political economy Studies in the Surplus Approach

contents

The Pace of Accumulation

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1. INTRODUCTION

According to Adam Smith's teaching, "the quantity of every commodity brought to market naturally suits itself to the effectual demand", i. e. to "the demand of those who are willing to pay the natural price of the commodity"[1]. Ricardo argues on the same lines, that the "power of purchasing" which a commodity "would possess, if not disturbed by any temporary or accidental cause, and which is its natural price"[2], is not determined by competition, or "the proportion between demand and supply", as this proportion can only "affect the market value of a commodity, until it is supplied in greater or less abundance, according as the demand may have increased or diminished"[3].

Competition comes, however, into play in Smith's account of the long-run tendency of the rate of profits to fall: "As capitals increase in any country, the profits which can be made by employing them necessarily diminish. It becomes gradually more and more difficult to find within the country a profitable method of employing any new capital" as well as "to get labourers to employ". Thus, "competition raises the wages of labour,

[1] A. SMITH, *An Inquiry into the Nature and Causes of the Wealth of Nations*, bk. I, ch. VII, Oxford, Clarendon Press, 1979, pp. 74 and 73.

[2] *The Works and Correspondence of David Ricardo*, Cambridge, CUP, 1951-1973, Vol. I (*Principles*), p. 92.

[3] *Ibid.*, Vol. I, p. 382.

and sinks the profits of stock"[4]. As against this, Ricardo observes that the rise in wages cannot but be "a temporary rise, proceeding from increased funds before the population is increased". But he also gives a second reason why, in his opinion, the rate of profits cannot be forced down by competition. This is that "at the same time that capital is increased, the work to be effected by capital, is increased in the same proportion", as "demand is only limited by production"[5].

This second reason was firstly put forward by Ricardo in his 1814 correspondence with Malthus. The latter was arguing that the rate of profits "seems to be determined by the quantity of accumulated capital compared with the demand for the products of capital"[6]. This view was opposed by Ricardo on the ground that in the long run demand has no part in the determination of the rate of profits, as it simply adjusts to production and the stock of capital: "though *for a short period* capital and produce may diminish faster than demand, — yet *in the long run* effective demand cannot augment or continue stationary with a diminishing capital"[7].

Ricardo's *long-run* theory of profits is actually based on the comparison between what we shall call "fully adjusted situations", i. e. situations in which a uniform rate of profits prevails, and the productive capacity installed in each industry is exactly sufficient to produce the quantities that the market absorbs when commodities are sold at their natural prices. The fully adjusted situations are reached through the adjustment of demand to production and productive capacity, as far as the *level* of aggregate demand is concerned, and through the adjustment of production and productive capacity to demand, as far as its *composition* is concerned. The first adjustment, which results from the operation of the Law of Markets, makes demand a temporary (or short-run), rather than permanent (or long-run), influence on the rate of profits, while the second adjustment corrects "the accidental and temporary deviations of the market prices of commodities"[8] from the natural prices corresponding to a particular rate of profits.

Marx rejected the Law of Markets but held to the method of referring to fully adjusted situations, in which demand has no influence on income distribution and prices. "When Adam Smith explains the fall in the rate of profit from an over-abundance of capital", Marx writes, "he is speaking of a *permanent* effect and this is wrong. As against this, the transitory over-

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[4] A. SMITH, *Wealth of Nations*, bk. II, ch. IV, *op. cit.*, pp. 352-3. Cf. also bk. I, ch. IX, p. 105.

[5] D. RICARDO, *op. cit.*, Vol. I, pp. 289-90.

[6] MALTHUS to RICARDO, 6 July 1814. *Ibid.*, Vol. VI, p. 111.

[7] RICARDO to MALTHUS, 11 August 1814. *Ibid.*, Vol. VI, p. 120; italics added.

[8] *Ibid.*, Vol. I, p. 88.

abundance of capital, over-production and crises are something different. Permanent crises do not exist"[9]. In fact crises and "capital destruction"[10] provide a solution to the problem of over-abundance of capital, and are one of the means by which the productive capacity installed adjusts to the requirements of production.

It will be argued in the course of this paper that Piero Sraffa's "equations of production"[11] also refer to fully adjusted situations, and that the latter should be interpreted as resulting from the adjustment of production and productive capacity to the level and composition of demand. The subject of *Production of Commodities by Means of Commodities* is what has been called "the 'core' of the surplus theories"[12]: basically, the analysis of the relation between wage and rate of profits, and between the latter and relative prices (also when natural resources are in short supply and alternative methods of production are available). And it is for the purposes of *this part of the theory* that Sraffa takes the quantities of both the products and of the means of production as given, in the same way as Marx does in his determination of the rate of profits and of the "prices of production". This paper endeavours to offer a contribution which may throw some light on *a different part of the theory*: the one in which the above quantities are determined.

Indeed, it may safely be said that the only proposition in Sraffa's book which lies outside the "core" of the theory is that which establishes a causal connection between the rate of interest and the rate of profits. A tentative interpretation of this connection is provided in Section 5 below.

The concept of "fully adjusted situations" is illustrated in Section 2 with the help of a highly simplified two-sector scheme. It will then be shown that the rate of accumulation observable in the fully adjusted situations (the ratio of the value of investment to the value of capital when productive capacity is normally utilised and a uniform rate of profits prevails) reflects only the size of the consumption sector relative to the investment sector, and appears to be a suitable indicator of income distribution, rather than of the actual pace of accumulation (Section 3). Let us suppose that at a given moment in time the economy finds itself in a fully adjusted situation, and let us suppose that after a period of, say, ten years, it is again in a fully adjusted situation. If income distribution is the same in the new situation as it was in the old one, the rate of accumulation

[9] K. MARX, *Theories on Surplus Value*, London, Lawrence & Wishart, 1979, Part. II, p. 497, footnote.

[10] On "capital destruction" cf. *ibid.*,npp. 495-6.

[11] P. SRAFFA, *Production of Commodities by Means of Commodities*, Cambridge, CUP, 1960, § 11.

[12] Cf. P. GAREGNANI, "Value and Distribution in the Classical Economists and Marx", *Oxford Economic Papers*, XXXVI, June 1984, pp. 292-9 and 320-3.

observable in the two situations will also be the same, *whatever the pace of accumulation may have been* over the decade. Were the pace of accumulation faster than it actually has been, this would have implied not a fall in the real wage, and in the size of the consumption sector relative to the investment sector, but a faster growth of productive capacity in both sectors alike (Section 4).

Obviously a temporary over-utilisation of productive capacity is required in order to bridge the gap between the moment in which normal utilisation turns out to be insufficient to meet the demand, and the moment in which productive capacity has fully adjusted. It follows that, the more room a normal utilisation of productive capacity leaves for production to expand in response to a rise in demand, the more the above conclusion becomes relevant from a practical point of view. No limitation, of course, applies in the case of a temporary *under*-utilisation of productive capacity.

It also follows that steady-state models, based on the hypothesis that productive capacity is *continuously* kept at its normal degree of utilisation, should be regarded as seriously misleading. This point is made at the end of this paper, in Section 6.

With reference to growth in conditions of full employment, Lord Kaldor has pointed out that there are two different uses for the Multiplier — to determine the level of real income, and to determine income distribution — and that these two uses are not incompatible, "provided the one is conceived as a short-run theory and the other as a long-run theory"[13]. The basic structure of the neo-Keynesian models is, however, the same, and the same result — that faster accumulation implies a lower real wage — follows in the case of non-full employment growth; so that Lord Kaldor's statement can indeed be taken as representative of the whole family of legitimate and Bastard Golden Ages. The view of accumulation presented here can then be characterized by contrast, as maintaining that, except in full employment, there is only one use for the Multiplier: the one for which it was originally designed.

This amounts to saying that both in the short and in the long run the balance between saving and investment is brought about through changes in the level (rather than in the distribution) of income[14]; the only difference being that in the long run, changes in the level of real income do not

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[13] N. KALDOR, "Alternative Theories of Distribution" (1956), *Essays on Value and Distribution*, London, G. Duckworth & Co., 1960, p. 228.

[14] The conclusion that "in a long-period analysis no less than in a short-period one, the level of investment should be considered as independent of the propensity to save" was originally put forward by P. GAREGNANI in "Notes on Consumption, Investment and Effective Demand", Part II, *Cambridge Journal of Economics*, III, September 1979, p. 79; or, rather, in the 1961 and 1964-65 papers referred to in Part I of the same article, *Cambridge Journal of Economics*, III, June 1979, p. 335, footnote.

involve changes in the degree of utilisation of productive capacity, but rather changes in the productive capacity installed.

2. THE FULLY ADJUSTED SITUATIONS

Let us consider a productive system consisting of two industries. In a certain period of time one of them produces a quantity I of iron and the other a quantity C of corn. Iron is the only means of production employed in the two industries and does not wear out with use. By I_i and I_c we indicate the quantities of iron employed in the production of iron and in that of corn, respectively. L_i and L_c are the corresponding quantities of labour. Production is carried out according to the following scheme:

$$I_i; L_i \rightarrow I$$

$$I_c; L_c \rightarrow C$$

The quantities produced can be increased and decreased both through variations in the degree of utilisation of productive capacity and through variations in the productive capacity installed. We shall suppose that in both cases the ratios

$$I/L_i = \pi_i$$

and

$$C/L_c = \pi_c$$

remain unchanged.

If all the profits are saved and all the wages spent in the purchase of corn, the production of the latter will be adequate to meet the demand when:

$$L_c\pi_c = L_iw_c + L_cw_c$$

(each unit of labour receives the same wage; with w_c we indicate this wage expressed in terms of corn). Between w_c and the proportion of $(L_i + L_c)$ employed in the production of corn the following relationship is established:

$$w_c = \pi_c \frac{L_c}{L_i + L_c}$$

represented graphically in Fig. 1.

At the origin of the axes not a single worker is employed in the corn industry. As the graph rises, w_c and the relative weight of L_c increase *pari*
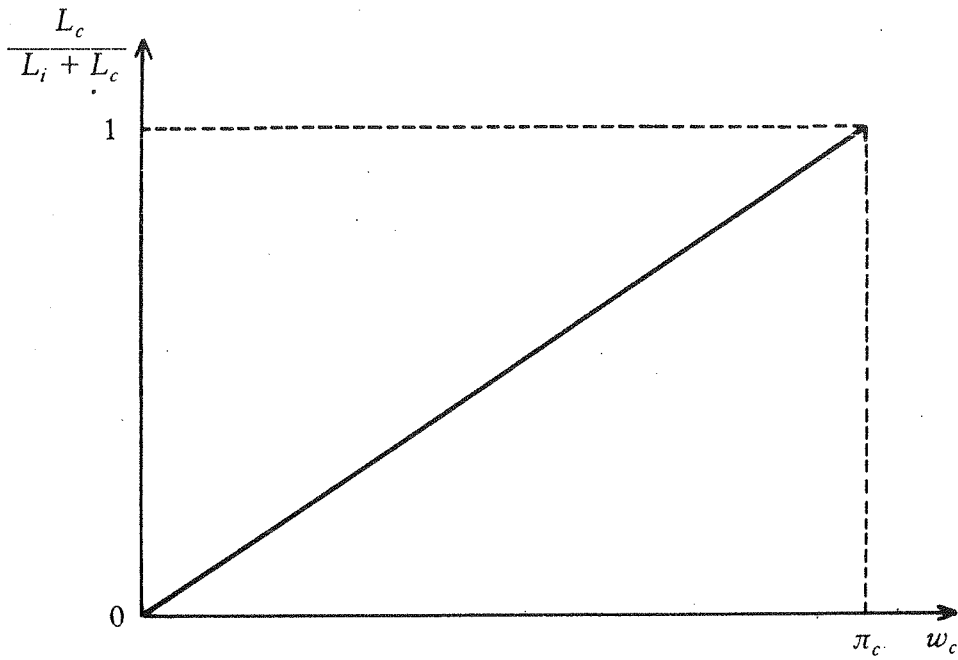
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Fig. 1. Relationship between the wage in terms of corn and the proportion of $(L_i + L_c)$ employed in the corn industry.
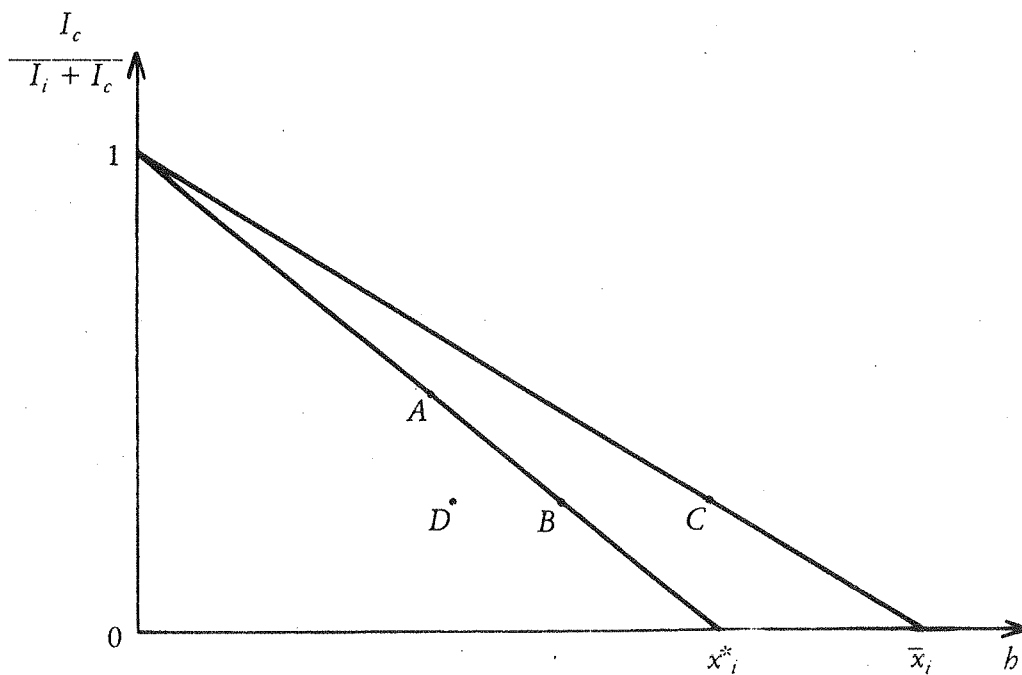

Fig. 2. Relationships between the rate of accumulation and the proportion of $(I_i + I_c)$ employed in the corn industry; $x_i = x^*_i$ and $x_i = \bar{x}_i$.

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passu until a point is reached where $w_c = \pi_c$ and not a single worker is employed in the iron industry.

As indices of the degree of utilisation of the productive capacity we adopt the ratios $I/I_i = x_i$ and $C/I_c = x_c$, which we consider variable in the range between zero and their respective *maximum values*, $\bar{x}_i$ and $\bar{x}_c$, corresponding to the maximum utilisation possible of productive capacity. Within the above range of variation one finds the *normal values*, x^*_i and x^*_c, corresponding to that utilisation which producers regard as normal.

The "rate of accumulation" of the economy, which we shall denote by h, is the ratio between the quantity of iron produced and that already in existence:

$$h = \frac{I}{I_i + I_c}$$

or with an equivalent expression:

$$h = x_i \left(1 - \frac{I_c}{I_i + I_c}\right).$$

Let us now assume as given the degree of utilisation of productive capacity in the iron industry (the value of x_i in the above expression). The ensuing relationship between h and the proportion of available iron employed in the corn industry can be represented graphically by a straight line. Giving x_i successive values ranging from zero to $\bar{x}_i$, we obtain a family of straight lines of this kind. The straight lines traced in Fig. 2 for the hypotheses $x_i = \bar{x}_i$ and $x_i = x^*_i$ belong to it. All the straight lines meet the axis of the ordinates at the same point, where no iron is employed in the iron industry and the rate of accumulation is zero. As we descend along any one of the straight lines, an ever greater proportion of $(I_i + I_c)$ is employed in the iron industry and the rate of accumulation increases continuously. When no iron is employed in the corn industry the rate of accumulation, which has become equal to the ratio between I and I_i, is the highest among those compatible with the chosen degree of utilisation.

For the moment there is no unique way to pass from Fig. 2 to Fig. 1 (from the distribution of iron between the two industries to the distribution of labour) and vice versa. Let us suppose that the productive capacity installed in the two industries does not vary as the economy shifts from a point such as B to a point such as C in Fig. 2, where productive capacity in the iron industry is over-utilised, while the distribution of iron between the two industries is unchanged. The distribution of $(L_i + L_c)$ and the wage in terms of corn (Fig. 1) will remain unchanged, too, only if the degree of utilisation of productive capacity in the corn industry rises in the same proportion as in the iron industry (i. e. if the ratio I_c/L_c falls in the

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same proportion as the ratio I_i/L_i). But the constancy of the proportion of $(I_i + I_c)$ employed in the corn industry may also emerge, as far as we know, from a constant degree of utilization of productive capacity in the corn industry (a constant ratio I_c/L_c) accompanied by a fall in w_c, or from the combined movement of the two variables. (In order that, in the case in question, w_c *may* remain constant we shall suppose, in general, that the maximum utilisation of productive capacity is not reached in the corn industry before it is reached in the iron industry. The opposite hypothesis will be considered at the end of Section 4. The possibility that the rise of production could be hindered by an insufficient supply of labour will not be considered at all.).

If, on the other hand, the economy shifts from a point such as A to a point such as B, the increase of h is accompanied by a fall in the proportion of $(I_i + I_c)$ employed in the corn industry. We cannot say, however, whether or how w_c and the distribution of labour between the two industries have changed, if we do not know what has happened to the degree of utilisation of productive capacity in the corn industry.

But this indeterminateness in the degree of utilisation of productive capacity is bound to disappear as soon as we move from short-run to long-run analysis. For this necessarily involves a shift of attention from changes in the degree of utilisation of productive capacity to changes in productive capacity itself, on the reasonable supposition that the latter does not tend to remain either systematically under-utilised or systematically over-utilised. It is on this ground that reference will be made in what follows to "fully adjusted situations" (cf. Section 1) in which $x_i = x^*_i$ and $x_c = x^*_c$.

When different fully adjusted situations are compared with one another, the rate of accumulation is automatically placed in a definite relationship to the wage in terms of corn. This is obvious if we consider that in the above comparison the ratios I_i/L_i ($= \pi_i/x^*_i$) and I_c/L_c ($= \pi_c/x^*_c$) are taken as given, so that the proportion of $(I_i + I_c)$ employed in the corn industry is placed in a definite relationship to the corresponding proportion of $(L_i + L_c)$, which in its turn is in a definite relationship (Fig. 1) to w_c.

These relationships are represented graphically in Fig. 3. Although the points A and B (quadrant I) are none other than those denoted by the same letters in Fig. 2, we now know that, if the economy shifts from A to B, the rise in the rate of accumulation is accompanied by a fall in the proportion of $(L_i + L_c)$ employed in the corn industry (quadrant II) and in the wage in terms of corn (quadrants III and IV).

The relationship represented in quadrant IV requires a few words of comment. When the straight line which appears in quadrant I was originally traced in Fig. 2, the condition which singled it out from the infinite straight lines of its kind was indicated in the normal utilisation of produc-
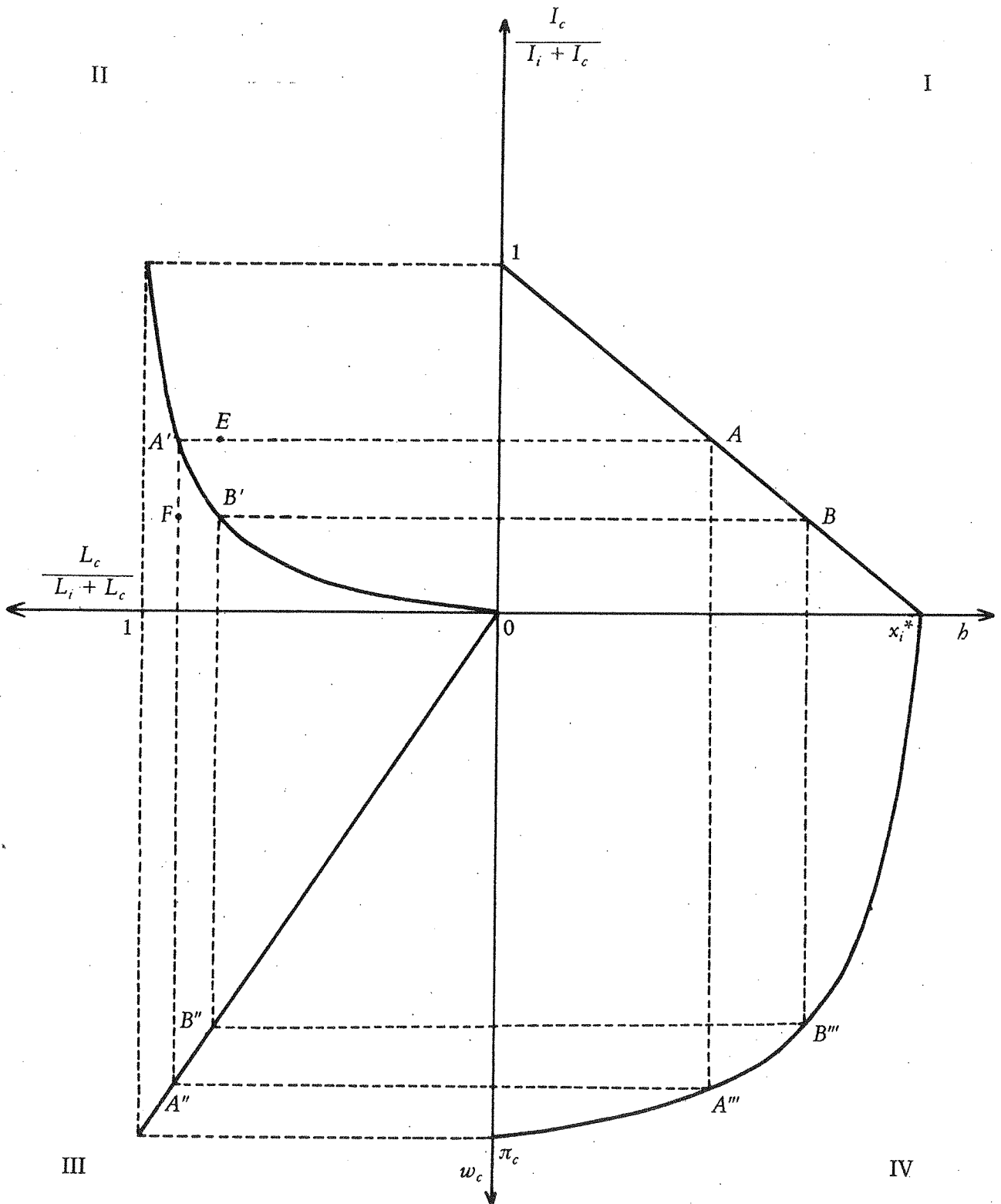
Fig. 3. Relationship between the rate of accumulation and the proportion of $(I_i + I_c)$ employed in the corn industry; $x_i = x^*_i$ (quadrant I); between this proportion and the corresponding proportion of $(L_i + L_c)$; $x_i = x^*_i$; $x_c = x^*_c$ (quadrant II); between the latter proportion and the wage in terms of corn (quadrant III); between the wage in terms of corn and the rate of accumulation; $x_i = x^*_i$; $x_c = x^*_c$ (quadrant IV).

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tive capacity *in the iron industry* ($x_i = x^*_i$). Subsequently the condition that productive capacity should be utilised normally *also in the corn industry* ($x_c = x^*_c$) was imposed. And it is on the basis of this further condition that the relationship shown in quadrant II and, thereby, that between w_c and the rate of accumulation, represented in quadrant IV, were obtained. The rate of accumulation which enters into the latter relationship, and which is subjected, therefore, to both the above-mentioned conditions, is the *rate of accumulation observable in the fully adjusted situations*, which will be denoted by h^* [15].

In each fully adjusted situation commodities are sold at prices which render the rate of profits uniform in the two industries. The overall profits being equal to the value of I, and the overall capital to the value of $(I_i + I_c)$, the rate of profits observable in any fully adjusted situation is necessarily equal to the rate of accumulation observable in that situation ($r = h^*$). The relationship represented in quadrant IV of Fig. 3 may therefore be read as a relationship between r and w_c.

Neither this relationship nor any of the others which have been established imply a causal connection. When we compare two fully adjusted situations, the one where we find a higher rate of accumulation will also show a higher rate of profits and a lower wage. But nothing in the way in which the different relationships have been constructed authorizes us to

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[15] From the equations $I = L_i \pi_i$; $C = L_c \pi_c$; $I = x^*_i I_i$; $C = x^*_c I_c$

we get

$$\frac{I_i}{I_c} = \frac{L_i}{L_c} \frac{\pi_i}{x^*_i} \frac{x^*_c}{\pi_c}$$

Defining then:

$$\frac{\pi_i}{x^*_i} \frac{x^*_c}{\pi_c} = X^*; \quad \frac{L_c}{L_i + L_c} = Y; \quad \frac{I_c}{I_i + I_c} = Z$$

by simple steps we obtain the equation:

$$Z = \frac{Y}{(1 - X^*) Y + X^*}$$

represented in quadrant II of Fig. 3. Finally we combine this equation with those represented in quadrants I and III:

$$h^* = x^*_i (1 - Z) \text{ and } w_c = \pi_c Y$$

to obtain the equation:

$$h^* = x^*_i (1 - \frac{w_c}{(1 - X^*) w_c + \pi_c X^*})$$

represented in quadrant IV. In drawing the curves it has been assumed that $X^* > 1$, namely that the iron-labour ratio corresponding to the normal degree of utilisation of productive capacity is higher in the iron industry than in the corn industry.

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conclude that h^* is higher because w_c is lower (or because r is higher), nor, on the contrary, that w_c is lower (and r higher) because h^* is higher. With regard to the study of causal connections, the considerations developed up to this point have a purely preliminary function.

3. FULLY ADJUSTED SITUATIONS WITH A DIFFERENT INCOME DISTRIBUTION

The first use that will be made of the scheme laid out in the preceding Section will be to illustrate a notable passage from Joan Robinson's *Accumulation of Capital* in which a comparison is made between "two economies alike in every respect except that in one of them, Beth, the real-wage rate is (and always has been) lower than in the other, Alaph". The two economies, which use the same methods of production, are caught "at a moment in their respective histories when the amount of employment is the same in both". It follows that "the demand for consumption goods and their rate of output is higher in Alaph, and the amount of employment in the consumption sector, with the appropriate equipment, is larger; the investment sector is consequently smaller and the rate of accumulation and the rate of profit lower".

The money wage being the same in the two economies, Alaph's higher real wage is entirely accounted for by the lower price of consumption goods. Now, however, "the Alaph entrepreneurs begin to form themselves into rings and raise prices". As the money wage remains unchanged, "the volume of sales of consumption goods gradually falls (or rather fails to rise at its former rate)". The ensuing under-utilisation of productive capacity spreads to the investment sector owing to the reduced demand for investment goods on the part of the consumption sector. "We may suppose — continues Joan Robinson — that after passing through a period of disinvestment, accumulation recovers to its former level (though there is no necessary reason why it should do so). If, now, real wages are the same as they were in Beth when the story began, the ratio of accumulation to the stock of capital is now the same in Alaph as it was in Beth, but this ratio has become established by a reduction in the stock of capital ... so that it now bears the low, Beth, ratio to the low, Alaph, level of accumulation"[16].

Starting from a point such as A'' in quadrant III of Fig. 3, Alaph shifts to a point such as B'', in which because of the diminution of w_c, a smaller proportion of $(L_i + L_c)$ is employed in the corn industry. Let us suppose that, initially, the productive capacity installed in the two industries remains unchanged. Then, the point corresponding to B'' in quadrant II is

[16] J. ROBINSON, *The Accumulation of Capital*, London, Macmillan, 1966, pp. 77-8.

no longer B', but E, in which the productive capacity installed in the corn industry is under-utilised ($x_c < x^*_c$). However, as soon as productive capacity begins to adjust to the level of production, Alaph moves away from E along an unspecified path, at the end of which it will reach point B' (and the corresponding points in quadrants I and IV). The new fully adjusted situation will, by comparison with the old one, be characterised by a higher rate of accumulation and a higher rate of profits.

The hypothesis, introduced for the sake of simplicity, that iron is not consumed with use is embarassing here, since it rules out the possibility that productive capacity adjusts to the level of production through the non-replacement of worn-out equipment, and hence the possibility that in the new fully adjusted situation the increase in h^* reflects, as in Joan Robinson's example, the *decrease* of I_c, with I and I_i unchanged. We must suppose, in other words, that the new situation is reached at a level of investment higher than (rather than equal to) what it was at the outset, so that the increase in h^* may result from a relative, not absolute, shrinkage of the corn industry.

The consequences of an increase in Beth real wage are symmetrical: "if competition broke out in Beth, and gradually raised real wages there to the original Alaph level, a burst of extra accumulation ... would establish the stock of capital at the high, Alaph, ratio to the high, Beth, rate of accumulation"[17]. Starting at B'', Beth shifts to A'' and hence, initially, to F, where the productive capacity installed in the corn industry is over-utilised ($x_c > x^*_c$). From here Beth moves towards A' (and the corresponding points in quadrants I and IV) through the growth of productive capacity installed in the corn industry relative to that installed in the iron industry. In the new fully adjusted situation the rate of accumulation and the rate of profits will thus be lower than in the old one.

It may appear surprising that a fall in investment should manifest itself, in the new fully adjusted situation, in a higher rate of accumulation (in Alaph's case) and that, conversely, a lower h^* should be reached through "a burst of extra accumulation" (in Beth's case). This pattern is, however, the natural consequence of the way in which the alteration in the relative size of the two industries, made necessary by the variation of the real wage, is assumed to take place. If a fall in w_c causes h^* to rise, this happens because the *slowing down* of accumulation is more marked in the corn industry than in the iron industry, so that I_c falls relative to I_i and I. A similarly unbalanced *acceleration* of accumulation, deriving from an increase in w_c, leads to the opposite result.

The route Joan Robinson follows in reaching her conclusions is no less worthy of note. The economy is permitted to move away from the fully

[17] *Ibid.*, p. 78.

adjusted situation in which it initially finds itself, but only to be subsequently led to a new fully adjusted situation by the adjustment of productive capacity to actual production and demand. Everything that follows in this paper can be described as an application and extension of this approach to the problem of accumulation[18].

4. FULLY ADJUSTED SITUATIONS WITH THE SAME INCOME DISTRIBUTION

We may say, expressing ourselves in the words of Harrod, that a fully adjusted situation is such that "producers will be content with what they are doing"[19]. The quantities which they bring to market are exactly those that the market absorbs when the commodities are sold at their "natural prices", and the equipment with which they have endowed themselves is exactly that which enables them to produce those quantities without moving away from the normal degree of utilisation of productive capacity. It follows that, if the rate of accumulation and the rate of profits observable in any fully adjusted situation are assumed to be constant through time, the economy is placed on a "warranted" path, along which I and C keep growing at a rate equal to r, and producers continue indefinitely to be content with what they are doing.

But if a "warranted" path is formed by an uninterrupted succession of fully adjusted situations, it does not follow at all that a fully adjusted situation should necessarily be part of an uninterrupted succession of similar situations, deployed along a "warranted" path. Henceforth, we shall refer to a "warranted" path solely as a term of comparison for fully adjusted situations which are *not* deployed along any such path.

Let us consider a fully adjusted situation belonging to the family of such situations corresponding to point B, and let us ask ourselves what will happen if the level of investment is lower than that required to keep the economy growing at the "warranted" rate. The economy will shift initially to a point such as D in Fig. 2, where a lower rate of accumulation is accompanied by under-utilisation of the productive capacity installed in the iron industry ($x_i < x^*_i$). If w_c does not vary, the degree of utilisation of the productive capacity installed in the corn industry falls in the same proportion ($x_c/x^*_c = x_i/x^*_i$).

It cannot be ruled out that for a while the efforts made to reduce productive capacity relative to production may be ineffective, or even have

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[18] This is no less true because of the fact that only at the end of his research was the author struck by the analogy between his own point of view and that adopted by Joan Robinson in describing the cases of Alaph and Beth.

[19] R. F. HARROD, *Towards a Dynamic Economics*, London, Macmillan, 1966, p. 81.

the perverse effect of widening the gap between potential output and demand. But under-utilisation, as well as over-utilisation, of productive capacity is by its very nature a temporary phenomenon. As we have done in the preceding Section in the context of a change in income distribution, we shall suppose that the tendency to produce under normal conditions will prevail, eventually leading to a new fully adjusted situation.

Let us now compare this situation with the original one. As in this case w_c has not changed, the rate of accumulation cannot but be the same in the new as in the old fully adjusted situation, although productive capacity, production and employment are all lower than if the economy had continuously grown at the "warranted" rate. Consequently, also the rate of profits is the same at the end as it was at the beginning of the story, although in the intermediate period profits have been kept abnormally low by the under-utilisation of productive capacity (cf. Section 5).

Again, the hypothesis that iron is infinitely durable prevents us from taking into account, within our scheme, the non-replacement of worn-out equipment, although this should not be taken to mean that "capital destruction" is unimportant in practice. With this caution, we shall continue to refer to the scheme (the purely illustrative function of which justifies, and at the same time calls for, the simplicity of hypotheses) and we shall describe the vicissitudes of the economy by saying that, after shifting from B to D, it returns along a more or less tortuous route from D to B.

Symmetrical considerations apply to the case of a level of investment higher than that required to keep the economy moving along the "warranted" path corresponding to the fully adjusted situation in which it is assumed to find itself at the outset. The initial rise in the rate of accumulation takes the form of a shift of the economy from a point such as B to a point to the right of it (but not to the right of C), in which the productive capacity installed in the iron industry is over-utilised ($x_i > {}^{\cdot}x^*_i$). In the corn industry the degree of utilisation of productive capacity rises in the same proportion.

The tendency to produce under normal conditions will once again lead the economy back to B, that is to a fully adjusted situation characterized by the same rate of accumulation and by the same uniform rate of profits as the situation at the outset. However, owing to the cumulative effect of the larger investments made along the way, productive capacity, production and employment are all higher than they would have been had the economy grown all the time at the "warranted" rate.

Up to this point we have supposed that, no matter how much the degree of utilisation of productive capacity in the iron industry rises, the corn industry is always able to meet the increased demand, so that the ratio of employment in the iron industry to employment in the corn industry has no reason to change. We must now turn to the case in which the absolute limit, beyond which the utilisation of productive capacity

cannot be pushed, occurs in the corn industry before it does in the iron industry.

Once this limit has been reached, the task of balancing savings and investment (the profits obtained in the corn industry and the wages paid in the iron industry) can no longer be discharged by the increase in the production of corn, and instead devolves on the fall of w_c which takes place through the rise in the price of corn relative to the money wage (insofar as workers do not succeed in preventing this turn of events).

The fall in w_c cannot, however, but share the temporary character of its cause. As soon as the bottleneck is removed, and the utilisation of productive capacity gradually returns to normal, the forces which regulate the distribution of income in the long run will reassert their influence. If they have not undergone any change in the meantime, the values of w_c, h^* and r will be the same in the new fully adjusted situation as in the old one. It is to the nature of these forces that we must now direct our attention.

5. THE ORDINARY RATE OF PROFITS

It will be remembered that the relationship shown in quadrant IV of Fig. 3 can be interpreted as a relationship between the rate of profits observable in the fully adjusted situations and the wage in terms of corn. The same relationship can be derived, more directly, from Sraffa's "equations of production" adapted to our special hypotheses:

$$\frac{I}{x^*_i}p_i r + \frac{I}{\pi_i}w_c = Ip_i$$

$$\frac{C}{x^*_c}p_i r + \frac{C}{\pi_c}w_c = C$$

where p_i is the price of iron, while the price of corn is made equal to unity.

In their original form, Sraffa's equations do not embody any explicit assumption as to the degree of utilisation of productive capacity. To interpret them as applicable only to the fully adjusted situations may seem, therefore, an arbitrary restriction. It must, however, be observed that the prices which appear in the equations are, as Sraffa explicitly states, the "natural prices" of commodities[20], and that the rate of profits which

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[20] "Such classical terms as 'necessary price', 'natural price' or 'price of production' would meet the case, but value and price have been preferred as being shorter and in the present context (which contains no reference to market prices) no more ambiguous". P. SRAFFA, *Production of Commodities, op. cit.*, p. 9.

enters into the natural prices is, in Adam Smith's words, the *ordinary or average* rate[21], conceived as the centre of gravity of the actual ratio of profits to the value of capital. Now, it is obvious that only the rate of profits observable in the fully adjusted situations can be taken as "ordinary" in this sense.

Clearly, for any given value of $w_{c'}$, over- (or under-) utilisation of productive capacity implies an abnormally high (or, respectively, low) ratio of profits to the value of capital. But the rate of profits which is considered a sufficient reward for the employment of capital, and represents the guiding light for investment and pricing decisions, cannot possibly be either an abnormally high or an abnormally low one.

Let us now look into Sraffa's suggestion that the (ordinary) rate of profits is "susceptible of being determined from outside the system of production, in particular by the level of the money rates of interest"[22]. The underlying reasoning seems to be the following. Between the rate of interest (singular for simplicity) and the rate of profits there cannot but be a close connection, as has been recognised both by the classical economists and by the marginalist school. Now, if Keynes is right in suggesting that the rate of interest lies ultimately in the hands of the monetary authorities, it follows that it is the rate of profits that must come into line[23].

In order to make the equalising mechanism transparent, we shall assume that all physical assets are owned by joint-stock companies which raise finance by issuing bonds and ordinary shares. As the ultimate holders of wealth can choose among shares, bonds and money, whenever the monetary authorities succeed in lowering the rate of interest, the rate of return on shares will follow suit. Once the possibility of raising finance on better terms has become established, the ruling rate of profits will be considered a more than sufficient inducement to hold physical assets and to use them in production. Competition among the companies will then force down r by causing prices to fall relative to the money wage. If, on the other hand, the rate of interest and the rate of return on shares rise, the ruling rate of profits is no longer considered sufficient by the companies. As a consequence, the latter will try to raise prices relative to the money wage, and competition will not prevent them from doing so. If workers are not prepared to accept the resulting fall in w_c, a conflict will arise, the outcome of which cannot be known in advance.

[21] A. Smith, *Wealth of Nations*, bk. I, ch. VII, *op. cit.*, p. 72.

[22] P. Sraffa, *op. cit.*, p. 33.

[23] On similar lines, cf. P. Garegnani, "Notes on Consumption", Part II, *op. cit.*, p. 81.

6. THE PACE OF ACCUMULATION

The time has come to gather together the threads of our argument in an attempt to arrive at some conclusions. As a first step, it may be appropriate to list the elements of the economic system which are taken as independent variables. One obvious candidate for this role is the rate of interest. Since, however, the rate of interest comes into play only inasmuch as it determines r, and hence w_c, no other part of the argument is affected if the rate of interest is left out of the picture, and w_c is taken, instead, as an independent variable. Our second, and last, independent variable is represented by the absolute level of investment (the quantity I).

As to the part played by each of the two variables, it may be worth emphasizing that:

— the fully adjusted level of I_i depends on I according to the relationship $I_i = I/x^*_i$;

— the fully adjusted ratio of I_c to I_i depends on w_c, but not on I.

It follows that, if w_c remains constant, the fully adjusted level of $(I_i + I_c)$ will vary in the same proportion as I, thus keeping h^* constant.

It is evident, then, that the rate of accumulation observable in the fully adjusted situations does not give us any information on the actual pace of accumulation: the observation of an equal rate of accumulation in two fully adjusted situations does not tell us *by how much* I and $(I_i + I_c)$ have risen in the transition from one to the other.

From this are also evident the serious limitations involved in the steady-state hypothesis, by which the rate of accumulation is constant through time, and the economy does not depart, even temporarily, from the normal degree of utilisation of productive capacity. When we compare two economies subject to the steady-state rule, a difference in the pace of accumulation cannot but take the form of a difference in h^*, and this implies a difference in w_c. To impose this rule amounts, therefore, to exclude *by hypothesis* that the same w_c may be compatible with different paces of accumulation.

Obviously, there is nothing wrong in tying the economy to never over- or under-utilise productive capacity, and in investigating the constraints that this condition imposes on the pace of accumulation. Providing, however, that this innocent exercise does not mislead us into disregarding the fact that the possibility of over- or under-utilising productive capacity is an all-important feature of real-world economies. It is this possibility that, in the present view of accumulation, paves the way to the adjustment of productive capacity to demand, thus making the existing wage (and the corresponding ordinary rate of profits) compatible with the pace at which accumulation happens to be carried on, however fast or slow it may be. (A

temporary fall in w_c is, however, required whenever a bottleneck is reached in the corn industry; cf. Section 4).

If entrepreneurs are assumed to choose the steady-state rate of accumulation which suits them best, it is to the rate of accumulation, rather than to the rate of inteerest, that the task of determining the rate of profits is *ipso facto* entrusted. As Joan Robinson puts it, "Whatever the ratio of net investment to the value of the stock of capital may be, the level of prices must be such as to make the distribution of income such that net saving per unit of value of capital is equal to it. Thus, ... the rate of profit is determined by the rate of accumulation of capital"[24]. But as soon as we turn our back on the steady-state hypothesis, it becomes apparent that entrepreneurs do not choose h^* any more than they choose the proportion of income which is devoted to investment.

When, in standard short-run analysis, we say that the level of real income depends on investment decisions and the value of the Multiplier, a difference of status is implicitly established between investment decisions, seen as the driving force of income generation, and those decisions — assumed to be of a more automatic nature — which are simply intended to adjust production to demand. A similar difference must be recognized, in long-run analysis, between two kinds of investment decisions: those intended to preserve or restore the normal degree of utilisation of productive capacity, and those intended for other purposes, such as the introduction of new products or of new productive processes.

It is the latter decisions which determine the pace of accumulation; to provide a conceptual framework wherein to arrange the information available on the determinants of these decisions is one of the tasks of that theory of accumulation on the threshold of which the present study stops. Decisions of the former type can be said to bring the ratio of I to $(I_i + I_c)$ into line with the ordinary rate of profits, just as decisions concerning the level of output are commonly said to bring the proportion of national income devoted to investment into line with the community's propensity to save.

The picture does not alter if we drop the assumption that "investment" and "capital" consist of one and the same commodity (or, what amounts to the same thing, of the same commodities combined in the same proportions). Whatever the composition of the two aggregates, the overall profits will turn out to be equal to the value of investment (or of consumption out of profits and investment, if we allow for the former to be positive), and the ratio of this value to the value of capital will be made equal to r by the adjustment of productive capacity to the level and composition of de-

[24] J. ROBINSON, "Normal Prices", *Essays in the Theory of Economic Growth*, London, Macmillan, 1962, pp. 11-2.

mand. It may be added that simplicity's sake is not the only reason why the above-mentioned assumption has been made. It was also among our aims to discuss the proposition according to which "the rate of profit is determined by the rate of accumulation of capital". And this proposition necessarily presupposes that the rate of accumulation is determined prior to the prices of commodities, which prices cannot be determined before knowing the rate of profits.

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