even decrease the wear and tear of some or all of the fixed capital items[31], it may change the pattern of

[29] Clearly, in the present case the 'certain point' Marx spoke of, up to which the shift differential can rise, is given by

$$\alpha = \frac{M p_m}{L_Q w}\left[\frac{r+r^2}{2+r}\right]$$

and thus depends on the value of invested (fixed) capital per unit of labour, $M p_m / L_Q$, the basic wage rate and the rate of profit.

[30] R. MARRIS, *op. cit.*, p. 26. Clearly, for a particular system of operation of plant and equipment to be cost-minimising it has to turn out to be so at any set of prices associated with the alternative systems at which the comparison can be carried out; cf. P. SRAFFA, *op. cit.*, p. 83.

[31] For example, in metal manufacturing and chemicals, economies in capital cost associated with high utilisation are said to be quite substantial. However, an even more important factor in favour of nearly continuous utilisation of capital in these industries appears to be found in economies in raw materials and fuel. J. S. Mill's proposition quoted above (see footnote 11) thus seems to apply in certain cases.

maintenance and repair activities, it may affect the efficiency of machinery and the productivity of labour, there may or may not be (dis)economies of scale, etc. Since the literature on theoretical and applied work in this field of research provides detailed descriptions of various possibilities, we need not dwell on them. Here it suffices to point out that the conventional analysis of the choice of technique in terms of alternative relationships between the rate of profit r and the (basic) wage rate w, measured in some standard of value, may be used to cover alternative systems of capital utilisation. Thus, for given (absolute or relative) wage differentials different systems of operation of plant and equipment may be represented by different w-r relationships. In Fig. 1 two such wage curves are depicted.

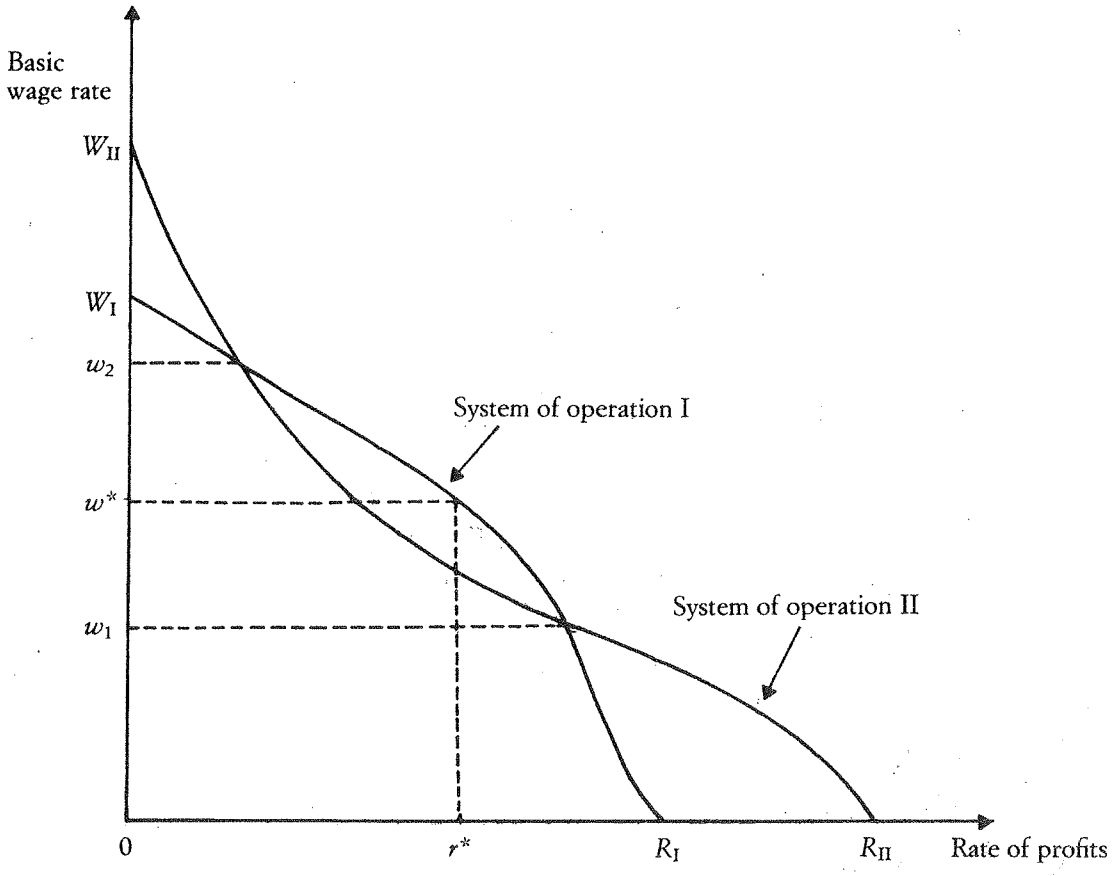

Fig. 1

Whilst it cannot be ruled out *a priori* that for given wage premiums the same system of operation is superior at all levels of the basic wage rate (the rate of profit), it is perhaps more likely that different systems will be profitable at different levels of w (r). It is even possible that the same system is superior at disconnected ranges of the wage rate, whereas at ranges of the wage rate from between some other system(s) is (are) optim-

al. Such a case is illustrated in Fig. 1, where system I is superior for $w_1 < w < w_2$, while system II dominates at $0 < w < w_1$ and $w_2 < w < W_{II}$; for $w = w_1$ and $w = w_2$ both systems yield the same r and can co-exist. Here we have a variant of the phenomenon of the reswitching of techniques: the reswitching of the same system of operation of plant and equipment, or *the return of the same rates of utilisation of the various items of durable capital.*

We may conclude that the normal rate of capacity utilisation cannot in general be determined independently of income distribution, i.e. the ruling basic wage rate (or rate of profits) and the overtime and shift differentials. Thus, in the case of Fig. 1 at a level of the basic wage rate w^* system I will be chosen; it will be associated with a uniform rate of profit r^* and a vector of normal prices p^*.

After having sketched what in the present author's view is the appropriate specification of the concept of 'normal' capital utilisation, let us now briefly discuss some recent contributions to the problem under consideration where different views were expressed.

5. SOME ALTERNATIVE VIEWS: A COMMENT

The opinion that Sraffa's price equations involve some implicit assumption as to the degree of normal utilisation of productive capacity is also entertained by F. Vianello[32]. However, it remains unclear in his paper how this degree is determined. Normal utilisation is defined as "that utilisation which producers regard as normal"[33]; it appears to be conventionally given and at any rate is assumed to be independent of income distribution.

Interestingly enough, the criterion of cost minimisation plays no role in Vianello's notion of 'normal' utilisation. The latter is supposed to fall short of what he calls 'maximum' utilisation despite the fact that in the model presented, an increase of actual above 'normal' utilisation up to its maximum level leaves the (net) profit margin per unit of output unaffected. Hence it comes as no surprise that "for any given [real wage rate], over- (or under-) utilisation of productive capacity implies an abnormally high (or, respectively, low) ratio of profits to the value of capital"[34].

[32] Cf. F. VIANELLO, *op. cit.*, pp. 71 and 83.

[33] *Ibid.*, p. 75.

[34] *Ibid.*, p. 84. Vianello in fact assumes that an increase in the rate of utilisation increases the sectoral output-capital ratio, while the output-labour ratio remains constant. Since overtime or shift work is not supposed to be paid a wage premium and since circulating capital costs, capital depreciation etc. are all set aside, an increase in utilisation of (perennial) capital does not lead to a fall in the

In my view Vianello's conception is difficult to sustain and, if the interpretation given in the preceding sections should prove correct, cannot be considered as an adequate representation of the notion of 'normal positions' common to the classical economists, Marx and Sraffa. In particular, it is by no means plausible that the competitive decisions of entrepreneurs should deliberately aim at the preservation or restoration of a degree of utilisation of productive capacity which is not profit maximising and therefore, under competition, cost minimising. Furthermore, Vianello's concept of normal utilisation has the disadvantage of lacking an 'objective' determination. Such a determination is however provided by the classical approach to the theory of value and distribution, where the choice of technique and thus the choice of the system of operation of plant and equipment is shown to depend on the specific sets of data contemplated by this approach (cf. section 4).

R. Ciccone[35] appears to hold a view which in certain respects is similar to Vianello's. In particular, he seems to share the opinion that an increase of capacity utilisation above its 'normal' degree tends to raise the profitability of business without of necessity affecting the real wage rate, given the set of technological alternatives. Thus he maintains that "owing to the possible changes in the degree of capacity utilisation, the ratio of profits to capital actually obtainable in the long period appears to be largely independent of the real wage"[36].

Whilst there is no doubt that the "realised rate of profit", to use Joan Robinson's[37] term, may fall short of, or rise above, the normal rate of profit, the question is whether the latter possibility presupposes a "realised real wage rate" that falls short of the normal wage rate. In Ciccone's view this has to be answered in the negative. Due to 'normal' fluctuations in demand firms tend to carry idle capacity for the sake of meeting peak

profit margin per unit of output and therefore raises the rate of profit. Clearly, under the conditions described, the tendency Marx spoke of (cf. section 3) would hold full sway over normal capital utilisation.

[35] Cf. R. CICCONE, "Accumulation, Utilisation of Capacity and Income Distribution: Some Critical Considerations on Joan Robinson's Theory of Distribution", paper presented to the Sraffa Conference. The following comments refer to the version of Ciccone's paper circulated at the Conference. The revised version of that paper published in this issue was not at my disposal when writing the present paper.

[36] R. CICCONE, *op. cit.*, p. 26.

[37] J. ROBINSON, *Essays in the Theory of Economic Growth*, London, Macmillan, 1962, p. 29. As Joan Robinson already observed, the 'realised rate of profit' is vague and difficult to define with sufficient precision to render it useful as a theoretical concept. The best definition available appears to be the one that uses normal prices to evaluate the surplus product actually realised and the social capital in existence; see also H. KURZ, "Akkumulation, Einkommensverteilung und effektive Nachfrage", *op. cit.*, p. 178. Moreover, it has to be noticed that outside the normal position of the economy the profit rates will generally differ between industries (and firms). The realised rate of profit therefore is some kind of average rate for the economy as a whole.

orders. With a rise in the pace of accumulation and thus a more rapid expansion of aggregate demand the maximum rate of product demand firms wish to meet will be experienced more often. Therefore, capacity utilisation will increase and so will the average realised rate of profit, given the real wage rate.

Clearly, this proposition deserves careful scrutiny. Here it suffices to note that in my view Ciccone's supporting arguments, suggestive as they may be, cannot bear the burden of his conclusion that the realised rate of profit is "largely independent of the real wage". While it cannot be ruled out that under conditions to be specified there may exist margins for the realised rate of profit to rise above the normal rate, these margins seem to be small rather than large. In the short run the impact of an increase in capital utilisation on the realised rate of profit may even be negative due to the costs incurred by the necessary restructuring of the production process. Moreover, it has to be taken into account that the 'normal' patterns of fluctuations in demand and the capability to respond flexibly with a judicious combination of production and storage activities differ across sectors. Consequently, the need to carry excess capacity varies vastly between sectors. Apparently, some industries in manufacturing can do almost without any excess capacity. 'Normal' fluctuations in demand are matched by contrary fluctuations in inventories. If some of these sectors happen to be basic industries then a speed up of accumulation would soon be hampered.

Therefore, the story to be told in the purely hypothetical case of given technological alternatives appears to be more like the following. If aggregate demand is high relatively to output produced from normal utilisation of capacity and if, in addition, the economy is not close to a situation of full employment, the conditions are favourable to an increase in prices relatively to money wages. The tendency of real wages to fall, i.e. the deviation of actual from normal distribution in favour of profits, may then render it profitable for entrepreneurs to switch to a more intensive utilisation of plant and equipment. However, with an assumedly constant basic real wage and in the absence of technological improvements, an above normal degree of capital utilisation will involve above normal unit costs due to, for example, higher average real wage costs per unit of output and a sub-optimal rate of capital depreciation. Hence, in the circumstances depicted, there is no reason to suppose that for the economy as a whole, the realised rate of profit may exceed the normal one. That is, the economy cannot operate in the area North-East of the wage-frontier (see Fig. 1); it can however operate in the area South-West of it.

Another difficulty with Ciccone's approach concerns the fact that two fundamentally different notions of the long period do not appear to be strictly kept apart: the long period as a long period of historical time and the 'long-period' or normal position towards which the economy is

assumed to gravitate[38]. As should be clear from the foregoing, the long-period position cannot be assumed to remain the same over time. It will rather be affected by technological innovations, persistent changes in the level and composition of output in demand and persistent changes in the balance of power between the parties involved in the conflict over the distribution of the product. The corresponding alterations in the long-period position may or may not be accompanied by variations in the normal degree of capital utilisation. For example, in a particular historical period the bias of technical change may be such that for a constant or even moderately rising real wage rate both the normal levels of the rate of profits and of capital utilisation will rise. Clearly, in such a case a rising statistical trend in profitability and capacity utilisation could not be exclusively explained in terms of high levels of aggregate demand. This demonstrates anew how important it is to try to give as precise a meaning as possible to the concept of 'normal positions'. Without such a concept it would seem to be impossible to isolate the impact of effective demand on the economic performance of the system and the distribution of the product[39]. On the other hand, for the reasons given in section 4, to take as independently given a whole 'regime of normal growth' is hardly sensible. In Sraffa no such assumption is to be found.

We may conclude by saying that the constraint binding changes in the normal levels of the real wage and the rate of profits remains effective over time. However, it has to be taken into account that this constraint, i.e. the *w-r* relationship, continuously changes its location and shape, thereby shifting the centre around which the economy is assumed to gravitate.

Fachbereich Wirtschaftswissenschaft, Universität Bremen.

[38] This may be illustrated in terms of his concept of the 'long-period utilisation'. Whilst for the greater part of his paper it is used to characterise the rate of utilisation actually realised on average over a 'long' period of time as opposed to the 'desired' or 'normal' rate (see *op. cit.*, pp. 5 and 9-12), it is also used in the latter sense (*ibid.*, p. 28).

[39] There is evidence from several sources that average capital utilisation and shift-work in the United States and other advanced industrial economies have increased quite substantially over the last six decades or so. See, for example, the evidence reported in R. R. BETANCOURT and C. K. CLAGUE, *op. cit.*, part. III. Obviously, there is no presumption that this long run trend can be predominantly explained in terms of effective demand pressures. Indeed, changes in the factors affecting the long-period position appear to have played an important role. Attempts to explain the phenomenon under consideration within the framework of the marginalist approach are numerous; cf. more recently B. S. MANN, "Capital Heterogeneity, Capital Utilization, and the Demand for Shiftworkers", *Canadian Journal of Economics*, XVII, September 1984.