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Behind the Crisis: The Exhaustion of a Regime of Accumulation. A "regulation school" perspective on some French empirical works

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ABSTRACT: The theory of a fall in the rate of profit due to a rise in the organic composition of capital has been too quickly discarded in recent years. A mathematical theorem shows that this phenomenon is viable under a "monopoly regulation." Data suggest that both a rise in organic composition and a "productivity-pull profit squeeze" could be at the root of the present crisis.

INTRODUCTION

According to Weeks (1979) the mainstream among American Marxist scholars shifted in the 1970s from "under-consumptionist" explanations of capitalist crisis (UC) to "profit-squeeze" theories (PS). The latter were supposed to emphasize the class struggle at the root of the crisis. At the same time, Van Parijs (1980) thought it was possible to pronounce the "obituary" of one of Marx's own theories of crisis: "the tendency of the rate of profit to fall" (FRP), connected to the tendency of the organic composition of capital (OCC) to rise.

My aim in this paper is to present some empirical data (and some theoretical discussion) raised in France about these three candidates for an explanation of the current crisis. In particular, I shall argue that, while the PS explanation is questionable, the "FRP-OCC" candidate should not be discarded too quickly; but the UC should be rejected (at least up to the *opening* of the crisis). So, I agree with Weisskopf, Bowles and Gordon (1985) that the present crisis occurred because the capitalist class was "too weak" rather than "too strong."

I do not intend to advance a "general theory of capitalist crisis," nor develop a concrete analysis of the current crisis.[1] I am simply going to show: (1) what role Marx really attributed to the tendency of the rate of profit to fall in the explanation of crisis, and what was the role of class struggle in this concern; (2) that it is possible to explain the postwar long growth period by a situation in which not only did the "counter-tendencies" offset the "tendency," but they did so in such a way as to minimize the risks of under-consumption; and (3) that relevant empirical data support this explanation, thus suggesting that the weakening of some of the counter-tendencies can explain the origin of the current crisis. In conclusion, I shall raise the problem of the link between the (latent) tendency and the (open) crisis itself.

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This is an abbreviated translation of the French version (Lipietz [1982a]) of a communication to the Summer Meeting of the Econometric Society (San Diego, June 1981), with some new considerations and a new theorem in the Appendix. I have benefitted from useful remarks from the audience at this meeting (in particular D. K. Foley) and from the referees of *Revue economique* and *RRPE*.

MARX'S EXPLANATIONS AND THE DEBATE[2]

A too cursory reading of *Capital*, Vol. III, leads to the following standard-vulgar "OCC-FRP" Marxian explanation of the crisis. Let σ, C, V, S be the value rate of profit, and the annual flows of constant and variable capital and of surplus-value. For the sake of simplicity, let us assume that the turnover of constant capital is 1. We then have:

$$\sigma = \frac{S}{C+V} = \frac{S/V}{1+C/V}$$

From here, the standard "syllogism" consists of three steps: (1) competition between capitalists leads to capital-using technical change, thus increasing the "technical composition of capital"; (2) this leads to an increase in the OCC ("C/V", according to the vulgate); (3) the increase of the OCC leads to a fall in σ, and hence also to a fall in the price rate of profit.

The "devastating" critique by many post-Marxian scholars attacked at first the purely mathematical statement (3), then raised many doubts about statement (2), and finally delivered a last blow to statement (1). But a careful examination leaves the debate still open.

First, it is true that, due to the possible movement of the rate of exploitation S/V, nothing can be deduced from the rise of C/V. But let us write:

$$\sigma = \frac{S/(V+S)}{(C/(V+S)) + (V/(V+S))} = \frac{\epsilon}{q+(1-\epsilon)}$$

Obviously, if σ is considered as a function of the two variables $q = C/(V+S)$ and $\epsilon = S/(V+S)$, a rise in q ultimately entails *necessarily* (that is, whatever the movement of ϵ) a fall in σ:

$$\left(\sigma = \frac{\epsilon}{q+1-\epsilon}\right) => (\forall h\ \exists H\ q>H => \forall \epsilon\ \sigma<h).\ \text{(straightforward).}$$

And it is easy to demonstrate (Lipietz 1982a) that a fall in σ ultimately entails a fall in the rate of profit. Thus, point (3) is true . . . if q may be considered *the* best express for the OCC, which it is because it expresses the ratio of "dead labor" C to "living labor" V + S, independently of the sharing of value added V + S. That was in fact Marx's definition in *Capital*: "the organic composition of capital is the value composition as far as it depends on the technical composition (i.e. not on the value of labor)." (For some Marxology on this issue, see Lipietz 1979a).

Now, clearly, the rise of this ratio q cannot be demonstrated by mathematics. Even if the technical composition of capital does rise (abstracting from the problem of the definition of a "volume" K of capital), the rise of OCC will depend not only on the former (K/L, L being the quantity of labor, either concrete or abstract!) but on the movement of π_I, the productivity of labor in department I (production of means of production):

$$q = \frac{K}{\pi_I} \cdot \frac{I}{L}$$

Thus, point (2) must be considered not as a mathematical deduction, but as an empirical *thesis* of Marx, a *law* about the tendency of technical change under the capitalist mode of organizing the labor process, which involves the effort to raise productivity through a growing separation between dead labor (C) and living labor (V + S).

This view is consistent not only with many of Marx's statements, but with many studies of the evolution of the labor process under capitalism (see the well-known contributions by Althusser, Balibar, Bettelheim, Braverman, Coriat, Marglin, Negri, et al. For a survey see Lipietz 1979a).

The remaining objection is (point 1) that the viability of any tendency for the OCC to rise so that the rate of profit falls, under the rules of capitalist competition, has been denied by the famous theorem of Okishio (1962). Yet a close examination of this theorem shows that its result is based on (at least) two questionable assumptions: (1) the introduction of technical change is only due to competition between capitalists, and (2) this introduction occurs at a constant real wage.

The first assumption is contrary to numerous studies of labor sociology (as well as Marx's statement that the introduction of machines is a weapon in the class struggle of bosses against workers). The second one is completely inappropriate, for it can be shown that, with a fixed real wage, a long trend of growth in productivity would lead to a crisis of realization (Lipietz 1980). In the Appendix I show that, under the more reasonable assumption of a constant rate of exploitation, Okishio's conclusion is false.

Precisely these issues are addressed by the so-called "French school of regulation."[3] The question of accumulation is the following: what is to be done, not only with the absolute surplus-value, but also with the growing relative surplus-value due to gains of productivity? Let us define a "regime of accumulation" as a systematic mode of dividing and reallocating the social product, which achieves over a long period a certain match between the transformation of the conditions of production (volume of capital employed, distribution between branches, and norms of production) and transformation in the conditions of final consumption (norms of consumption of wage workers and other social classes, collective expenditures, etc.). As accumulation expands, the growth of output of production goods and consumption goods must match the growth of capital commitments and the growth of purchasing power of wage-earners. In this conceptualization there appear several possible regimes of accumulation: extensive accumulation (simple homothetic growth of the two departments validating each other), intensive accumulation without mass consumption (where the expansion of constant capital alone validates the growth of department I), intensive accumulation with growing mass consumption, etc.

It remains true that regimes of accumulation do not materialize by themselves. The problem is to know what coercive forces, what institutional forms, will assure the coherence of the strategies and expectations of the agents of the capitalist market economy, to make them converge towards the realization of the schema of reproduction. We are thus led to the problem of regulation. We

will therefore call a "mode of regulation" the ensemble of institutional forms, the networks, the explicit or implicit norms, which assure the compatibility of behaviors in the framework of a regime of accumulation, in conformity with the state of the social relations, and thereby through the contradictions and the conflictual character of the relations between agents and social groups.

Since there exist several possible regimes of accumulation and several modes of regulation, a Marxist should consider the possibility of various types of crisis, taking the form of a "UC-crisis," a "FRP-OCC-crisis," or a "FRP-PS-crisis," according to the tendencies of the technical composition of capital, the real wage, and the productivity in the two departments, within the current regime.

Here is the place for the famous "counter-tendencies" of Volume III. It is true that the rise of OCC could be inhibited by a rise in π_1. It is also true that, given a rise in OCC, the FRP could be temporarily inhibited (or accelerated) by a rise (or a fall) in the rate of exploitation. But these counter-tendencies in turn open up the possibility of a crisis of under-consumption (and a fall in the rate of exploitation can lead to a profit-squeeze crisis). Moreover, none of these forms of crisis are "class-struggle-free": the class-struggle is already *embodied* in the technical forms of production, through the struggle within the labor-process leading to the rise in the technical composition of capital.

To conclude this very brief theoretical discussion, it appears that:
— A weakening of the regime of accumulation leading to a major crisis may occur through a fall in the rate of profit due to a rise in the organic composition of capital. This is obvious when the rate of exploitation is kept constant; for then capital-using technical changes compatible with Samuelson–Okishio conditions of "viability" lead to a fall in the rate of profit (see Appendix).
— This tendency is inhibited as long as gains in productivity offset both the rise in the technical composition of capital and the rise in the real wage.
— The question of the actual reason for the weakening of a particular regime of accumulation is a problem for empirical investigation. This is also true of the question of the relative responsibility of OCC and of the rate of exploitation in the case of an FRP-crisis.

THE POSTWAR "GOLDEN AGE"

Empirical studies on both the United States and the French long-term experiences (Aglietta 1976; CEPREMAP 1977) have led to the identification of several distinct regimes of accumulation in capitalist history.

The 1848–1914 period is mainly characterized (unevenly according to the sub-periods) by a simple extension of productive capacity without dramatic change in the organic composition of capital or in productivity. The latter experienced an average growth rate of 2 percent a year (in France), and the growth in the purchasing power of the working class was a little less. The regulation operated through the classical "business cycle," with prices and revenues growing in the booms, and crashes entailing a fall which did not completely offset the previous rise in the real wage.

In the twenties a revolutionary mode of organization of work was generalized in the United States, and partially in Europe: *Taylorism*. It consisted in

expropriation, by a gigantic and capillary deepening of the capitalist control of the labor process, the know-how of the collective workers, a know-how which was henceforth systematized by engineers and technicians according to the methods of the "scientific management of work." A further step was the incorporation of this know-how into the automatic system of machines, which dictated the method of work to the workers who had thus been robbed of initiative: such was the *productive watershed of "Fordism"* (Coriat 1979).

In the inter-war years, the development of Taylorism and embryonic Fordism provoked the first big wave of intensive accumulation. Productivity grew at the rate of 6 percent per year (three times the average rate of the nineteenth century). But the growth of purchasing power remained mediocre. This scissors effect, very favorable to the rate of profit, via a rising of the rate of exploitation which was in no way offset by the growth of the composition of capital, which remained modest,[4] provoked an also unprecedented crisis of overproduction (or underconsumption): the crisis of the 1930s. It was more than a question of a business cycle recession. The existing "competitive regulation" was no longer adequate to intensive accumulation. One can therefore characterize this big crisis of the thirties as both *the first crisis of intensive accumulation and the last crisis of the competitive regulation*.

After the reconstruction of Europe (by its nature mainly extensive) and the Korean War, the OECD countries underwent a new intensive expansion, which this time lasted for twenty years, during which productivity increased again considerably, as did fixed capital per head. But this time the increase in purchasing power of wage-earners (productive and unproductive) paralleled almost exactly the rise in productivity. As this rise in productivity affected the two Departments more or less equally, the organic composition of capital remained roughly unaltered, and the rate of exploitation likewise.

I will qualify these results later, but for the moment, they allow us to give a broad characterization of the "Golden Age," in terms of two basic conditions:
— The rates of growth of the global technical composition of capital (i.e. approximately, of fixed capital per capita) and of the productivity of Department I are the same. This latter "counter-tendency" to the rise of the technical composition of capital inhibits the tendency of the value-composition of capital to increase (since $q = K/L \cdot 1/\pi_I$).
— The rates of growth of real consumption per wage-earner (d), and of the productivity of Department II (π_{II}), are the same. The "counter-tendency" to the FRP, which the rise in the rate of exploitation would have constituted, was thus inhibited (since $1-\epsilon = d/\pi_{II}$). And, by the same token, so was the tendency towards a crisis of under-consumption.

Since neither the organic composition of capital (q) nor the rate of exploitation (ϵ) tended to change, the general rate of profit (σ) remained stable:

$$\sigma = \frac{\epsilon}{q + (1-\epsilon)} = \frac{(1 - d/\pi_{II})}{(K/L)(1/\pi_I) + (d/\pi_{II})}$$

Accumulation could therefore follow a regular rhythm.

These two basic conditions held, approximately, in the developed countries up to the middle of the sixties. Now, nothing assured *a priori* that this would be so.

The first condition was obtained in near-miraculous fashion,[5] and in fact statistical data will show, in the next part of this paper, that it was decreasingly so during the sixties in the main industrialized countries. On the other hand, the second condition was assured more or less explicitly by a policy of regulation of the wage relation: mass production was accompanied by mass consumption, thus realizing the full development of *"Fordism."* This partial regulation was one among a set of institutional forms which constitute a variant of the "monopoly regulation."

Schematically, this mode of regulation, which was consolidated after 1945, combined the following institutional forms:
— *A collective "contractualization" of the direct wage*. The worker did not need to negotiate day by day, individually, the sale of his labor-power. Collective agreements covered the majority of wage-earners, so that employers could agree among themselves (and incidentally with the trade-unions) on the wage increases which would be imposed on all, at the level of a region or a country. To complete this obligation of "sharing the fruits of growth," a "guaranteed minimum wage" was established (Boyer 1979).
— *The Welfare State (social security + system of unemployment insurance)*. It ensured every wage-earner, and then nearly all of the population, a guaranteed income invulnerable to the risks of everyday life (Lipietz 1983b).
— *The growth of the tertiary sector*. The stablization of the wage relation was accompanied by its generalization to most activities, including those of management, of trade and finance, and of control (Aglietta and Brender 1984).
— *Important modifications in the relations between markets, banks and industrial firms*. They allowed these firms to switch techniques of production and products, while maintaining their prices in the obsolescent ones, by a rigidification of "mark-up" type procedures (Boyer and Mistral 1978).
— *Hegemony of credit money*. This money was issued by the banking system according to the needs of accumulation and the movement of nominal prices (Lipietz 1982b, 1983a).
— *Dramatic increase in the economic power of the state*. Not so much (contrary to Keynes's predictions) through public expenditures, but mostly through its function in the management of the reproduction of the labor force and of currency (de Brunhoff 1976).

It is the functioning of this monopoly mode of regulation, superimposed on the generalization of Fordism in the labor process, which has permitted the a priori acceptance of the two basic conditions of the "scheme of the Golden Age" of intensive accumulation. The different countries of the OECD were thus able to experience, during a fifteen-year period, an exceptionally strong, lengthy and regular growth, with, of course, some slowdowns (the cyclical "recessions"), and great differences between various national rates of growth.

As long as these inner conditions of intensive accumulation sustained themselves, the nominal rate of profit, defined by the ratio of some elements of cash flow to assets, evolved in the same way as the economic rate of return (the closer indicator of the value rate of profit), defined through a statistical evaluation of the ratio of operating surplus to fixed capital (Delestré and Mairesse 1976). Unfortunately for capital, the inner ratio of values began

nonetheless to shift unfavorably to profitability. Let us now examine this point more closely.

THE HIDDEN CRISIS OF INTENSIVE ACCUMULATION

Before looking at the data, one must specify what is to be expected from it. First, my ambition is limited. I am not undertaking a concrete analysis of the crisis,[6] but simply trying to shed some light on its deeper causes. To be precise, I need to verify that: (1) during a rather long period, the evolution of certain basic magnitudes accorded roughly with the requisites of the Fordist regime, and (2) in the years *before* the opening of the crisis these requisites were no longer satisfied. In order to decide between the various candidates for the role of "cause of crisis" (UC, PS, OCC. . .), one needs to examine which magnitudes diverged most strikingly from the scheme. The "oil-shock" operated as a "revelator" of these divergences: thus, 1974 may be labeled as the "official opening" of the crisis (Lipietz 1985). But I shall *not* examine what happened after 1974, since the subsequent evolution involves *reactions* to the crisis, not causes of it.

Moreover, in order to be brief, I shall limit myself to a particular corpus of data: some inquiries pursued within the French Economic Administration, connected with an early concern about the decline of profitability. Why do I say "decline of profitability" and not "fall in the rate of profit"? Because of the great difficulty of defining an accurate rate of profit in the context of an inflationary evolution of nominal magnitudes, which expresses less and less correctly the evolution of "real" magnitudes.[7] Thus I shall focus on the two main inner variables determining profitability: the rate of exploitation and the organic composition of capital. The statistical indices that I shall use are:

— the share of wages in value-added, which is itself a function of the real wage and of productivity in Department II ($1-\epsilon = d/\pi_{II}$).

— the "productivity of fixed capital," that is, the ratio of value added to gross fixed capital stock (in real terms) which is itself a function of "real capital per capita" (close to the technical composition of capital) and of productivity in department I ($q = K/L \cdot 1/\pi_I$).

I must emphasize the great frailty of these statistical indices. The difficulties of definition of aggregate volumes (for instance of "K") are well known. On the other hand, series distinguishing between the two Marxian Departments are seldom available. Still, the available indices do permit one to draw some conclusions.

Rate of Exploitation: No General "Profit Squeeze"

First, I shall not distinguish productive and unproductive wage labor.[8] It is true that unproductive wages are part of surplus-value, yet these wages are also deducted from capital accumulation. But the series I use are corrected for the growing share of wage-earners in the population. Second, we are not able to distinguish in international data between the two departments, and we must therefore assume that the gains in productivity (measured by annual value added per capita at constant prices) are uniform.[9]

In the figures compiled by Lapierre-Donzel (1981), and presented in Table 1, we can observe a decreasing wage share in the years before the crisis, in France, Great Britain and the United States, and a slight growth in the wage share in the FRG.[10]

Table 1
Corrected Wage/Value Ratio*

Great Britain	**(1950)**	**(1955)**	**(1960)**		**(1970)**		**(1974)**
	67.3	70.7	70.7		73.6		70.3
U.S.A.		**(1956)**	**(1960)**	**(1966)**	**(1970)**		**(1975)**
		62.8	63.7	61.4	65.5		63.8
F.R.G.	**(1950)**	**(1955)**	**(1960)**	**(1965)**	**(1970)**		**(1975)**
	64.8	58.9	58.4	59.4	58.5		61.1
France			**(1959)**	**(1964)**	**(1968)**	**(1973)**	**(1975)**
			51.6	51.2	51.6	49.5	51.7

*Due to the weight of non-wage workers, it is impossible to build this index for Japan. Yet it is possible to estimate an important fall till 1970 and then a rise.

Source: Lapierre-Donzel (1981).

Yet this result casts no light on the causes of the evolution of the wage share. Thus, one needs to split the result between a "real wage" and a "productivity" effect. From Table 2 we may draw the following conclusions:

— In Great Britain and the United States, there is a slow-down in real wages greater than the slow-down in productivity. The latter appears as soon as 1966 in the United States, leading to a transitory fall in the rate of exploitation before 1970, which is afterwards brought back to the level of 1955 (when including the employer's national insurance contributions).

— in France, there is no break in the two tendencies, productivity growing always faster than real wages.

— in Germany, from 1970 to 1974, just as in the United States from 1966 to 1970, the responsibility for the fall of the rate of exploitation must be attributed to the slow-down in productivity, with a constant rate of growth in the real wage.

— only in Japan do we notice the coexistence of a slow-down in productivity and an acceleration in the real wage.

Table 2
Growth of Real Wage (s/w) and Productivity Π
(annual rate)

		(1950 –1955)	(1955 –1950)	(1960 –1970)	(1970 –1974)
Great Britain	(s/p)	3.0	2.3	3.1	1.2
	Π	2.0	2.3	2.6	2.4

		(1956 –1961)	(1961 –1966)	(1966 –1970)	(1970 –1975)
U.S.A.	(s/p)	2.9	2.4	2.5	−0.2
	Π	2.3	3.6	0.9	0.3

		(1950 –1955)	(1955 –1960)	(1960 –1965)	(1965 –1970)	(1970 –1974)
F.R.G.	(s/p)	5.5	4.8	5.5	4.9	5.1
	Π	7.2	5.2	5.0	5.3	3.8

		(1955 –1959)*	(1959 –1964)	(1964 –1968)	(1968 –1973)	(1973 –1975)
France	(s/p)	2.4	5.6	4.5	4.9	4.2
	Π	4.2	6.1	4.8	5.4	1.8

		(1954 –1957)	(1957 –1964)	(1964 –1970)	(1970 –1973)	(1973 –1975)
Japan	(s/p)	5.8	7.7	8.6	11.6	5.6
	Π	8.6	9.4	9.6	6.5	0.5

*Old basis.

Source: Lapierre-Donzel (1981).

Thus, it seems difficult to attribute the world crisis to a world-wide profit-squeeze. This assumption is absolutely denied in France and Great Britain, and even in the United States in the 1970–1974 period. It is questionable in the FRG if by "profit-squeeze" we mean, following Itoh (1980), Weisskopf (1979) and Armstrong, Glyn and Harrison (1984), that an *autonomous* increase in the rate of growth of the real wage (due to tensions on the labor market) has broken the scheme of accumulation. In most cases, with the only exception of Japan in our sample, the problem is the slow-down in productivity. This slow-down can be attributed to the exhausting of Fordism as a labor process organization principle, both from the technical and the social side (Coriat 1979). It is thus correct

to impute the crisis to "class struggle," but class struggle within the labor process (absenteism, micro-conflictuality), rather than within distribution. We should therefore draw a distinction between a "Wage-Push — PS" explanation (the most poular PS explanation among Marxist scholars since Kalecki) and a "Productivity-Pull-PS" explanation.

The "Wage-Push-PS" explanation can not be considered a *general* explanation of the world crisis. And no more can its direct opposite, the under-consumption explanation, since, contrary to the 1920s, we do not observe, *before* the crisis, any dramatic "scissors" between productivity and wage growth. Of course, *after* the beginning of the crisis, the policies of "austerity," leading to a fall in unit labor costs, may have entailed, in some Department II sectors, a fall in demand, and thus a deepening of the crisis (Lipietz 1985). This is obvious in the housing and automobile industries (CEPREMAP 1980).

Rise in Organic Composition of Capital: Its Generalization in the Sixties

Let us look now at the second major determinant of profitability. The studies I refer to use a very rough index: the physical output/capital ratio, Q/K, Q and K being gross value added and fixed capital in real terms. Since these two indices are built from "value series" deflated by a price index, we are not so far from the inverse of the organic composition of capital, if we forget the problem of circulating constant capital and if we suppose an *evenness in gains of productivity* between the two departments. In this case we can split the indicator into a "technical composition" factor K/L (volume of capital per capita) and a "productivity" factor Q/L: I will make this heroic assumption for international comparison. But first let us consider briefly the complex "French debate" on this issue.

The French case: History of an "economic fact"

In 1974, a division of the National Institute for Statistics and Economic Studies (INSEE) published a brilliant new set of long-term time series for the French economy. The most striking discovery was a break in the tendency of evolution of "Q/K," which started to fall after 1964. This result, which seemed to reinforce the standard Marxist position, stimulated a long polemical debate which led to a reconstruction of the "facts."

First of all, some scholars noted that this fall in the aggregate ratio Q/K could have resulted from a shift in the weighting of various sectors (Lipietz 1976). In fact, within non-agricultural firms, the fall from 1964 is only −7 percent by 1971, and it reaches −30 percent by 1974.[11] But in typical Fordist industries (automobiles, mechanical and electrical engineering, etc.), the fall begins only in 1969 and is only −6 percent by 1973 (Azouvi 1979) — hardly enough for triggering a crisis!

More troublesome: a general reestimation of physical capital series ("New basis 1971" as opposed to "Old Basis 1962") made this break-down simply vanish for most industries, at least to 1973 (Delestré 1979)! It is true that, at this time (the early seventies), France experienced an over-heating period leading to a short-term growth of Q by means of a very high employment of productive capacities. Yet this argument, which led scholars to shift from Q to a "full

employment of capacity'' index Q* (Billaudot 1979) did not happen to be used as the main defence of the OCC. More interested by the conditions of exploitation of humanpower within the labor process, the adherents of intensive accumulation theories emphasized the fact that the evaluation of technical composition through the indicator K/L was understimating the reality, because of the rise of work in multiple shifts (Billaudot 1976, 1979); Bertrand 1976).

From 1957 to 1979, the share of shift-workers among operatives increased: from 28 percent to 77 percent in metallurgy; from 8 percent to 39 percent in machine-building; from 34 percent to 50 percent in textiles; and from 14 percent to 31 percent in overall manufacturing industries. In 1974, 61 percent of the work by shift was 2-shifts, 27 percent 3-shifts, 14 percent 4-shifts and more.

This deep transformation in the use of fixed capital was thus hiding the real growth of the technical composition of capital. In fact, from 1957 to 1963, the growth of the stock of fixed capital (in volume) was 5.5 percent a year, but it would have been 9.7 percent without the extension of the duration of utilization of machines, and the ''apparent productivity of fixed capital'' Q/K would have begun to fall already then. The underestimation of this fall due to extension of work by shift is 4 percent a year from 1959 to 1963, but only 0.6 percent from 1963 to 1970 and 1.2 percent from 1970 to 1974. Obviously, there is a kind of ''diminishing return'' to this device, since the ''good effects'' of extending shifts to economize on fixed capital are ''one-shot.'' Even machines cannot work more than 24 hours a day! Similarly, gains in productivity, insofar as they are only gains in the intensity of labor, are also subject to limits.

The main significance of this discussion is that it provides a very simple example of the using up of ''good effects'' (for capital) of a peculiar form of organizing labor.

Now, even with the 1971-based series, the ratio K/Q (as an index of OCC which takes account of the economizing of constant capital) started to rise inexorably after 1973, in every sector. Of course this rise of the OCC (or fall in ''productivity of fixed capital'') is overestimated in periods of recession. But, if one compares the years 1972 and 1977 (years of similar rates of utilization of productive capacity) the fall in Q/K is obvious, general and deep (see Table 3).

Table 3
''Productivity'' of Capital (Q/K), 1972–1977

	Non-farm	Industry	Intermediate goods	Equipment goods	Non-durable consumers goods
Constant price	−8.1	−7.1	−9.6	7.4	7.4
Current price	−9.5	−7.3	+3.8	16.9	16.9

Source: Delestré (1979).

So far we have taken for granted that Q/K (in volume) is a good proxy for the value-composition of capital, assuming that the gains in productivity are even. But this is not true. In a path-breaking study, Bertrand (1978) was able to build 1950–1974 series for the two Marxian departments which show noticeable differences (Table 4).

Table 4
Analysis in Productive Departments

	1954	1967	1974
Manpower in D_1	95	135	155
Manpower in D_2	100	95	95
Value added in D_1 (constant price)	105	310	460
Value added in D_2 (constant price)	120	240	320
Labor-composition in D_1	20	21	22
Labor-composition in D_2	15	21	24

Source: Bertrand (1978). Index 100 in 1950 for manpower and value added, % for labor-composition (see note 12).

Productivity (value added per capita) grows more slowly in Department I, and so does the ''labor-composition of the product.''[12] In fact, Department II (with its main Fordist sector, the automobile industry) is the first one subject to a Fordist type of transformation of the labor process. Thus π_I is less than the average rate of growth of productivity, and the difference is reflected in the variation over time of relative prices between the two sectors. So we may use the movement of K/Q *at current prices* (and not in volume) as an index of the combination of the rise of the technical composition of capital *and* of slower gains in productivity within Department I (see Table 3). Here, the rise of the OCC (or fall in Q/K) is even more significant (nearly 20 percent in Taylorist and Fordist industries), with only the intermediate goods industries benefitting from the move in relative prices.

In conclusion, the rise in the OCC (or fall in the ''productivity of fixed capital'') in France, after its fall in the years 1950–1964, is obvious in the seventies, even if it is disputable before 1973. France seems to be a case of ''too young Fordism,'' swept along in the global crisis in the early seventies, before the exhaustion of its own scheme of accumulation, which should have occurred later in the seventies. What about the other great industrial countries?

A general ''U-profile'' for the OCC

The data collected by Cellier (1980) have shown that the phenomenon of the fall in Q/K is much more evident in the other industrialized countries (see Table 5). It started as soon as the early sixties in Japan, the mid-fifties in Germany, the early fifties in Great Britain, and (after some fluctuations) the mid-sixties in the United States.

Table 5
Annual Mean Rate of Growth of Technical Composition of Capital (K/L), Productivity (Q/L), Output-Capital Ratio (Q/K)

		K/L				Q/L				Q/K			
	1950–1955	1955–1960	1960–1965	1965–1970	1970–1975	1950–1955	1955–1960	1960–1965	1965–1970	1970–1975	1955–1960	1960–1965	1965–1970	1970–1975
Japan		5.7(b)	11.0	10.9	11.2 9.9		12.5(b)	7.8	13.1	3.5 5.4	6.8	−3.2	2.2	−7.7 −4.5
F.R.G	1.8	6.1	8.0	5.9	7.6 7.5	8.5	5.4	5.4	5.4	3.2 3.3	−0.7	−2.6	−0.5	−4.4 −4.2
France A Basis	3.2(a)	3.5	5.7			5.1	5.6	5.1			2.1	−0.6		
N Basis			4.1	4.9	5.0 4.8			6.1	7.0	3.1 4.9		2.	2.1	−1.9 0.1
Great Britain	2.3	3.8	3.7	4.3	4.6(c) 5.0	2.2	2.4	2.9	3.2	3.4(c) 5.5	−0.1	−0.8	−1.1	−1.2(c) 0.5
U.S.A.		5.0(b)	2.0	3.6	4.3 1.8		2.1(b)	4.5	1.0	−0.6 2.6	−2.9	2.5	−2.6	−4.9 0.8

Second Line in row "1970–1975" is 1970–1973 — (a): 1951–1955 — (b): 1956–1960 — (c): 1970–1974

Source: Cellier (1980).

Of course I can not here make a distinction between the two departments, and I must use Q/L as a general index for the productivity counter-tendency to the rise of the technical composition of capital K/L (through the equality $K/Q = K/L \cdot L/Q$).

Thus there seems to exist a kind of law: a new principle in organizing production (here: Fordism) at first generates more gains in productivity than increases in fixed capital per capita, but then it ends up becoming much too "costly." We have seen one example of this mechanism: at first work in shifts offsets growth in fixed capital per "present" worker, then it is no more possible. But more deeply, one may suppose that the search for "the one best way" by Taylorist methods reaches an end with the generalization of "scientific management" at the moment where social unrest on the line and the deskilling of operatives cuts off the basis of productivity: the ingenuity of the collective worker.

Billaudot (1979, 1980) suggests a still more general law. One may suppose that *any* "new" technological paradigm, through economies in constant capital and/or gains in productivity, requires a lighter organic composition of capital than the former paradigm, but grows heavy as it deepens along its own line. We can see a confirmation of this idea when we note that, according to Bertrand (Table 4), the "labor-composition," equivalent to the "marginal organic composition" (applicable to new equipments: see note 12) never stopped growing since 1950. Thus, by a "vintage-effect" well-known to statisticians, the average organic composition follows a U-curve.[13]

This kind of analysis suggests a general explanation for the succession of "good" and "bad" phases within regimes of accumulation: a basis for a theory of long waves, based on mutations within the labor process.

Now, some readers may be unsatisfied with these inquiries into the archaeology of the present crisis, and ask: "Well, at present, after fifteen years, is capitalism succeeding in reversing the unfortunate tendencies that have slowed down productivity and raised the composition of capital"? Though this is beyond the scope of the present paper, I will provide a clue. According to the (French) Center for International Information and Prospective Studies (C.E.P.I.I. 1984), only one major country, through path-breaking innovations in the organization of labor, showed at the end of the seventies a medium-term reversal of these unfavorable tendencies both in productivity growth and in the movement of the organic composition of capital (although not yet back to the good old sixties). Surely you can guess the one!

AS A CONCLUSION: SOME DIRECTIONS FOR FURTHER STUDY

With all the usual care required in the use of statistics, we may draw the following conclusion.

At the end of the sixties, in all the major industrial capitalist countries, there was a fading of the two main counter-tendencies to the fall of the rate of profit:
— A fall in the rate of growth of productivity led in some countries to a downward pressure on the rate of exploitation.

— The "productivity of capital," an index of the inverse of the OCC, began to fall everywhere.

These two factors led to what Marx has called a "relative overaccumulation of capital," where new capital produces relatively less surplus-value.

Now, we need to understand how these two tendencies led to an open crisis.[14] It is still difficult to give to that question a fully developed answer. We need to understand the linkage between the "deep" or "inner" tendencies of the economic system and the "apparent magnitudes" (prices, revenues, behaviors and expectations: Lipietz 1983a).

First of all, there should be no theoretical objection to the idea that a continuous evolution of tendencies could lead to a sharp break. This is one of the implications of "catastrophe theory" (see, for instance, Harris 1979). Yet there is still a need to make explicit by what concrete mechanisms a "decline in profitability" leads to a fall in investments, unemployment, etc.

It is true, that given inflationary mark-up pricing procedures, a fall in the economic rate of return is not reflected fully in the nominal rate of profit. But it leads to growth of the share of depreciation allowances in gross cash-flow, and a rise in the cost of new investments. Hence accumulation is more and more difficult, more and more dependent on borrowed capital funds, and attempts to compensate the higher costs of fixed capital (and the higher costs of energy after 1973) by downward pressures on the real wage lead to a drop in effective demand. But the resultant "Keynesian crisis" is *not* at the root of the current crisis (unlike in the thirties). On the contrary it is a *reaction* to the "classical" crisis of profitability. And this tendency toward a "secondary demand-gap" is amplified by the pressure of a "foreign-trade constraint" (Lipietz 1984).

In any event, it is clear that a talmudic harking back to a "general Marxian theory of crisis" is of little interest. We must study, in each concrete regime of accumulation, which are the developing contradictions leading to its crisis, and, within the crisis, the way through which capital tries to offset these contradictions.

APPENDIX
RISE IN TECHNICAL COMPOSITION OF CAPITAL WITH CONSTANT RATE OF EXPLOITATION

Mathematically speaking, the falsity of Okishio's Theorem in the case of a non-constant real-wage could be established by any counter-example. But, to be economically relevant, the example should not look too "ad hoc." That was the problem with Roemer's attempt (1978): he made not only the "standard" initial assumptions for transformation-related problems (no rent, completely circulating capital, no joint production) but also more questionable ones. This was mainly due to his use of the "old" solution to the transformation problem (Seton-Okishio-Morishima). Using the "new" solution, we can provide an example closer to the post-World War II reality.

Roemer's attempt

In his attempt to prove that growth in the real wage can make some technical changes both "rate of profit diminishing" and "viable in competition" in the Samuelson-Okishio sense (that is, diminishing cost-price at current prices), Roemer (1978) exhibited an example where a technical change in Department I entails a fall in the rate of profit. But his example suffers from two serious limitation.

First, the demonstration is carried out with a two-sector model. This is not a purely mathematical simplification, since it implies that the technical composition is uniform across industries in at least

Department I. But this case enjoys a pleasant peculiarity: organic composition varies monotonically with the input/output ratio, irrespective of productivity! In fact: (with a = input/output ratio in I, l = labor/output ratio in I) the value of good I is $v = a.\ v + l$, hence the organic composition of capital in I is:

$$OCC_I = \frac{C_I}{V_I + S_I} = \frac{v \cdot a}{l} = \frac{a}{l/v} = \frac{a}{1-a}$$

Thus, this mathematical simplification just skips the point (2) of the FRP-controversy: the counter-tendency to the rise in OCC due to a rise in π_I.

The other simplification in Roemers example is the following: after technical change and re-equalization of the rates of profit, the profit/wage ratio is assumed to remain what it was *sector by sector*. A curious hypothesis, leading to de-equalization of wage rates in the two sectors!

In fact, Roemer could not do much better because he used the "old" solution to the transformation problem. This solution starts with the definition of the value of labor-power as the value of what the wage buys. It is quite unsuitable for handling the idea of a constant general rate of exploitation with changing real wages and productivity. So, let us shift to the "new solution."

Suitability of the "new solution"

The "new solution" to the transformation problem (Foley 1979; Lipietz 1979b; Dumenil 1980) is based upon the other possible definition of the value of labor-power, that is: the wage in money multiplied by the value of money (this latter being defined as the ratio: total price of the net product/total value added). This definition is quite suitable for considering changes in the real wage with a constant rate of exploitation, thus a constant value-wage, since the value-wage is defined independently of the changes in productivity π_{II} and the concrete basket of consumer goods d.

Let y, v, p be the vectors and covectors of net products, unit values and production prices, and let A and l be the matrix of input and the covector of direct abstract labor. Let us choose the numeraire and unit of abstract labor so that the price and value of net product equals 1:

$$H_1)\ v \cdot y = p \cdot y$$

Note that the value of money is thus equal to 1, and the value of labor power thus equals its price in money: w.

The equalization of rates of profit entails:

$$H_2)\ p = \gamma(pA + wl)$$

($\gamma = 1 + r$, r being the equilibrium rate of profit).

Note that:

$$v = l(I - A)^{-1}$$

$$p = w\gamma l(I - \gamma A)^{-1}$$

Since $p \cdot y$ is an increasing function of γ, it is straightforward that $(H_1 + H_2)$ admits only one solution in (p, γ). In this case, the sum of profits equals surplus-value, and the rate of profit depends on the rate of exploitation $\epsilon = 1 - w$, on the technical structure of sectors (A,l), and on the weighting of sectors y. Marx's statements in *Capital*, Vol. III, are hence vindicated. These results hold also in the generalization to the presence of rent, fixed capital, etc. (Lipietz 1979c).

Let us keep in mind that (H_2) may be written:

$$v \cdot y - p \cdot y = l[(I - A)^{-1} - w\gamma(I - \gamma A)^{-1}]y = l\ R\ y = 0. \qquad (I)$$

An OCC-FRP theorem

We may now prove an OCC-FRP theorem about the effect, on the general rate of profit, of the rise in the technical composition of capital, even with rising productivity. The new solution makes it possible to isolate this effect, since we may express the "ceteris paribus" conditions in a simple way:

Assumption A_1. The value of labor-power remains constant.

Assumption A_2. The weighting of various sectors remains constant.

Let us make precise the nature of technical change so that it accords with the logic of Fordism.

We may imagine a *flow* of technical changes (dA, dl) occurring in *all* the sectors during each period, so that:

Assumption A_3. Technical change is uniformly labor-saving: labor productivity grows in parallel in every sector.

Assumption A_4. Technical change is strictly capital-using: inputs are strictly not decreasing (at least one input grows).

Now, here is an "ad hoc" condition: the technical structure of the economy (A,l) should not be too "naughty," so that the "value-price divergence," due to diversity of organic compositions across sectors, will not cause too much trouble, at least in Department I.

Assumption A_5. The Economy (A,l) is "regular": in sectors of Department I values do not exceed production prices by a percentage greater than the rate of profit (a very weak and realistic assumption!).

Last but not least, technical change should be subject to the conditions of viability imposed by Okishio (1962) and Samuelson (1972), that is:

Assumption A_6. Technical changes are viable: at current prices they reduce the cost of production for the firms.

These assumption (plus the "standard" transformation ones) lead to the conclusion:

Theorem. In a regular economy subject to a flow of viable, uniformly labor-saving, strictly capital-using, technical changes, if the rate of exploitation and the structure of net product remain constant, then the rate of profit falls.

Proof

The hypothesis can be expressed this way:

A_1 : w = constant
A_2 : y = constant
A_3 : $dl = k \cdot l, k<o$
A_4 : $dA \geq O$
A_5 : $\gamma p > v$ (in Department I)
A_6 : $pdA + wdl < o$

First, the subset of technical changes (dA, dl) including $A_3 + A_4 + A_6$ is infinite. We are to prove that in this subset $d\gamma < o$.

Differentiating (H_2) according to (A_1) gives:

$$dp = \frac{d\gamma}{\gamma}\ p + \gamma\ dp\ A + \gamma\ p\ dA + \gamma\ w\ dl, \text{ or:}$$

$$dp = \frac{d\gamma}{\gamma}\ p\ (I - \gamma A)^{-1} + \gamma\ p\ dA\ (I - \gamma A)^{-1} + \gamma\ wl\ (I - \gamma A)^{-1} \qquad (II)$$

Differentiating (H_1) according to (A_2) gives:

$$dv \cdot y = dp \cdot y \qquad (III)$$

Differentiating $v = vA + l$ gives:

$$dv = v\ dA\ (I - A)^{-1} + dl\ (I - A)^{-1} \qquad (IV)$$

Expressing (III) via (II) and (IV) we have:

$$dl(I - A)^{-1}y + v\ dA(I - A)^{-1}y = \frac{d\gamma}{\gamma}\ p(I - \gamma A)^{-1}y + \gamma\ w\ dl\ (I - \gamma A)^{-1}y + \gamma p\ dA(I - A)^{-1}y$$

which may be summarized in the form:

$$M\ d\gamma = dl\ R\ y - K$$

The M term $(= p/\gamma(I - \gamma A)^{-1}y)$, being a product of semi-positive matrices and vectors, is positive.

The dl R y term, according to (I) and (A_3), is null. (V)

The K term is written:

$$K = \gamma\ p\ dA(I - \gamma A)^{-1}y - v\ dA(I - A)^{-1}y. \qquad (VI)$$

Since $(I - \gamma A)^{-1} > (I - A)^{-1}$, K is bounded from below:

$$K > (\gamma p - v)\ dA\ (I - A)^{-1}y$$

According to $(A_4 + A_5)$, this is strictly positive, thus:

$$d\gamma = dr = -K/M < o \qquad \text{Q.E.D.}$$

Discussion

It is only fair to Roemer to discuss the robustness of this result with respect to the assumptions made. Changes in technical composition of capital are reflected in (V) and (VI). (VI) expresses the rising value of constant capital, with abstraction from the countertendency $dl < o$. The ad hoc assumption A_5 about this effect is very weak and simplifies the demonstration. On the other hand, the countertendency of rising productivity $dl < o$ is embodied in (V) and strongly limited by dl R y = o, which derives from the very strong assumption A_3. How far could we relax this hypothesis with the theorem still holding true?

The most encompassing theorem relaxing A_3 may be:

$$dr < o <==> dl\ R\ y < K \qquad (VII)$$

Since we know that K is positive and we have exhibited a lower bound, since we already know one case (A_3) satisfying condition (VII), and since dl R y is a continuous function of the vector dl, then the result $dr < o$ holds in a subset of (dA, dl), which contains the union, for each separate dA satisfying A_4, of all the sets $E_{dA} = \{dl \mid A_3, A_6, dl\ R\ y < K\}$. Since any dl could be written:

$$dl = f + h \cdot Ry,$$

f being a vector of the hyperplane orthogonal to vector Ry, and h a scalar, then each E_{dA} is a open subset:

$$E_{dA} = \{(f,h) \mid A_6,\ h \leq K/(Ry)^2\}$$

This is a pretty wide scope of validity! Its description is analytically complicated, but its economic meaning is obvious: the growth in technical change and productivity should entail a rise in organic composition.

NOTES

1. For an analysis of the complex linkages within the international aspects of the current crisis, see for instance Lipietz (1985)
2. This section has been cut considerably (due to the empirical character of the present issue of the *RRPE*). See Lipietz (1979a, 1982a) for more details about Marx's statements, mathematical demonstrations (including the case of slowly rotating fixed capital), references to scholars, etc.
3. See Aglietta (1976), CEPREMAP (1977, 1980), Boyer and Mistral (1978), Lipietz (1979a, 1983a, 1985).
4. See Mazier et al. (1982), where the cases of the two departments are distinguished.
5. Yet it is possible to show that the institutional forms of the "monopoly regulation" did favor the most innovative firms, in spite of the potential problem of capital devalorization. See Lipietz (1983a).
6. See note 1.
7. This divergence is the form of the crisis within monopoly regulation, and the subject of Lipietz (1983a).
8. See the work of Delaunay (1980), which indicates that in France a rise in exploitation of productive labor was nearly exactly offset by an extension of unproductive labor. The same appears true in the United States (see the Moseley–Weisskopf exchange in *C.J.E.* 9 (1)).
9. This is not true, at least in France: see below.
10. It may be noticed that some difficulties arise from differences in time periods in Tables 1 and 2. For a long (but methodologically interesting) discussion of the German case, see the French original version (Lipietz 1982a). Anyway, as it will be seen, there was no change in the tendencies in the 1973–1975 period.
11. In France the peak point of the postwar boom was reached in August 1974.

12. The "labor-composition" is the ratio of the direct labor in one department to the indirect labor committed *at the same time* in a sub-section of Department I to the reproduction of means of production of the department in question, this ratio being corrected for net accumulation. A well-known theorem on Marxist schemes of reproduction shows that this ratio is equal to the organic composition of newly invested capital (C/V + S) of the department in question. This magnitude differs from Q/K not only in its mode of statistical production, but as it refers to the constant capital reproduced in the period, and not to the stock of fixed capital. Thus, it is an index for the OCC of *newly* committed capital, and not for the average: it is thus a "marginal OCC." We shall see later the importance of this point.

13. Through direct computations based on series of investments and replacements, Billaudot (1980) made an evaluation of the marginal coefficient of capital in France. He noticed that, contrary to the average coefficient, which grows slowly, as we know, from 1967 to 1973, the marginal coefficient rises from 1.5 to 2.5.

14. In fact, this kind of crisis is not so sharp as the type of "overproduction crisis" experienced in the 1930s.

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