

2 The Theory of the Falling Rate of Profit*

‘Others apart sat on a hill retired,
In thoughts more elevate, and reasoned high
Of providence, foreknowledge, will, and fate,
Fixed fate, free will, foreknowledge absolute,
And found no end, in wandering mazes lost.’

(Milton, *Paradise Lost*)

Marx uncovered many causes of capitalist economic crisis. It has been traditional, however, to place his theory of the tendency of the rate of profit to fall in the centre of the Marxian analysis and critique of capitalism. Marx’s main exposition appears in the first and third volumes of *Capital*.¹ The theory attempts to show that there is an inbuilt tendency for the capitalist system to stagnate or fall into crisis, as a result of the falling rate of profit. But Marx did not expect the rate of profit to decline in a persistent and uninterrupted manner; certain ‘counteracting influences’ would periodically halt the downward slide. Despite this qualification, the theory has been regarded, by most Marxists, as the backbone of revolutionary Marxism. According to this view its refutation or removal would lead to reformism in theory and practice. In this regrettable context we shall attempt to refute the theory of the falling rate of profit. In addition we shall argue that revolutionary Marxism is not damaged by the surgical removal of the theory from the theoretical system. On the contrary, it becomes possible to extricate the fatalistic and mechanistic interpretations of Marxism that have gained prevalence amongst both its supporters and its hostile critics.

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THE THEORY

The General Rate of Profit

The existence of separate capitalist firms creates a tendency for the rate of profit to be equalised between firms. The more competitive the situation the more pronounced is this tendency. Capitalist competition, therefore, leads to the formation of a general rate of profit in the economy. This tendency is even present under monopoly capitalism, as capitalism is inconceivable without some degree of competition and separation between firms.² With increasing competition and interdependence we have no reason to suppose that this tendency is dead today.

Marx's analysis of the falling rate of profit proceeds from this essential feature of capitalist production. At a given level of abstraction it is justified to ignore the various frictions and barriers that prevent the rapid formation of an equilibrium general rate of profit. Marx starts from the rate of profit in value terms in each firm, i.e. surplus value divided by the value of the total capital invested. He then treats the whole economy as a 'single capital'³ and equates the general with the *average* rate of profit. Hence, in Marx's view, the general rate of profit is the total surplus value in the economy divided by the total value of capital invested.

Two points are evident here. First, no reason is given to identify the general with the average rate of profit. Second, Marx's general rate of profit is a ratio between value amounts, i.e. amounts of socially necessary labour time. It is not a ratio between prices. Some Marxists and non-Marxists, such as Ladislaus von Bortkiewicz, have criticised this formulation of the general rate of profit on the grounds that there is no reason to assume that the rate of profit in *value* terms will tend to be equalised. The rate of return on capital advanced is calculated in terms of *prices*, as capitalists are not aware of, or disposed towards, any embodied labour calculation. The general rate of profit is the ratio between profit and the price of capital invested, as this is the actual rate of profit that is equalised between firms in the real world. This point of contention relates to the well-known transformation problem. Several articles exist on this topic and it is not appropriate to discuss it here.⁴

Despite this connection between the transformation problem and the question of the falling rate of profit it is possible to deal with the latter without invoking a rejection of Marx's solution. Our critique of

the falling rate of profit theory in the second section is directed at Marx's formula for the general rate of profit, as in certain circumstances this coincides with the correct formula adduced by Bortkiewicz and others – when prices are proportional to values, for instance. Hence we can avoid the 'intricacies of the transformation problem, at the cost of a lack of completeness in our argument.

The following mathematical symbols shall be adopted:

y = net output in value terms

This is the magnitude of the socially necessary living labour time expended in the economy in one year. It is part of the value of the output.

v = variable capital

The working class receives a number of wage goods in a year. The amount of socially necessary labour time embodied in these goods is the variable capital.

s = surplus value

The workers are compelled to work for the capitalists and produce an amount of extra or surplus value over and above the value of the wage goods they receive in return. In other words s is expropriated by the capitalist class. Obviously, by definition: $v + s = y$.

c = constant capital flow

This is the value of the raw materials used up, plus the depreciation of the means of production, in value terms. Like v and s , c is a flow variable.

k = constant capital stock (i.e. fixed capital)

Normally certain means of production will remain at the end of a production or turnover period, and these will have a value k . This value is not part of the value of the social product that is exchanged on the market, unless the capitalists sell their machinery. The value of the goods that are produced in one year is $c + v + s$.

t = time period of production (i.e. turnover period)

The above variable is not familiar in Marxian literature. It refers to the length of the period of time that is required to produce, transport and sell a particular good. In order to simplify our presentation we shall assume that t is the same for all goods, and that wages are paid at the start of the time period of production. These may seem to be extreme assumptions, but our arguments are not invalidated if t is different for all commodities. On the contrary, our position is reinforced in the heterogeneous case.

The capitalist spends his investment funds on three basic types of commodity: first labour power, second raw materials and expenditure to cover depreciation, and third fixed capital goods. Their respective values are v , c and k . Now it is important to note that c and v are *flows*, i.e. they refer to an amount of labour time *per year*, whereas k is a *stock* item, i.e. it is just a congealed aggregate of labour time, it is not a rate or flow. The amount k corresponds to the fixed capital that is required to set up production. But the whole of c and v need not be advanced at first, if t is less than unity. It is necessary to set up production for only one time period of production t . At the end of this period the extra funds that are realised can be thrown into circulation.

If we assume that the rate of growth in the economy is small then the amount of c and v advanced will be $t(c + v)$. Otherwise this will be the average amount of c and v advanced in a year. Hence the total capital invested has at least an approximate value of

$$k + t(c + v)$$

This appears reasonable if the units of the amounts k , c and v are inspected. As c and v are amounts of labour time *per year* they have to be multiplied by an amount of time, in this case t years, to make their addition to the stock variable k sensible. Hence the general rate of profit, according to Marx's definition, is given by the equation:

$$p = \frac{s}{k + t(c + v)} \quad (2.1)$$

where p is the rate of profit in value terms. This expression is so unfamiliar that its basis in Marx's writings may be contested. In

particular it has been traditional for Marxists to ignore k in their formulation. However, apart from the occasional assumption that k is zero, Marx repeatedly asserts that the rate of profit must include k .⁵ In the real world the capitalists calculate the rate of profit in terms of *total* capital invested. It is quite inadmissible for Marxists to continue to ignore constant capital stock. The introduction of t is novel. A close inspection of *Capital*, however, will indicate that the above formula corresponds to the one implied by Marx and Engels.⁶ The formula will appear more familiar if t is assumed to be unity:

$$p = \frac{s}{k + c + v} \quad (2.2)$$

Marx's Formulation of the Theory

Marx's exposition of the theory of the falling rate of profit in the third volume of *Capital* commences with a numerical example.⁷ He assumes that

$$s = v = 100$$

Also Marx implicitly assumes that t is unity. He examines the effect of a gradual increase in that total amount of constant capital ($k + c$). Using equation (2.2) we get the following table:

$k + c$	$k + c + v$	p (percent)
50	150	$66\frac{2}{3}$
100	200	50
200	300	$33\frac{1}{3}$
300	400	25
400	500	20

These numerical examples can be generalised in the following manner. Dividing top and bottom of the fraction in equation (2.2) by v we get

$$p = \frac{\frac{s}{v}}{\frac{k + c}{v} + 1}$$

Marx calls the fraction s/v the rate of surplus value. Now if the latter is constant and the fraction

$$\frac{k + c}{v}$$

increases, as in the above example, then the rate of profit will fall. Or, in Marx's words: 'this gradual growth in the constant capital, in relation to the variable, must necessarily result in a *gradual fall in the general rate of profit*, given that the rate of surplus value, or the level of exploitation of labour by capital, remains the same'.⁸

Marx's justification for assuming that the fraction $(k + c)/v$ increases is supposedly based on a number of related arguments that appear in various parts of *Capital*. In one place he sees the increase as a result of the decrease of v , due to productivity increases.⁹ Elsewhere he sees the increase as resulting from the accumulation of capital.¹⁰ We shall discuss these arguments at a later stage.

Critics often attack the assumption of a constant rate of surplus value (s/v).¹¹ It is argued that rises in productivity, causing a fall in v , will also lead to a rise in the rate of surplus value. This may compensate for any rise in $(k + c)/v$ and the rate of profit may not fall. It has been pointed out that Marx was aware of this difficulty and he attempted to deal with it.¹² Marx suggested that surplus value per worker per day could rise, but up to a certain limit only.¹³ This limit is provided by the number of hours in a day. But that does not define a limit for s/v . Increases in productivity may still bring down v , and there is no theoretical upper limit for the rate of surplus value. As it turns out, Marx had a valid but somewhat latent point, which must be extracted by a reformulation of the theory.

To complete the exposition of the theory of the falling rate of profit it remains to show that the theory can be reduced to the hypothesis of a tendency for the organic composition of capital to rise. Marx failed to give a formal demonstration of this point. This partly stems from a slight clumsiness in the definition of the basic mathematical ratios in *Capital*. A simple demonstration can be derived from a convenient redefinition of the basic Marxian ratios. It is possible to abstract from changes in the degree of exploitation by expressing each ratio in terms of the net output (y). This does not mean that any variable is assumed constant, or that any variable is regarded as an exclusive function of net output. It is simply a method of focusing attention on the determinants of the rate of profit that do not directly relate to changes in the degree of exploitation, using Marx's formula for the rate of profit. Evidently Marx attempted to abstract from the degree

of exploitation in his exposition of the theory in *Capital*.

By means of simple algebra it is easy to show that the rate of profit cannot exceed an upper bound. This upper bound, or maximum rate of profit, is equal to the value of net output (y) divided by the value of the constant capital stock (k). Hence, *whatever the degree of exploitation*, the rate of profit cannot exceed the magnitude of y/k . The fraction k/y is dubbed the organic composition of capital, as it is argued that it is quite close to Marx's category, and it best displays the essential meaning. So if q is the organic composition of capital then

$$\text{maximum rate of profit} = \frac{1}{q} = \frac{y}{k}$$

The theory of the falling rate of profit is thus reduced to the question of the rise or fall in the organic composition of capital. For if q rises then the maximum rate of profit will fall with it, and the *actual* rate of profit will fall if all other variables, including the degree of exploitation, remain constant.

A CRITIQUE

Technical Change and the Organic Composition of Capital

Our attention must now shift to the validity of the supposition that the organic composition of capital will rise. Paul Sweezy has made the following point:

In *physical* terms it is certainly true that the amount of machinery and materials per worker has tended to grow at a very rapid rate for at least a century and a half. But the organic composition of capital is a *value* expression; and because of steadily rising labour productivity, the growth in the volume of machinery and materials per worker must not be regarded as an index of the change in the organic composition of capital. Actually the general impression of the rapidity of the growth of the organic composition of capital seems to be considerably exaggerated. (Sweezy, 1942, p. 103).

Elsewhere, Sweezy (1973, pp. 28–9) argues that Marx's insistence on an increasing organic composition of capital stems from the fact that Marx was witnessing the transition from hand labour to mechan-

ised production. Today we have an already mechanised economy where the problem for the capitalist is to minimise his expenditure *both* on means of production and labour power, whilst increasing his productivity. We have no reason to suppose that the fall in the organic composition of capital has continued after the transition from extensive to intensive mechanisation.

Mark Blaug (1960) and others have focused attention on the possibility of 'capital saving' innovations, and their role in lowering, or preventing a rapid rise, in the organic composition of capital. Whilst a Marxist may object to the use of the word 'capital' in this context, such innovations deserve examination. They could fall into two overlapping classes: those that lead to a reduction in the organic composition of capital by reducing the value of constant capital stock relative to net output, and those that lead to a similar reduction in the rate of constant capital flow. Examples of the first class include the more efficient use of machinery and buildings. In the second class is included the more efficient use of raw materials. The existence of these innovations undermines any notion of the tendency of the organic composition of capital to rise.

However, David Yaffe (1972) has argued that these innovations cannot be given a great deal of significance; they must be shown to *necessarily* recur. In reply we must ask why innovations causing an *increase* in the organic composition of capital *necessarily* recur? If the physical and value aspects of accumulation are separated then there is no reason to suppose that technical change will have any particular bias in the long run. In the chapter on 'Counteracting Influences' in the third volume of *Capital*, Marx devoted a section to the 'cheapening of the elements of constant capital'. He wrote: 'In certain cases, the mass of the constant capital elements may increase, while their total value remains the same or even falls' (Marx, 1981, p. 343).

Just as Marx gives an inadequate explanation of a *tendency* for the organic composition to rise, he merely asserts that the reduction in the value of constant capital is an *isolated* case. Perhaps there is no less justification to assert that the *reduction* in the value of elements of constant capital is the underlying *tendency*, and the *increase* in the organic composition of capital is a counteracting influence or isolated case?

We are drawn to an agnostic conclusion on the trend of the organic composition of capital. But it does little justice to Marx, or the Marxian tradition, to leave matters there. Some commentators have detected certain theories of technical change in Marx. Such theories

profess to demonstrate that the organic composition of capital will rise as a result of the process of capital accumulation. It must be admitted that these theories are quite convincing at first sight: so convincing that similar arguments can be found in neoclassical economic theory.

Technical Change and the Concept of Capital

A recent and forceful presentation of Marx's theory of technical change has been offered by Yaffe:

Marx regarded it as an incontrovertible fact, as a self evident or a tautological proposition, that the organic composition of capital should rise . . . The compulsion to employ machinery, under capitalist production and to increase by these means the productivity of labour is expressed in reality by competition and the consequent need to reduce the cost of production. But this is not its explanation which must be deduced, in terms of Marx's method, from the concept of capital itself. The concept of capital is a contradictory one. On the one side we have capital as 'value in process' as value attempting to expand itself without limit and on the other side we have the working population, the limited basis of this expansion. Capital, therefore, must, on the one hand, try and make itself as independent as possible of that basis in its process of self expansion; it attempts to reduce the necessary labour time to a minimum by increasing the productivity of labour. On the other hand it needs to increase the basis of its expansion, that is the labour power available for exploitation; that means to increase simultaneously the working population . . . The dialectical solution to this contradiction . . . is to increase the scale of production through the replacing of living labour by objectified (dead) labour in the form of machinery . . . What we have tried to show from an examination of the concept of capital is the necessity of increasing the social division of labour, through the application of machinery and therefore, of replacing on an increasing scale living labour by objectified (dead) labour. It follows from this that both the *technical composition of capital* and the *organic composition of capital* must increase in the process of capitalist production although the latter will not increase as quickly as the former due to increases in the productivity of labour. (Yaffe, 1972, pp. 17-19)

The Problem of Productivity Increases

Yaffe mentions increases in the productivity of labour only. But in reality such increases are more problematic. For instance, as was mentioned above, an existing machine can be utilised more efficiently with the same amount of labour, which means that the amount of machinery per unit of output is *reduced* as a result. Technical change often takes the form of replacing one machine by another *different* one. In which case we cannot talk about an increase or decrease in the *mass* of machinery, in an economic sense, as we are talking about *heterogeneous* objects. And it is quite possible that *less* embodied labour in the form of machinery will be required per unit of output.

The increase of productivity is certainly a hallmark of capitalism. As a result there will be a tendency to reduce the amount of living labour required for every item of output. But we have no reason to suppose that the labour embodied in machinery per unit of output will decrease at a *slower* rate. The notion that productivity increases are associated with increases in the organic composition of capital is without foundation.

The Nature of Capital Accumulation

The second erroneous notion that appears in the quotation from Yaffe is that the accumulation of capital is, for practical purposes, synonymous with the accumulation of dead labour, i.e. constant capital. An accomplished Marxist like Yaffe is, of course, aware that capital is not just a thing but a social relation. Nevertheless, the habit of confusing social relations with things is a fundamental, albeit disguised, error found in the canons of over-zealous interpreters of Marx. Exactly the same error is found in neoclassical economics: the dominant school of bourgeois economics.

Amit Bhaduri (1969) has indicated the significance of the distinction between the concepts of capital as a thing and capital as a social relation in an important essay produced during the capital theory controversy. He wrote:

It must be granted that Marx himself was unable to indicate the *logical* implications of his understanding of the role of 'capital' for the formulation of a theory of distribution between profits and wages in a capitalist economy. In the view of the present writer this is precisely what the recent controversies on capital theory do: they

lay bare the *logical* weakness of treating capital merely as an instrument of production in developing a theory of distribution in a capitalist economy. (p. 535)

These remarks apply, with equal force, to the subject of capital accumulation. After the capital theory controversy the neoclassical model of economic growth, which is discussed below, now lies in ruins.

The accumulation of capital, therefore, cannot be simply reduced to the accumulation of homogeneous embodied labour. This error has continually recurred in the Marxian tradition. It is not uncommon for Marxists to treat reproduction schemes as if they reflect money prices, or even the physical scale of production, whereas these schemes are in value terms only. In the historic debates that were generated by the publication of Rosa Luxemburg's *The Accumulation of Capital*, Otto Bauer (1913) ignored the problems uncovered by Luxemburg by concentrating exclusively on the accumulation of embodied labour values. Luxemburg on the other hand compounded this confusion by mistaking the accumulation of capital for the accumulation of money, and an increasing social product measured in *price* terms. (See Luxemburg, 1972; 1963, chs 4–9.)

In fact accumulation involves all these aspects, but is not reducible to any one of them; capital accumulation is not just the accumulation of things, or the augmentation of single quantities. Fundamentally, the accumulation of capital is the *reproduction of capitalist social relations on an extended scale*. It involves the extension of these relations over all other subordinate modes of production, which become destroyed or subsumed by capitalism, and the intensification of these relations, when, for instance, the means of production become monopolised by fewer capitalists.

Capital Accumulation and Employment

Another argument, quite similar to the one used by Yaffe, is sometimes brought up to defend the falling rate of profit theory. It is argued that as capitalism expands to the extent that unemployment falls, wages tend to rise as a result of the more favourable situation of the working class. As a result, it is argued, capitalists tend to reduce the size of their labour force and 'substitute' constant capital for labour power. Hence the organic composition of capital will tend to rise. To be complete this theory must also argue that the process is

not reversed, with a fall in the organic composition of capital, when wages are low during a recession. Otherwise no overall trend could be deduced.

There is a grain of truth in this theory. Wages do tend to oscillate in this manner. Capitalists often lay off workers when the wage bill is too high. In these circumstances they are likely to 'rationalise' production and invest in new plant and equipment. But we have no reason to suppose that the *value* of their constant capital will increase as a result. What happens when full employment is reached and the capitalists still strive to accumulate? They cannot enlarge their labour power, so perhaps they are forced to increase constant capital, and thereby increase the organic composition of capital? This argument is unsound because it either assumes that accumulation necessarily involves an increase in the value of constant capital, which we have argued to be false, or it assumes that the capitalists *consciously* strive to augment the *value* of their capital. On the contrary, the capitalists are not aware of their embodied labour values, or inclined to find out. Perhaps they will strive to increase the *mass* of machinery employed, but this bears no necessary relation to its *value*.

Of course we do not argue that capitalism operates according to the subjective plans of the capitalists. The overall dynamic of the system is a result of a complex interaction of forces, and capitalism retains an anarchic character. But we cannot mechanically divorce the actions of powerful individuals from the objective course of events, or regard the former as completely 'determined' by the 'economic base', which is conceived as a sort of separate machine devoid of individuals and the force of ideas. The basis of analysis, in any field of scientific enquiry, cannot be reduced to either the whole alone, or to the constituent parts by themselves.

The Concept of Capital and the Materialist Method

The tendency for the organic composition of capital to rise cannot be justifiably derived from the 'concept of capital' in a purely *a priori* manner. It is a mere tautology to *start* from the *definition* of a capital as 'self-expanding value', add the correct notion of the limited size of the pool of living labour power, and triumphantly conclude that the organic composition of capital will rise. This method of reasoning 'explains' social reality from a pre-defined *idea*; it does not explain ideas, including the concepts of political economy, from social practice.

The Marxian method involves initial abstraction from a multitude of empirical phenomena. However, Marxian concepts such as the commodity, capital, and abstract labour are not just ideas, they are *real* under capitalism. In contrast, bourgeois economics starts to 'explain' reality from ahistorical ideas such as utility and human nature. Correct economic categories are only abstract expressions of real social relations, and only remain true as long as these relations exist.

Marx, himself, tried to derive the law of the falling rate of profit from the concept of capital in several passages in the *Grundrisse*. However, this idealistic method of reasoning receives little prominence in *Capital*.

An Agnostic Conclusion

There seems to be no *a priori* reason for the organic composition of capital to rise. This conclusion rests on a rigorous separation of three aspects of capitalist production: the physical aspect, the price aspect, and the value aspect. The relations between these aspects and the whole partly determine the dynamic behaviour of the capitalist system. Only by such a rigorous separation can capital be conceived as a social relation, rather than a homogeneous 'thing'.

We do not need to elaborate the point that vulgar bourgeois economy confuses the different aspects of capitalist production. Neoclassical economics elevates the physical aspect of capital to the detriment of all others. We have 'marginal productivity', 'factor substitution'; capital as a thing *par excellence*. But the point needs to be emphasised that some Marxists have committed a very similar mistake in trying to defend the falling rate of profit theory. They have confused the value aspect with the physical aspect (and in the case of the transformation problem prices are confused with values). By reducing capital to a mere value, capital is implicitly regarded as a homogeneous 'thing'.

For these reasons the recent attack on neoclassical economics, in the capital controversy, is a significant event for Marxism. A brief and unsystematic account is given here, as Marxists cannot remain silent in the face of the theoretical conclusions. A correct interpretation of capital theory can lead to a forceful re-establishment of the concept of capital as a social relation, if certain Ricardian pitfalls are avoided. We are led to abandon the theory of the falling rate of profit, and along with it all vulgar notions of capital and capital accumulation.

THE IMPACT OF THE CAPITAL CONTROVERSY

Most of the conclusions of the capital debate stem from rigorous and logical arguments applied to a situation where heterogeneous capital goods exist. There are consequences for the theories of price, distribution, and capital accumulation. Here, of course, we are primarily concerned with the latter.

The Concept of Dated Labour

Marx's labour-theoretic approach to the analysis of capital accumulation involves a high degree of aggregation. However, it is a mistake to simply analyse the system in terms of just two types of labour time, i.e. living labour and dead labour embodied in commodities. In most cases we cannot usefully aggregate all embodied labour from the past into one homogeneous whole. The *date* at which a past labour input is required to produce a commodity is crucial. Nearly all goods are produced with both living labour and means of production. The means of production are, in turn, products of living labour and means of production in a previous time period. Hence the labour embodied in a commodity can be split into a long series of dated labour inputs (Sraffa, 1960) diminishing into the past. Each of the terms in this series has an independent significance in determining such variables as the rate of profit. Marx drew a distinction between dead labour and living labour, so the dated labour series is an extension of Marx's distinction from two to many time epithets. It is possible to regard all technical innovation as labour-saving in some sense. But the crucial point is that we need to regard amounts of labour from different time periods as qualitatively different.

Marx's aggregative approach is sometimes justified by an appeal to the real-world aggregation of money amounts in a capitalist economy. Clearly, in a system of generalised commodity production, everything has a common measure in its price. But price should not be confused with value, even if the former is regarded as the 'phenomenal form' of the latter. To paraphrase Oscar Wilde: the capitalist knows the price of everything but the value of nothing. Furthermore, the analytical search for such an underlying 'substance' is doomed to failure. Although accounting based on monetary units is common practice, this does not mean that there is a homogeneous substance beneath this phenomenal form.

The capital controversy shows that no measure of the 'amount of capital', be it 'value', price or whatever, is independent of the rate of

profit and the distribution of the product between social classes. As these alter, so too will the book value of the bourgeois world. The consequence of heterogeneity is that there is no independent measure of capitalist wealth.

D. M. Nuti (1970a, p. 53) concluded an essay on capital theory with these words: 'The ideological role of the "value of capital" is that of breaking the direct actual link between the *time pattern* of output in which any technology can be resolved, and establishing instead a relation between *current* output and *current* labour. To this purpose the *current* "value of the capital stock" is needed; a mythical conceptual construction in which the past and the future of the economy are telescoped into the present'. This criticism can be also applied to the habit of measuring constant capital in terms of a single amount of embodied labour.

The Solovian Growth Model

The similarity between the bourgeois concept of capital and the crude 'embodied labour' conception is reflected in the similarity between the falling rate of profit theory and the neoclassical growth model, particularly that of Robert Solow (1956), involving the idea of a 'production function'. Two inputs, dubbed 'factors of production', i.e. 'capital' and 'labour', combine together in production to create a net output. This output is represented as a mathematical function of the inputs. Solow discusses a number of such production functions. He makes the simplifying assumption of constant returns to scale, i.e. output per worker does not depend upon the size of the plant, just the relative proportions of 'capital' and 'labour'. This allows him to represent the production function by a two-dimensional graph, examples of which are shown in Figure 2.1.

Solow shows that in many cases there is an equilibrating process which allows output per worker and capital per worker to converge to a fixed level, and full employment is achieved. But this allows for no technical progress. It would seem reasonable to assume, along with Solow, that technical progress can be represented by an 'expanding' production function of the type shown in Figure 2.2.

At first the production function is represented by the curve *PF1*. Later it moves up to *PF2*, and later still it has moved to *PF3*. Hence output per worker increases even if the amount of capital per worker stays constant, as a result of technical progress. And now the discussion of Solow's equilibrating process leads to the conclusion that 'the

Figure 2.1 Production in functions

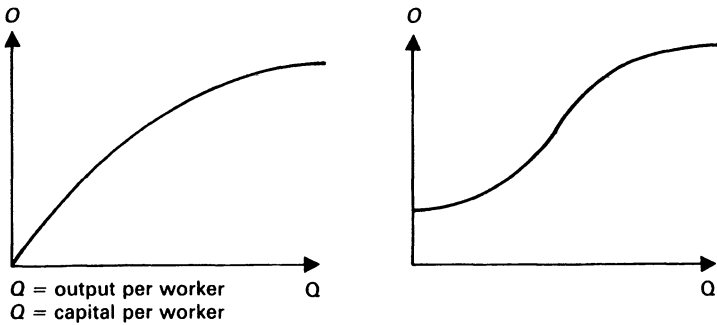
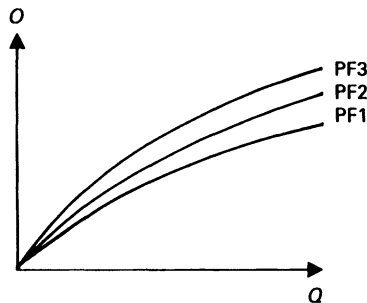


Figure 2.2 Production function with technical progress



capital-labour ratio never reaches an equilibrium value but grows forever' (Solow, 1956, p. 81).

If we ignore the ideologically-bound terminology and the monstrous presumption that full employment can be maintained automatically under capitalism, then the similarities with the falling rate of profit theory are evident. In both instances we have the presumption that we can measure constant capital independently of all other economic conditions. Solow assumes that in the majority of cases output per worker will increase as capital per worker increases. Orthodox Marxists such as Yaffe can write: 'The increase in the means of production per worker . . . is not merely a technical premiss . . . It is the expression in general terms of the only way the productivity of labour can rise under capitalist production' (1972, p. 17).

We have the conception of a particular type of technical progress which can lead Solow and some Marxists to a similar conclusion. Thus Yaffe writes: 'It follows that both the technical composition of capital and the organic composition of capital *must* increase in the process of capitalist production.' Finally, the notion is shared that an increase in the organic composition of capital, or the amount of capital per worker will lead to a fall in the rate of profit.

The Attack on the Neoclassical Aggregate Production Function

One of the first shots in the battle was fired by Joan Robinson (1953). She contested the complacency of the neoclassicals who assumed that the 'amount of capital' can be readily measured. After twenty years of debate the aggregate 'capital and labour' production function lies in ruins. One of the latest and more important blows was delivered by Piero Garegnani (1970). From the premiss of heterogeneous capital goods he developed several feasible 'production functions', depending on given feasible technical conditions of production. These bear *no relation* to the 'well-behaved' neoclassical production function. Four of Garegnani's examples are shown in Figure 2.3.

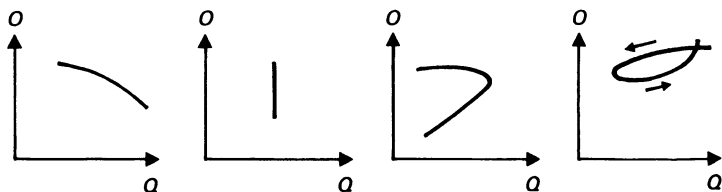
It is clear from these examples that increased capital per worker (Q) is related to output per worker (O) in no simple or consistent way. *There is no basis, therefore, for asserting that increased productivity is generally associated with an increased organic composition of capital.* Also Garegnani shows that there is no simple inverse relation between Q and the rate of profit. The notion that the march of productivity leads to a general fall in the rate of profit is completely shattered.

If we try to introduce a notion of technical progress into these production functions we do not get the simple Solovian result that Q 'grows forever'. Far from it. Technical progress bears no simple or necessary relation to Q , or to the organic composition of capital.

The arguments of Garegnani, Sraffa and others are systematic and logical. Their destructive power is rooted in these qualities. Marxists have no reason to abandon these arguments, but they must be supplemented by a critique of the fashionable Ricardian interpretations of capital theory. However, this cannot be done by aping the arguments of neoclassical economists which have been proved so indefensible. Neither can the matter be resolved by a simple reiteration of Marx.

We now turn to an examination of the empirical data for the

Figure 2.3 Garegnani's 'perverse' production functions



United States which suggest that there has been no consistent rise in the organic composition of capital. The evidence does suggest a rise in the organic composition of capital up to about 1920 with the general spread of mechanisation – after that date innovations seem to have led to constant capital saving improvements and a consequent decline in the organic composition of capital.

A SURVEY OF EMPIRICAL DATA FOR THE UNITED STATES

Data alone cannot decisively refute a theory. But that does not mean that empirical tests have no status in Marxism. Marxian categories are not just ideas, they correspond to real relations and parameters in the capitalist system.

The evidence that is relevant to an examination of the theory of the falling rate of profit is not the actual profit rate, or the share of profits in national income, but data concerning the organic composition of capital and related expressions. In Britain, for example, Andrew Glyn and Bob Sutcliffe (1972) have argued that there has been a fall in the rate of profit due to a falling share of profits in the national income. But that does not, in any way, endorse Marx's theory, which stems from the hypothesis of a rising organic composition of capital.

Unfortunately there are few empirical studies of the organic composition of capital. The author is not aware of any other major study other than the ones carried out by Gillman (1957) and Mage (1963). Both of these studies apply to the United States. The former is concerned with the organic composition of capital in the manufacturing sector, the latter is concerned with the economy as a whole. There have been many criticisms of these statistics, and in the opinion of the present writer both sets do not show real *value* ratios, i.e. ratios

between amounts of socially necessary labour time. However, the data are reproduced here for the information of the reader. The data are expressed in terms of the definition of the organic composition of capital that is found in this article (i.e. $q = k/(v + s)$). Mage's data were already expressed in this form, but Gillman's had to be calculated from the statistics he provides for k , v , and s .

No pronounced upward trend in the organic composition of capital is evident in Mage's figures in Table 2.1. The high figures for 1930, 1935 and 1940 are partly a result of the Great Depression, when net output ($v + s$) was low and a great deal of constant capital stock was unutilised. If these figures are excluded the slight upward trend is even less significant.

Some startling facts are apparent in Table 2.2. First, it appears that the organic composition of capital in the manufacturing sector is much less than in the economy as a whole. Perhaps this can be explained by the high productivity of the industries that produce capital goods for that sector. Secondly, after a clear rise in the organic composition of capital from 1880 to 1921, there is a tendency for its magnitude to decline after the latter date. Discounting the high figures in the years of severe depression, the organic composition of capital was about 1.3 in the boom period in the 1920s, and this figure is not rivalled after the Second World War, at least up to 1952.

We now turn to the data provided by bourgeois economists. The ratio that is analogous with the organic composition of capital, according to our definition, is the 'capital-output' ratio. This is the ratio between the price of constant capital stock and the price of output. The capital-output ratio is related to the rate of profit in the following manner:

$$\begin{aligned} \text{rate of profit} &= \frac{\text{profit}}{\text{price of total capital}} \\ &= \frac{\text{share of profits in income}}{\text{capital-output ratio}} \end{aligned}$$

The latter result illustrates the analogy between the capital-output ratio and the organic composition of capital. These two ratios are not identical but they have a similar status within two respective accounting systems, one in terms of prices, the other in terms of values. In fact the capital-output ratio is *more* relevant for a direct calcula-

Table 2.1 The organic composition of capital in the US economy, according to Mage

<i>year</i>	1900	1905	1910	1915	1920	1925	1930
<i>q</i>	3.67	3.16	3.18	3.51	3.65	3.95	4.47
<i>year</i>	1935	1940	1945	1950	1955	1960	
<i>q</i>	4.92	4.09	2.64	3.45	3.64	4.20	

Table 2.2 The organic composition of capital in the manufacturing sector of the US economy, according to Gillman

<i>year</i>	1880	1890	1900	1912	1919	1921	1923
<i>q</i>	0.41	0.52	0.72	0.95	1.40	2.04	1.35
<i>year</i>	1925	1927	1929	1931	1933	1935	1937
<i>q</i>	1.30	1.30	1.19	1.79	1.95	1.47	1.18
<i>year</i>	1939	1947	1949	1950	1951	1952	
<i>q</i>	1.20	1.04	1.23	1.11	1.10	1.11	

tion of the rate of profit in real terms. The operative rate of profit, upon which the capitalists base their investment decisions, is a ratio between price amounts, not a ratio between values. It is possible for the organic composition of capital to rise whilst the capital-output ratio falls, but the capitalist is unaware of the former, which does not necessarily effect the real rate of profit, or the investment decision.

Once again, this does not mean that the economy operates entirely in accord with the subjective wishes of the capitalists. But these subjective wishes are *part* of the objective reality, and any investigation into the dynamics of the capitalist system must show the basis on which capitalists make decisions to invest. To 'explain' the workings of the capitalist system without any reference to appearances, or the ideas that motivate the capitalist, is to raise the 'economy' to the status of a heavenly machine grinding out the destiny of capitalist society. Marxists, like high priests, alone are aware of the god-like

Table 2.3 Ratio of net capital stock to net national product in the USA
(Mean annual figures per decade)

<i>period</i>	1869–78	1879–88	1889–98	1899–1908	1909–18
<i>ratio</i>	3.6	3.0	3.6	3.5	3.9

<i>period</i>	1919–28	1929–38	1939–48	1948–55
<i>ratio</i>	3.8	4.4	3.3	3.0

Table 2.4 Ratio of capital stock to net product in the US manufacturing sector

<i>year</i>	1880	1900	1922	1948
<i>ratio</i>	0.78*	1.18	1.58	0.98

* Strictly not comparable with 1990 figure because of different methods of obtaining data.

power of the machine. Hence this ‘materialist’ attempt to understand capitalism collapses into an idealism; society is divided into two parts, one of which is superior to society. The result is that Marxism has no contact with empirical data, and no possible basis for a fruitful dialogue with other approaches in social science.

One of the most extensive studies of the capital–output ratio in the US has been carried out by Simon Kuznets (1961). His data for the economy as a whole are presented in Table 2.3. These provide a remarkable resemblance to Mage’s data in Table 2.1. There is no marked upward trend in the capital – output ratio, and a slight downward trend is evident after 1909–18 if we disregard the inflated figure for the depression years of 1929–38. Even if we include the figure for the years 1929–38 statistical analysis shows that the overall upward trend in the capital – output ratio is very slight indeed. The trend line shows a rise of only 0.0086 per year. On this basis the trend reaches the magnitude of 4.3 in the year 2000. But the extent of the variance of the actual figures from the trend allows us to make no such prediction from the statistics.

Kuznets regards the figures in Table 2.4 as rough approximations only. The earlier figures are larger than those provided by Gillman for the manufacturing sector, but a similar pattern is evident. The figures show a rise before 1922, but the figure for 1948 indicates a fall in the capital–output ratio after the former date.

The figures in the first three parts of Table 2.5, where individual

Table 2.5 Kuznets's ratios of capital to output for selected major industries in the USA

Manufacturing Industries									
	1890	1900	1929	1937	1948	1953			
Food	0.21	0.24	0.26	0.18	0.15	0.12			
Textiles	0.35	0.39	0.30	0.19	0.16	0.14			
Chemicals and Refining	0.42	0.44	0.55	0.49	0.47	0.47			
Metal products	0.44	0.47	0.39	0.35	0.27	0.25			
Extractive Industries									
	1870	1890	1919	1940	1953				
Metals	1.14	2.37	1.49	0.59	0.77				
Anthracite coal	0.35	0.45	0.45	0.34	0.32				
Petroleum and natural gas	1.64	3.45	5.51	1.73	1.01				
Regulated Industries									
	1880	1890	1900	1910	1920	1930	1940	1950	
Steam railways	16.0	9.9	6.5	4.4	3.6	4.4	4.0	2.7	
Electric railways	—	3.3	6.8	5.8	4.1	3.4	3.4	2.3	
Electricity supply	—	12.1	12.3	10.5	4.8	3.7	2.4	1.3	
Telephones	—	5.0	3.9	2.6	1.6	1.9	1.8	1.8	
Agriculture									
	1870	1880	1890	1900	1910	1920	1930	1940	1950
(A)	8.86	8.64	8.64	8.09	8.51	8.28	7.29	6.68	7.06
(B)	2.75	2.70	2.76	2.47	2.84	2.98	2.48	2.11	2.52
(C)	1.28	1.22	1.12	1.06	1.44	1.58	1.40	1.13	1.57

(A) Ratio of total capital, including land, to net farm income.

(B) Ratio of total capital, excluding land, to net farm income.

(C) Ratio of total price of buildings and equipment to net farm income.

industries are considered, are the ratios between capital and gross output, so they are not strictly comparable with the capital-net output ratios, which are larger for a given industry. Most of the industries show a slight overall decline in the capital output ratio over time. Petroleum and natural gas shows a very rapid rise from 1870 to 1919, and an even more rapid fall after the latter date. Steam railways, electricity supply, and telephones all show a very marked fall over the whole period.

The figures for agriculture are especially interesting as they show the effects of mechanisation in that sector. The upward trend in the price ratio of buildings and equipment to net farm income reflects the process of increasing mechanisation. But this does not create an overall rise in the total capital-net income ratios, including or ex-

cluding land. It appears that machinery has replaced power animals and other livestock *along with* savings in the use of other agricultural materials. These two simultaneous processes have led to a slight fall in the capital-net income ratios.

In conclusion, most of these figures do not give empirical backing to the hypothesis of a rising capital-output ratio. Most of the figures show a rise up to about the year 1920 and a general fall after that date. A similar pattern is evident in Gillman's data. The period up to 1920 was characterised by an *extensive* accumulation of capital, i.e. a rise in the mass of machinery, a spreading of mechanisation, an accumulation of values, and the general extension of capitalist relations of production in the USA. The years after 1920 could be regarded as years of *intensive* innovation in an already mechanised economy, punctuated by crises such as the Great Depression. More attention was shifted to constant capital-saving improvements, and the more efficient utilisation of existing plant and machinery, in the home economy.

POLITICAL AND METHODOLOGICAL IMPLICATIONS

In this section we shall discuss the political and methodological implications of the so-called law of the falling tendency of the rate of profit. The rejection of the law has profound implications. Some would argue that such a rejection constitutes a victory for reformism. On the contrary such an antithesis is based upon a faulty problematic.

The Law and its Counteracting Influences

It is commonplace to assert that society is not a laboratory. It is clear that laws of social development cannot be isolated from their counteracting influences. In contrast the physical scientist attempts, with some success, to isolate the phenomenon under investigation and determine its inner laws, without the clutter of extraneous influences.

With this point in mind, interpretations of the law of the falling rate of profit can be grouped into three classes: the law as a manifest tendency, the law as a concomitant force, and the law as an ultimate tendency. In the first conception the law is regarded as an evident and persistent force; counteracting forces just retard the fall in the rate of profit, they do not annul its clear downward trend. The second conception is less decisive: the law is regarded as one force amongst

many. The outcome of this multitude of interacting influences is not necessarily a fall in the rate of profit. Finally we may regard the law as an *ultimate* tendency, which can be checked by counteracting influences. Consequently although a fall in the rate of profit may not be evident for long periods of time, it appears ultimately sometime in the future.

Perhaps it is easy to dismiss the conception of the law as a manifest tendency; few Marxists adhere to this conception today. But this may be explained by the fact that a persistent fall in the rate of profit or rise in the organic composition of capital are not clearly evident in the twentieth century. In contrast, Adam Smith and Ricardo were much bothered by the fall in the rate of profit which was evident in the eighteenth and early nineteenth centuries. Marx's theory was, at least in part, an attempt to solve this riddle. Today, however, with no consensus in economic circles, and in view of the evidence of Gillman, Mage and Kuznets, few would deny that the 'counteracting influences' have become prominent for many decades.

The Law as a Concomitant Force

The second conception is practically a polar opposite of the first; instead of necessity we have indeterminacy in the long run. Over thirty years ago Maurice Dobb put forward an interpretation of Marx's law which seems close to the notion of the law as a concomitant force:

There is often a tendency . . . to give Marx's view of this matter a too mechanistic twist, depicting it as though it relied on the forecast of profit falling in a continuous downward curve until it reached a point at which the system would come to an abrupt stop, like an engine with insufficient pressure of steam behind the piston. The true interpretation would seem to be that Marx saw tendency and counter-tendency as elements of conflict out of which the general movement of the system emerged.¹⁴

In the second section of this present essay we have contested the idea of a necessary fall in the rate of profit on theoretical grounds. The notion of the law as a concomitant force, with an indeterminate outcome, could seem to be in accord with our theoretical position. Such an interpretation would be false. It is not justified to *describe* forces bringing down the rate of profit as 'tendencies' whereas forces

acting in the opposite direction are seen to be mere 'counteracting influences'. Such an arbitrary designation of conceptual status could be reversed. In which case the counteracting influences would become 'law' and the law of the falling rate of profit would collapse – by a mere change of terminology.

In a reaction against mechanistic Marxism the notion of the law as a concomitant force does not completely escape from the mechanistic problematic. The agnosticism of this position could be reduced to a lack of *knowledge* of the laws of motion of the 'economy'. Further discovery might reveal laws which act to bring down the rate of profit. To escape from this problematic we need to reject the notion of the economy as a machine. We shall return to this problem at a later stage.

The Law as an Ultimate Tendency

This is, no doubt, the most widespread conception of the law. It, itself, has two variants: some regard the 'underlying' fall in the rate of profit as being superimposed by periodic fluctuations, others regard the 'ultimate' fall in the rate of profit as an 'inevitable' process which is to become pronounced sometime in the future. In the latter case the 'periodic fluctuation' spans an epoch. At least for the purposes of this discussion these two variants are essentially similar. Within this conception of an ultimate tendency we have, in a sense, a synthesis of the first two conceptions: conjunctural indeterminacy but 'in the last instance' the force of necessity.

Here the law runs the gauntlet of counteracting influences. It is in constant danger of being thrown back to its starting-point. But in the long run it triumphs: not in the shape of rich empirical experience, but in the *idea* of its 'ultimate' victory. The 'last instance' is never announced by the sound of trumpets and the collapse of the citadel of profit. It is prophesied, but its coming is unrecognisable. Its status as an 'ultimate' law faces the perennial challenge of another periodic upswing in the rate of profit, which would lead us to the conclusion that there is at least one more 'last instance' to come. As Althusser has aptly remarked in a different context: 'From the first moment to the last, the lonely hour of the "last instance" never comes' (Althusser, 1969, p. 113).

The law as an ultimate tendency can never be identified with empirical experience: for fear of the tyranny of facts. The history of the capitalist mode of production becomes a dualist combination of

rational forces and empirical surroundings. The law finally comes to rest in the realm of pure reason: it *explains* the demise of capitalism, but the law of the falling rate of profit is never revealed as an ultimate tendency in the realm of appearance.

Marxian political economy has tended to become a seance with the spirit of a weird 'economic machine' which never appears in view. Its 'laws' are identified, its mechanics become known, or rather they are *already* known, even before they become manifest. History submits to our *Principia Economica*.

The Role of Marxian Political Economy

It may be argued that the previous theoretical position applies to all tendential laws of an 'ultimate' character. That argument is indeed correct. Marxism is more or less rid of the 'law' of the absolute immiseration of the proletariat, even its origin in Marx is doubtful. Efforts are being made to purge Marxism of all notions of a breakdown theory. It is now opportune to reject the law of the falling tendency of the rate of profit.

Lucio Colletti (1972, 1973) and others have pointed out that the works of Marx and Engels have been interpreted in a mechanistic manner by most of the deans of orthodox Marxism for nearly a hundred years. It has become commonplace to identify the source of these mechanistic distortions of Marxism in some of the works of Engels. However, some of the blame must also fall on Marx. His *Preface to a Contribution to the Critique of Political Economy* can be, and has been, interpreted in a crassly mechanistic fashion, although its real meaning is somewhat ambiguous or obscure. In the preface to the first German edition of the first volume of *Capital* Marx talks of 'laws . . . working themselves out with iron necessity' (Marx, 1976, p. 91).

The version of Marxism that was given prominence by the leading theoreticians of the Second International, such as Kautsky and Plekhanov, rests on a vulgar notion of the 'economy', which is seen as one isolated 'factor', emptied of all effective social and historical content. The 'economy' runs on like a machine, prior to any real human intervention or mediation, whereas in Marx we can find countless references to his notion of the 'social relations of production' which embraces both the production of *things* and the production of *ideas*: material production and the reproduction of social relations.

Unmechanistic interventionist Marxism cannot proceed, therefore,

from a pure analysis of the 'economy', and then embellish this fabric with sociological and political 'detail'. These 'factors' cannot be mechanically isolated. The categories of Marxian political economy are at once economic, sociological and political. Consider, for example, the concept of labour power as a commodity. It involves the existence of separate 'sociological' *classes* between which purchase and sale can take place, a *legal* framework within which a labour contract can exist, and an existence of a *state* which can protect capitalist social relations, as well as the more obvious 'economic' connotations.

Marxian political economy has traditionally been the fount of prediction in the shape of 'economic perspectives' for socialist organisations. The duality between theory and phenomena has been transformed into a *de facto* separation between theory and practice. The role of theory is mere prediction: to assure the movement of the 'inevitability' of socialism, to herald the next crisis which is 'just round the corner'. Theory, in short, is a commentary on the workings of the mythical economic machine. Practice, on the other hand, is involvement in economic struggle as an acknowledged cog of the machine.

Such mechanistic theory is a basis for quasi-religious fanaticism: the idea that despite isolation and defeat the objective force of events will ensure that victory is inevitable. Notably, this fanatical aspect of mechanical materialism was persistently attacked by Antonio Gramsci. As a Marxist, he suggested that 'laws' pointing to supposedly 'inevitable' developments are unjustified and serve no positive political purpose.¹⁵ For these and other reasons it is necessary to bury the last iron law of Marxian political economy – the law of the falling tendency of the rate of profit.¹⁶

Notes

1. *Capital*, vol. 1, ch. 25, sections 2 and 3; and vol. 3, part 3. See also Marx (1973, pp. 386–98, 745–58).
2. Marx (1973, pp. 413–14).
3. Marx (1981, p. 255).
4. *Capital*, vol. 3, part 2; Sweezy (1942, ch. 7); Bortkiewicz (1952); Steedman (1973); Hodgson (1974); Yaffe (1973).
5. Marx (1981, pp. 138–9, 163–9, 208, 334, 335–6).
6. *Capital*, vol. 2, part 2, and vol. 3, ch. 4.
7. Marx (1981, p. 317).

8. Marx (1981, p. 318).
9. Marx (1981, p. 318–19).
10. Marx (1969, pp. 415–16).
11. Robinson (1942, p. 36–40).
12. Meek (1967, pp. 131–5).
13. Marx (1976, p. 419).
14. Dobb (1940, p. 110). Since the above article was written, Ben Fine and Laurence Harris (1976, 1977) have gone even further than Maurice Dobb in proposing a version of the law as a concomitant tendency. They describe it as ‘the law of the tendency of the rate of profit to fall *and* of the tendency for counteracting influences to operate’ (Fine and Harris, 1976, pp. 162–3) and assert that ‘the existence of both the tendency of the rate of profit to fall and of counteracting influences has the status of a law in the sense that both are inevitable products of capitalist accumulation’ (p. 167). In my reply I suggest that this amounts to a vacuous ‘law of the tendency of the rate of profit to *fall or rise*’ (Hodgson, 1977, p. 98). It is also reasonable to ask why, in this interpretation, the downward forces should be given the description and implied status of a ‘law’ and those in the opposite direction are labelled ‘counteracting influences’. Given that Fine and Harris regard both sets of forces as significant, they give no reason why the labels should not be switched, giving ‘the law of the tendency of the rate of profit to rise’.
15. Gramsci (1971, pp. 167–8, 171, 336–7, 342–3).
16. This essay was written before the ‘Okishio theorem’ (Okishio, 1961) became widely known and advanced as a further argument against the theory of the falling rate of profit (Bowles, 1981; Roemer, 1981).