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TECHNICAL CHANGE AND THE THEORY OF "REGULATION"

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A B S T R A C T

Basically the paper proposes an outlook the French theory of "régulation" and applies it to the issues of technological change, growth and crisis. First, the main concepts are presented : accumulation regime, institutional forms (wage labour nexus, nature of competition, State interventions, monetary and international regimes), mode of regulation, cyclical and structural crisis. Second, the role of technology in long run dynamics is investigated according to the main results obtained by previous study upon France (and US). The viability of any accumulation regime is related to the compatibility between a technological system and a mode of regulation. Conversely, any structural crisis is up to a discrepancy between these two factors. Nevertheless, the present crisis and that of 1929 are quite different, since they derive from very different accumulation regimes, taylorist in one case, fordist in the other. Finally, a research agenda is suggested. In particular, formalizing the various accumulation regimes seems quite necessary, in order to assess more clearly the impact of technological change upon growth and employment.

LA PLACE DU CHANGEMENT TECHNIQUE DANS LES THEORIES DE LA REGULATION

Robert BOYER

R E S U M E

L'article vise une présentation synthétique de la théorie de la régulation qui est ensuite appliquée à la question des effets du changement technique sur la croissance et les crises. D'abord sont présentés les concepts de base : régime d'accumulation, formes institutionnelles (rapport salarial, nature de la compétition, relations Etat-économie, régimes monétaire et international) mode de régulation, crises cyclique et structurelle. Dans un second temps, il est traité des principaux résultats obtenus concernant la place de la technologie à la lumière des recherches antérieures portant sur la France et accéssoirement les Etats-Unis. La viabilité d'un régime d'accumulation est rattachée à la compatibilité entre un système technique et le mode de régulation en vigueur. Réciproquement, toute crise structurelle dérive de l'incompatibilité de ces deux facteurs. Néanmoins la crise actuelle et celle de 1929 sont différentes dans la mesure où elles dérivent de régimes d'accumulation contrastés, tayloriste dans un cas, fordiste dans l'autre. L'article s'achève par la proposition d'un programme de recherches, portant en particulier sur la formalisation de différents régimes d'accumulation.

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I - MIXING TECHNOLOGY WITH ECONOMICS : A DIFFICULT TASK.

The interest in new technologies is now widely spread among politicians, public opinion, managers and of course social scientists. More and more people are now conscious of some kind of link between technological changes, transformations in competition, new shapens in industrial organization and finally the composition and the level of employment. But paradoxically, the research on such topics, however very intensive during the last decade, has not yet produced any clear cut result. The reasons for such troubles are not necessarily accidental since they trace up to very basic problems.

As a matter of fact, the economist has many problems in dealing with technical change as such, for at least three interrelated reasons.

° If the technological systems are supposed to evolve quite continuously in response to mainly *external factors* (the advances in pure and applied sciences), they are only shifting the long run equilibrium path for the economy. As a consequence, the usual method inject technological trends into a given macroeconomic model, without any feedback from the economic side to the technological one. The actual and big problem is to combine economics with technology *in the very long run*, in the marshalian meaning i.e. when the industrial structures and labor forces are adapted to the given technological paradigm.

° A second difficulty lies in the temptation of a *technological determinism* according which economic growth as well as most of social institutions would derive from pure technical matters. If this kind of statement was not made by Schumpeter himself, it turned out to be a salient feature of the present recovery of the neo-schumpeterian ideas. After all this is not so much surprising since standard theory usually do not deal with *social forms of organization* which are either supposed as given by history, or totally ignored. Hence a major challenge : is it possible to distinguish clearly two dynamics of the institutional forms on one side, of the technological

system on the other and then check their ex post compatibility ?

° But the problem is made still more complex by another puzzling finding : nor innovations neither growth exhibit steady trends in the long run, since on the contrary, the so-called *Kondratieff waves* –i.e. the succession of a long lasting boom and then stagnation over a period of half a century– are now again considered as a true problem for economic historians. Now, theoreticians are mainly interested in equilibrium path growth models, and only few of them try to formalize Kondratieff style cycles. At my knowledge, very few successful examples are available on this last topic. Similarly, economists have a lot of problems in analyzing why the same technological trajectory might have positive effects upon employment and stability during some periods...but negative ones during another. The traditional theories do conclude to an invariant impact –usually positive in neo-classical models, negative in the pure keynesian closed economy framework–, whereas the issue at stake is to understand *changing patterns through time*.

No doubt that now many economists are trying to cope with these problems, since numerous national or international projects have been launched, especially during the last decade. The present paper intends to suggest a tentative theorizing, the aims of which were precisely the same, even though initally at least the question of technological change was not at the forefront. This approach called "*regulation*" in French is not easily translated into English, since the closer vocable, that of "*socio-economic tuning*", brings a connotation of a conscious and sophisticated adjustment mechanism. Actually the process of fiting production and social demand in a given set of structures and institutions is always an uneven, unbalanced and usually contradictory consequence of very partial rationalities and strategies...however integrated might seem the modern corporate economies. This approach is far from being a fully flegded theory, but its interest is precisely to bring some answer to the three previous puzzles.

° Contrary to the usual business in economics, the focus is not concentrated upon the short or medium terms issues but upon the *long run and structural*

changes in advanced capitalist countries. For example the U.S. and French economies have been studied over near two centuries. For such a scope, technology, industrial structures, labour force composition and institutions cannot be assumed given or constant.

- Similarly, technology cannot be dealt in isolation with the rest of *the economic and social system*. The major question is then the coherence and compatibility of a given technical system with a pattern accumulation, itself defined by a complex set of economic regularities and mechanisms about competition, demand, labour market, credit and State interventions. The major finding is the following : there are several and different modes of development and "regulation" observed in history, instead of an only universal one.

- Within each mode of development, the very factors which account for a successful long lasting boom do explain the reversal of economic dynamics *from growth to crisis*. Once totally mature, a socio-technical system gives rise to new economic imbalances and social conflicts. Hence possible troubles in the whole process of accumulation, leading to a major i.e. structural crisis, characterized by quasi-stagnation and large unstabilities. Therefore the same on going technical change –crudely measured by average productivity growth– might have negative effects upon employment, in complete opposition with what was observed during the period of high and stable growth.

Under such a circumstance, the paper is devoted to some development of these topics. First, the major concepts of the "regulation" approach are presented (section II). Then, a summary is given about the main findings upon the relationship between technology and long run economic dynamics (section III).

II - A METHOD FOR A STRUCTURAL CHANGE ANALYSIS : THE REGULATION APPROACH.

1. Between economic history and theory.

In fact, most of the problems previously stressed upon, derive from very unsatisfactory links between two departments of the social sciences : economic and social history on one side, economic analysis on the other. Most *historians* are fond of assessing the validity of events, sources, and data. When they do dare to propose and test causal mechanisms, they mainly refer to the state of the arts, as regards other social sciences, especially economy, but sociology and anthropology too. The New Economic History is a clear example of such a strategy...which as led to mitigated results : sometimes interesting, often provocative for good controversies among scholars, and in other cases, quite dubious findings ! If the French school of "Annales" is excluded, almost no historian is challenging the existing economic theories, might be neo-classical, keynesian or even marxian ! Implicitely, at least, historical facts are supposed to fit into a given general theory, already available.

On the contrary, *the economist* is rarely as modest. Whatever the precise content of his theory, his aim is to derive general results from very basic principles, as few as possible (the principle of maximization for neo-classicists, the law of value for marxists and so on...). While testing his models, the economist is strongly induced to interpret any discrepancy as a purely casual phenomenon, more or less related to historical or sociological specificities, thus without any theoretical importance. Just to give an example, most of monetary histories are no more than stubborn tentatives to prove the truth of a variant or another for quantitative theory. Even completely perverse evolutions for income velocity are interpreted as minor phenomenon. Why to bother with reality and history, since the basic theory is necessarily true according to founding principles !

Paradoxically, such a caricature is not absent from many marxist analyses : has not Marx said everything about the laws of capitalism in the

long run ? In a capitalist system production is undertaken in order to get a profit over commodities as exchange value, and not only in order to satisfy direct individual or social needs –i.e. according to the use value of commodities–. Therefore appears a tendancy to make accumulation as an end by itself, an absolute novelty with the respect to all the previous production modes. Labour itself is becoming a commodity, but a very special one which brings a surplus value, at the roots of the profit. Hence, a propensity to exploit more and more workers, according to new production methods, obtained by applying science and techniques to economic activity. Marx has thought to prove a fundamental dynamic laws of capitalism : its necessary collapse due to the famous tendancy for the rate of profit to fall. Since it has not be the case till now, the followers of Marx use to stress upon the succession of transitory counterbalancing forces. When used undiscriminately, such a device can interpret any discrepancy, whatever the side of the gap between the prediction of the theory and observed historical events. Just to give an example, some marxists in the Sixties could contend that since world war I, productive forces had been continuously declining...or others that the unprecedented growth observed from 1945 to 1973 was the very evidence of the deepening of the structural crisis of the interwar !

From a methodological point of view, such severe shortcomings derive largely from insufficient links between theory and empirical analysis on one side, purely deductive methods and inductive ones on the other side. Would not it be surprising for example for a physicist to stop in elaborating the more basic concept of mechanics (the notion of forces, weight, acceleration...) and then only describing the evolution of any precise complex system ? In fact, the good method is to build a series of intermediate models which use the general laws of mechanics in order to analyse the exact composition of forces and then check if the expectations derived from the model fit with the facts. Mutatis mutandis, the economist is facing the same problem and should adopt a very similar strategy : try to work out intermediate notions and models in order to finally organize an appropriate and careful comparison with observed facts.

Under this respect, the regulation approach is an attempt in order to

elaborate *a continuum of concepts* from the more abstract ones (for example that of production modes) to the observed regularities in the behaviour of economic agents (as part of the regulation mechanisms). Some of these intermediate notions are respectively that of accumulation regime, structural or institutional forms, wage labour nexus and so on. They benefit from the conclusions of long run historical studies and they advocate for a new theoretical framework which would combine a critique of marxian orthodoxy, and an extension of kaleckian and keynesian idea for macroeconomics, in order to rejuvenate a variant of the old institutionalism or historicism. Let us now present these different topics.

2. The notion of accumulation regime.

The regulation approach, progressively elaborated in France since the early Seventies, is basically built upon a critique of mechanical and catastrophist interpretations of Marx. For sure, the logic of accumulation is central to capitalist economies. Of course, the spreading of the market relationship brings into the system the possibility of crises, while all the conflicts upon exploitation of workers and competition among capitalists make these crises more and more likely...at least during precise periods. But actually, historical records suggest that the inherent contradictions of the system can be held, at least partially and for a period. Then minor crises are sufficient to promote a recovery, within a cumulative growth pattern. Such episodes are not to be characterized as pure accident, but as possible *stable configuration for the economy*. This is the basic hint and the reason why the concept of *regime of accumulation* is so important.

In order to analyse the possibility of such a process in the long run, the economist has to find out what are the various technological, social and economic regularities which allows it. Let us mention five of them :

° A pattern for *production organization* within firms, defining the way wage-earners work upon production means.

° A *time horizon* for capital formation decisions, according to which managers

can use a given set of rules and criteria.

- *Income shares* between wage, profit and taxes, in order to reproduce the various social classes or groups.
- A *volume and composition for effective demand*, which validates the trends in the capacities of production.
- Precise of relationships between capitalist and *non capitalist modes* of production.

Hence a regime of accumulation is defined by the whole set of regularities which allow a general and more or less consistent evolution for capital formation, i.e. which dampen and spread over time the imbalances which permamently arise from the process itself. The five features previously defined are sufficient to build a kind of macro model with two departments (producing respectively the consumption and the production goods) or aggregated, for simplicity sake (section IV). Given the evolution for technical coefficients, income shares, composition of demand, transfers to other social groups and time lags involved are sufficient to close a dynamical model (R. BOYER 1975, H. BERTRAND 1983, FAGERBERG 1984).

Of course the method is not brand new and has a long historical background. Nevertheless this approach tries to overcome some major shortcomings of the previous attempts. First, the game is not purely mathematical, and the key parameters are chosen according to statistical and econometric studies as detailled as possible. Second, the technological determinants are mixed with economic and social mechanisms, which prevents to consider that capital is merely a question of reproduction in a quasi technical meaning : for example workers are not a special productive commodity but part of social relationship defining their place in society. Third, the regime of accumulation is not at all the end of the analysis, since it appears a very abstract concept, largely unobserved by economic units. But then, how do a capitalists, workers, and other social groups behave in order to substantiate this regime ?

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3. The importance of institutional forms.

This notion enlightens the roots of social regularities which channel economic reproduction. Basically, a structural or institutional form is labelling a codification of one main social relationship. Here again the hint is that the same invariant and abstract relationship might have very different precise configurations, for a given country through time or across countries during the same period. In some sense, the regulation approach is extending to most organizational forms what technologists use to do as regards *technological systems or paradigms*. Is it not clear that the characteristics of the first industrial revolution are not that of the present one ? Similarly, all the forms of labour organization, State interventions, monetary creation and so on...are not at all equivalent as regards economic dynamics.

° *Monetary and credit relationships* are essential in defining the mode of interaction between separate economic units. This abstract form can take several configurations according to the direction of causality between money and credit on one side, the degree of sophistication of national and international financial systems on the other. At first sight, this form might seem quite from the question of technological change. But after all, J. SCHUMPETER in Theory of Evolution attributed to credit relation a major role in shifting resources from old industries and products into new ones. Furthermore, many contemporary analysts see some links between technological change (i.e. the mix between product and process innovations) and the tendency towards inflation or deflation, in a Kondratieff style or not (Ch. FREEMAN (1978), G. MENSCH (1978)).

Historical studies do confirm significant change in the forms of the monetary constraint. In the XIXth century, under the so called gold standard, inflows or outflows of currencies continually control the evolutions of domestic credit. Hence a very typical business cycle, associating banckrupcies with declining prices and production. On the contrary, after World War II, the volume of credit given by the banks to firms and households is the key determinant in money supply. External

capital flows are exerting only transitory constraints, usually overcome by a once for all devaluation in the late Bretton-Wood system. Therefore a possible cumulative expansion of credit money with a permanent inflation, at least till the Seventies. Consequently, one observes a very specific pattern for investment in industrial structures and Research and Development.

° *The wage labour nexus* defines a second and a crucial institutional form, since it characterizes the relationships between capital and labour, management and employees. Broadly speaking, it involves all the problems relating to work organization, standard of living for wage-earners. Then, a form of the wage labour nexus is defined by a coherent system for the following five components : the type of means of production and control other workers ; the technical and social division of labour as implying a configuration for skilling/deskilling ; the degree of stability of the employment relation, measured for example by the speed of employment or work duration adjustments ; the determinants for direct and social wages according to labour market functionning and the welfare state organization; the standard of living of wage-earners as regards the volume and the origin of the commodities they consume.

Empirical investigations exhibit very different forms through history or across countries at a given period of time. To be short, a *competitive wage labour nexus* used to prevail in the last century : most of the consumption of the workers came from non capitalist modes of production and few collective organizations were there to oppose to business strategies and market forces. Hence a high responsiveness of wages to employment fluctuations with quite no indexing. By contrast, since the first World War, collective bargaining and the building of a Welfare State have introduced *a new wage labour nexus, called fordist*. In that system, wage is not only a cost but a key determinant of consumption and hence effective demand. Implicitely, or by explicit agreement, the nominal wage is then indexed to consumer prices and to expected productivity gains, with a very low sensitivity to unemployment. This point is of interest for technological change analysis, since the concept of fordism closely relate mass production to mass consumption, therefore to a very precise stage of

capitalist development (see III.2, for more details).

° *The type of competition* is a third component to be brought into the analysis. The concept of accumulation regime assumes a completely homogeneous capital, whereas in fact, many separate private units compete to get higher profits, via production cost reductions and/or significant product differentiation. In fact, the competition expresses itself by various price mechanisms, which may have quite opposite effects upon the direction and intensity of technological change. Is needed a clear distinction between purely static approaches (the monopoly as a source of extra profits via oligopolistic pricing) from dynamic analyses (the issue is then whether more concentration spurs product and process innovations).

Under this respect, historical analyses bring interesting results, in opposing at least two types of competition. In the XIXth century, even if the financial concentration was not negligible, prices variation was the only way to adjust any discrepancy between demand and productive capacities. The logic was very myopic and operating only ex post. The closure of plants, bankrupcies and redundancies were the usual way for providing a new equilibrium to the system. This is *traditional price competition*. From 1945 to the Seventies, the regulation has been quite different. A much higher centralization of financial assets and concentration of markets leads to *oligopolistic competition*. In that system, firms compete through advertisement and more generally product differentiation, while the prices are derived from a mark up applied to the average costs. Basically this is associated to a form of internal planning, where firms try to extend their capacities along with expected demand. As far as real wage income is increasing with productivity (the fordist wage labour nexus), cumulative growth is then possible, the ex post adjustment bearing only on minor discrepancies over growth rates and no more production levels.

Here comes out the specificity of the fordist development mode, by contrast to that of the last century. The canvas has to be completed by examining two last components

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° *The way of adhesion to the international regime* plays a proeminent role when one passes from a purely abstract analysis to the study of a given national economy. This notion will be defined by the set of rules and conventions which organize the exchange of commodities, the localisation of production units (via direct foreign investment) and the financing of external disequilibria. The conception is quite at odds with traditional discussions which oppose open to closed economy, free trade to protectionnism, fixed to flexible exchange rate systems and so on.... In fact the regulation approach is developing a series of intermediate concepts which relates the international growth regime (i.e. the division of economic space and their linkages) to the existence of strategic areas and finally to the opportunities and constraints imposed or offered to each nation by the world system (J. MISTRAL 1986).

The issue is quite important as far as technical change is concerned. The advances in abstract knowledge as well as in applied technology is mainly defined at the international level, not separately in each isolated country. Nevertheless, all the societies are not equally able in sizing these general opportunities and translating them into profitable production to be sold at home and abroad. Hence the various countries get a different place in the international regime of growth, due both to their mastering of new technologies and to their access to world finance. This explains for example that the rate of growth in Japan is not that of U.S., and why Germany and UK macroeconomic achievements differ. Similarly the international regime might change in the long run, due to an original mix of technological domination, financial intermediation and political hegemony. Historical evidence suggest that contrasted periods do alternate within the domination of the same country, be the UK during the last century or the US after World War II. A relative stability and cumulative growth take place when all the factors of domination are simultaneously mastered by the leading country, but on the contrary, large unstabilities and slow growth or even stagnation are observed, when technological and economic hegemony has declined, but not necessarily financial intermediation.

° *The forms of State interventions* are the last institutional configuration. In some respect, it is related to the previous one, since it has been always

an attribute of the State to organize the relations with the world economy. Basically, the State operate in an alternative way by comparison with the pure market relationships : coercition by law is replacing mutually profitable exchanges, whereas the power to tax is clearly at odds with the exchanges of equivalent commodities. Hence contrary to an old marxist view, the State does not necessary derive from purely capitalist relations. Basically it seems to express a nexus of linkages between social classes and groups, qualitatively through laws and regulation, quantitatively through public spending (Ch. ANDRE, R. DELORME 1983).

The interest of the notion is to allow very different patterns for State interventions. During a long period of time, a *bounded State* has been prevailing, the role of which was mainly to enforce private contracts, laws about property and to warrant internal and external security. Nevertheless, economic role of this limited State was not nil, since it helped a lot in preserving the existing social order and compromises. After the first world war (and still more the second), quite all advanced capitalist countries have evolved towards an *inserted and large State*. His role is now crucial in organizing the production of public services, financing infrastructures and productive investment, managing social wage within the so-called Welfare State. Of course, one would add the intervention over science and technology by the various means of education, tax system, defense programs, general regulation about technical norms and so on.... Both qualitatively and quantitatively, these two types of State are not at all equivalent as far as economic dynamics and social reproduction are concerned.

4. Modes of regulation and type of crisis.

It is then necessary to pass from these limited and partial regularities, bearing on numerous economic agents and their behaviour to the possibility of a consistent dynamical system. Standard economic theory uses the general concept of equilibrium and assumes that for a broad category of tatonnement process, the model converges towards a stable and unique equilibrium. Of course in more sophiticated mathematical economic theory, many equilibria can exist, but such a result is rarely related to any economic

problems in real life. On the contrary the regulation approach stresses the possibility of *several modes* for adjusting production to demand, credit to money, income distribution to demand formation. More basically, each set of wage labour nexus, firms organization and type of competition, public institutions and monetary rules may –or may not– induce a coherent adjustment process for the economy as a whole. All this institutional and structural setting is not at all a barrier to market mechanisms since, on the contrary, it might be a solution for making it efficient and shaping its functioning. In that framework institutions and markets, State and private units, jointly set economic and social dynamics.

The analysis is hence converging towards the notion of *mode of regulation*, a partial and modest alternative to the overwhelming tyranny of static equilibrium. Consequently, will be called so any set of rules and individual and collective behaviours, which have the three following properties :

- to reproduce the *basic social relationships* through a system of institutional forms historically determined ;
- to control and conduct the prevailing *accumulation mode* ;
- to bring into compatibility possibly conflicting *decentralized decisions*, without the necessity for individual or even institutions to bear in mind the logic of the whole system.

The trick is now to show that this notion is not an empty box, but can be fed with several examples of very contrasted regulation, which is precisely the aim of the next section (III-1). Note too that technology is present in many places in the regulation but integrated into industrial organization, wage labour relations, standard of consumption and so on. But beforehand, a last definition and typology has to be presented.

In fact, the concept of regulation has to be completed by its twin, that of crisis. In common language, as well as in most economic theory, this notion has either a proteiform meaning (the crisis of oil, debt, Welfare State, keynesian economic policy,...) or not any (unless to call so a lasting underemployment equilibrium or a breaking down in growth trends). This

approach attributes a very central place to it and thus propose a clear distinction between two broad categories of crisis.

° According to a first definition, *the cyclical crises* are the usual feature of any stabilized mode of regulation. Since the accumulation of capital is leading economic dynamics, disequilibria recurrently occur within the system, due to the necessary lags between the demand and capacity effects of the investment or the discrepancy between stocks and flows in financial decisions. Therefore after some period of boom, the economy has to adjust to the previous imbalances by a downwards movement of inventories, production, investment, employment and so on.... So this type of crisis is self equilibrating the system, and not at all destroying it. Thus it might be confusing to speak of crisis, since this vocable brings a catastrophic and dramatic tone in that is *the usual business cycle*.

Nevertheless two qualifications have to be given. First, from cycle to cycle, the various institutional forms and industrial structures are slowly changing, hence implying some slight drift in the regulation mode. But qualitatively, it remains the same and the question of new institutions does not arise. Second, economic policy rules have not to be changed to promote the recovery : without any discretionary intervention by the State, growth can take place again, as soon as the previous disequilibria have been eliminated by the regulation process.

° A second and quite opposite definition deals with *structural crises*. Will be labelled so any episode during which the very functionning of regulation becomes contradictory with the existing institutional forms, which in fact are abandoned, destroyed or passed around. In other words, the limits of the regulation mode and regime of accumulation –the conjunction of which defines a *mode of development*– become obvious in quite every sphere of social and economic life. It is now well grounded to speak about the existence of a crisis , since the system can no more reproduce itself in the long run, at least according to the same institutional and technological basis.

At least three criteria allow to distinguish a cyclical crisis from a structural one. First, the social and economic conflicts are such that,

within the given mode of regulation, there exist no self correcting mechanisms for the profit decline. Second, most -if not all- of the institutional forms are questioned by the spreading of the crisis from its local and seemingly accidental origin to the whole system. Third, the way out of the trouble is not obtained by letting the economic mechanisms to play their role, since they are precisely coming into contradiction one with the other. Thus some strategic choices made by leading firms, unions, and governments are necessary to promote a new mode of development. In other words, the system is no more totally deterministic, but political and social choices do play a role in shaping and restructuring the economy.

Such a distinction is not purely semantic. If the mild recessions of the Sixties did belong to the first category, the period opened in the early Seventies is clearly of a different nature, more or less of the second category. The consequences as regards economic policy are far reaching. This central conclusion of the regulation approach has now to be presented with more details.

III - THE PLACE OF TECHNOLOGY IN LONG RUN DYNAMICS : THE MAIN RESULTS OF THE REGULATION APPROACH.

1. Three regulation modes : old, competitive, monopolist.

An historical analysis of French economy since the end of the XVIIIth century gives many hints about such changes. In order to substantiate them, the method combines various tools usually disconnected. First, a precise characterization of the institutional setting (using available syntheses and monographs by historians). Second, a proposal for the rationale for logic of economic regularities associated to each institutional form. Third, statistical and econometric tests of the derived hypotheses for each topic (price and wage formation, credit and money, and so on...). Fourth, synthesis of each component in order to check the coherence and viability of the whole

TABLE 1 : A BRIEF SUMMARY OF AN HISTORICAL STUDY OF FRENCH CAPITALISM

THE MAJOR INSTITUTIONAL FORMS HAVE BEEN TRANSFORMING THEMSELVES

PERIODS / INSTITUTIONAL FORMS	1789	1848	1873	1896	1914 - 1918	1929	1939 - 1952	1967	1973	1980'
* WAGE LABOUR NEXUS										
. Work organization	Manufactures replace craftmen	Work duration is extended but reaches crisis levels	Limitations of malleability of work rules	Early Scientific Management	Massive use of taylorian methods.....	.....implemented for civilian goods.....	.....but workers oppose to it	Industrial disruption and recovery	Fordism becomes dominant.....	but hits some limits The search for new forms
. Lifestyle	Basically out of the capitalist sector	slight evolution in consumption norms	Slow insertion of wage earners in society			Social wage is recognized as a principle		Launching of a complete . Welfare system . Workers benefit from mass consumption		The slowing down shakes Welfare State financial stability
* COMPETITION										
. Concentration and centralisation	Large plants are emerging.....	....Tendency towards concentration	Finance capital is strenghtening		Cooperation large firms/ State	Industrial cartels and financial holdings	Basis for national planning	Concentration of markets.....	.....French holdings become international...	...a new balance between home and international strategy
. Price formation	Controled by guilds	Principle of free market	Prices clear the market	Early monopolistic pricing	State price controls	First example of mark-up pricing	State controls	. Administred prices, public control . medium term strategy in pricing decisions		...the return to more price competition
* STATE										
. Budget and taxes	Limited to general functions.....	....even if regulations are important	Significant economic interventions (railways)	Small size of budget/ GDP	Unprecedented surge	Budgetary cuts.....	relative growth in the depression	New and high levels for public spending /GDP	Slow growth.....stabilization.....growth of the size of State	...tentative to curb down public regulations
. Money and credit	Metallic reserves limit money creation	Credit is checked by external balance and interest rate variations			The war is financed by pure money credit.....	.....so is the postwar boom	Return to gold standard		Credit money has now a leading role.....	.....periodic devaluations..... ...tentative monetary controls ...crisis of economic policy
* INTERNATIONAL REGIME										
. Hegemonic country	England is the core of industrial revolution.....and the banker of the world		United States and Germany are challenging British hegemony		British decline is reinforced	.....surge of US might		US are now hegemonic, organize and stabilize the international regime.....	.....which is challenged by new competitors	underlying crisis of US leadership
. Cohesive forces	Exchange of manufactured goods versus primary commodities	The relative stability derives from the position of England			The loss of competitiveness	.....destabilizes the system		A new international order.....	.....allows OECD growth..... ....till the crisis of the Bretton Woods system	a very unstable system

Source : "Approches de l'inflation" CEPREMAP-CORDES (1977)

regulation. Finally when possible, building of models in order to assess the exact properties of each mode of regulation.

A very brief synthesis of such a study is given on Table I, just to give some idea of the method which has been kept at a too high level generality in the previous presentation. A significant evidence is that over two centuries, the cyclical pattern of the French economy has been changing rather drastically :

° *In old regulation* ("régulation à l'ancienne"), the agricultural sector plays a dominant role, since the modern capitalist industry is only emerging. Hence a very original conjonctural pattern : every bad harvest leads to soaring prices of corn and more generally agricultural prices ; hence peasants cannot buy industrial goods and the industrial sector is hit by the second round of the crisis ; then workers are fired and nominal wage is curbed down, even if the general price level is climbing up. The regulation is by nature *stagflationnist*, since it associates unemployment with inflation (graph 1).

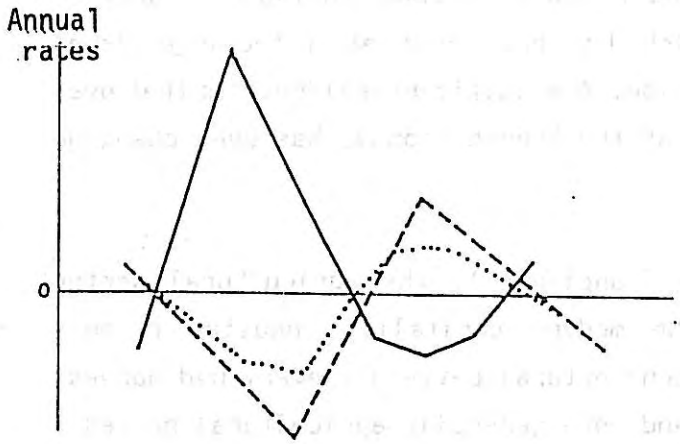
° *In competitive regulation* ("régulation concurrentielle"), the pattern is changing very significantly. Now the industrial sector is imposing more and more his logic to the whole system. The crisis derives from over-production in the industry and no more from under-production. Even in the agriculture social and economic relationships are transformed, in such a way that more productivity is obtained. So during the XIXth century, the scarcity of food is replaced by its plentiness. Therefore, emerge the *modern industrial business cycles* : the boom is slightly inflationnary, the crisis deflationnary. Most of the macroeconomic variables now behave pro-cyclically. The difference with the previous regulation is therefore large and clear cut (graph 1).

° *In monopolist regulation* ("régulation monopoliste"), the distribution of income is significantly socialized through a series of compromises between capital and labour (fordist wage formation along with inflation and

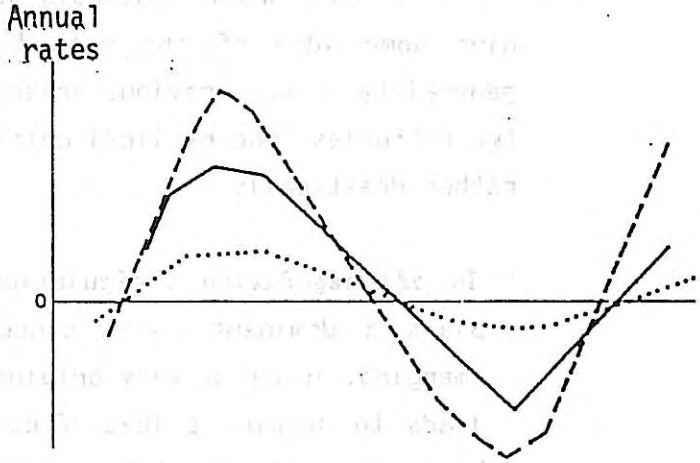
GRAPH 1 : CHANGING REGULATION MODES OVER TWO CENTURIES

SOME STYLIZED DIAGRAM ABOUT THE FRENCH EXPERIENCE

1. THE OLD REGULATION
XVIIIth century

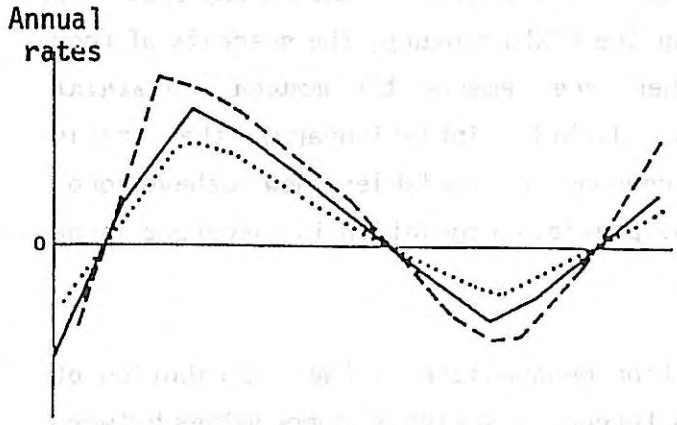


2. EARLY COMPETITIVE REGULATION
XIXth century

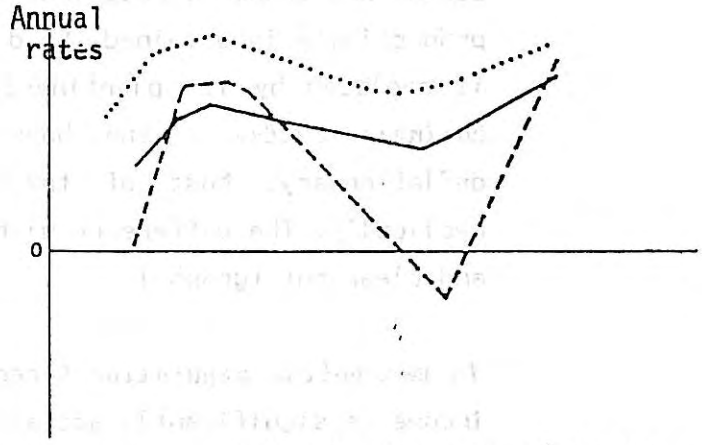


LEGEND :
..... Nominal wage
_____ Cost of living
------- Production

3. MATURE COMPETITIVE REGULATION
(Interwar period)



4. MONOPOLIST REGULATION
(Contemporary period)



Source : R. BOYER (1978) "Les salaires en longue période", Economie et Statistique, n° 103, Septembre, p. 55.

productivity), between firms (mark up pricing), between the State, citizens and capital (Welfare State, pattern of public spending and tax system). Therefore the pure price adjustment mechanisms take only a minor part of the burden in adjusting social demand and production. To a larger extent, a complex set of institutions, conventions and rules constantly aims at developing effective demand at the rate of production capacities, which in turn derive partially from the intensity and direction of technical change via the accumulation process.

The economic dynamics is now fairly different : growth is faster since the increasing returns to scale associated to fordist industries can be reaped via a steady demand evolution, easy to forecast. The business cycle becomes milder and milder and inflation does not stop even during recessions. Hence *a new stagflationnist pattern*, very specific of the monopolistic regulation, if not totally original in long run history (remember the old regulation). So, the central approach stresses upon the specificities of moder economies, which bear little resemblance with even the interwar period. The conclusion is still strenghtened by an analysis of accumulation regimes.

2. Very contrasted modes of development.

It turns out that the two last regulations have been associated with different accumulation regimes, and this is another reason for diverging patterns of crisis in 1929 and nowsdays (sections 3 and 4 below). More generally, since the mid of the last century, three major patterns of growth have been observed. In this characterization, the interplay between the technology economic and social factors is determinant.

° *Extensive accumulation* exhibits a significant use of science and technology in production processes, but the firms mainly try to apply existing knowledges to their business, without trying to improve them continuously. Similarly, the time horizon of firms is generally rather short, whereas the wage-earners in the industry are mainly producers of commodities, and not

TABLE 2 : A BRIEF STATISTICAL SURVEY OF DEVELOPMENT MODES IN FRANCE (1856 - 1985)

AFTER W.W.II PRODUCTION NORMS AND WAGE EARNERS CONSUMPTION NORMS ARE JOINTLY EVOLVING

A. REAL WAGE AND PRODUCTIVITY IN THE LONG RUN
(average annual rates in per cent)

INDEXES / PERIODS	Industrial Employment	Weekly Hours	Total Hours	Productivity per Employee	Real Wage	Accumulation Regime
1856-1870	- 1,0	- 0,8	- 1,8	2,4	1,4	Intensive
1870-1895	0,8	- 1,0	- 0,2	2,3	2,0	Intensive and its crisis
1895-1913	0,8	- 0,3	0,5	0,3	+ ε	Extensive
1913-1920	0,3	1,2	1,5	- 1,8	- 3,0	Extensive
1920-1930	1,2	- 2,8	- 1,6	5,8	2,2	Intensive without mass consumption
1930-1937	- 3,1	- 2.8	- 6,0	2,8	1,5	....and its crisis
1937-1949	1,0	0,9	1,9	- 0,3	- 0,5	Extensive
1949-1959	1,1	0,2	1,3	4,9	3,9	Intensive
1959-1973	0,8	- 0,4	0,4	4,8	4,1	...with mass consumption..
1973-1985	- 2,0	- 0,9	- 2,9	3,5	1,5	...and its crisis

Sources : CEPREMAP-CORDES (1977) ; Comptes de la Nation C131-132 (1986).

WAGE LABOUR IS THE DOMINANT FORM OF ACTIVITY

B. THE PLACE OF WAGE EARNERS IN THE WHOLE ECONOMY
(Figures in percent)

SHARES OF	1913	1929	1938	1949	1959	1969	1979	1985
Wage earners in total labour force	57,9	60,4	56,6	61,8	69,4	78,4	83,8	84,4
Direct wage in household disposable income	38,3	43,2	43,1	41,4	46,7	47,3	47,1	44,5
Direct wage and social benefits in household disposable income	39,4	45,7	48,0	57,3	67,2	72,3	78,3	86,0
. Food in total consumption	47,7	47,7	44,7	47,9	39,7	28,4	20,4	19,3
. Industrial goods in total consumption	27,4	29,9	29,4	28,1	29,1	29,9	34,3	33,6

Computed on the basis of the following data : L.A. VINCENT (1972) p. 322-325; A. SAUVY (1967) p.483 ; INSEE (Comptes de la Nation) C 131-132, TIII,p.176-234.

FROM COMPETITIVE TO FORDIST REGULATION OF WAGES

C. ESTIMATES FOR THE RELATION $\overset{\circ}{W} = \varepsilon \cdot p + \theta_0 \cdot N + \theta_1$ with

$\overset{\circ}{W}$: nominal wage; p : consumer price, N : employment (annual wage rates),( ) : t of student.

	ε	θ_0	θ_1	R^2	D^W
1923-1938	0.47 (3.37)	1.49 (2.99)	3.1 (2.8)	0.81	1.82
1953-1969	0.59 (4.4)	0.91 (2.56)	4.65 (6.1)	0.66	1.64
1959-1977	0.96 (8.0)	0.39 (1.17)	4.44 (4.49)	0.81	1.64

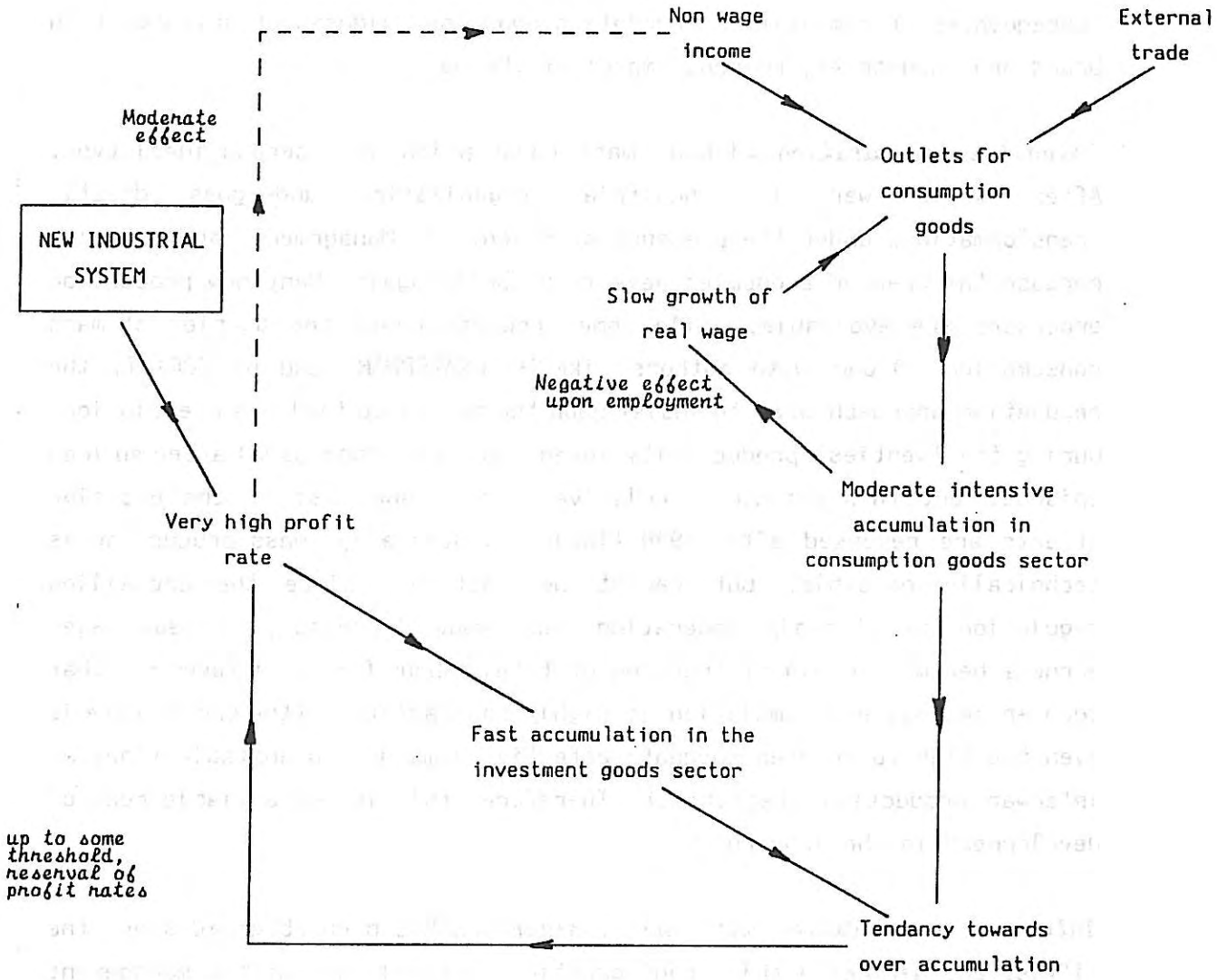
Source : BASLE M., MAZIER J., VIDAL J.F. "Emploi, revenu salarial prix et profit". Economie et Prévision 1982.

that much consumers of them. Thus from 1895 to 1920, average productivity is quasi-stagnating, so does real wages, while the growth is only obtained by a lengthening of the working hours or by the hiring of more workers (Table 2). This quasi-stagnation may be related to numerous factors : lack of technological opportunities, limitations of the home and world markets, consequences of competitive regulation upon the boldness of investment in brand new industries, ruinous impact of the war.

° *Intensive accumulation* without mass consumption is a second ideal-type. After world war I, industrial organization undergoes drastic transformations under the pressure of Scientific Management, and not only because the wrecked economies have to be built again. Many new production processes are available, while some products cross the barrier of mass consumption. Along with authors like H. BRAVERMAN, and B. CORIAT, the regulation approach uses to insist upon the so-called taylorian revolution. During the Twenties, productivity speeds up, more than usual after such an episode. But this period is relatively short and most of the positive effects are reversed after 1930 (Table 2). Basically, mass production is technically possible, but cannot be sustained since the prevailing regulation is strongly moderating real wage increases, whereas wage-earners become a dominant fraction of total labour force. It turns out that such an intensive accumulation is highly contradictory (the profit rate is even too high to feed an adequate effective demand) and unstable (look at interwar production statistics). Therefore, this is not a viable mode of development in the long run.

° *Intensive accumulation with mass consumption* has been observed since the Fifties and defines a third configuration. Not only scientific management is still improved (diffusion of the assembly line as key figure of industrial organization) and new products are launched (radio and T.V. sets, electrical appliances for home and so on...), but *a new social compromise* between capital and labour concludes that workers will benefit from economic and technological progress. Workers are now both *producers and consumers* of capitalist new goods. Similarly, wages are a cost but too a

GRAPH 2 : THE VICIOUS SPIRAL OF INTENSIVE ACCUMULATION WITHOUT MASS CONSUMPTION



key determinant for consumption and hence aggregate demand (via an investment accelerator effect). The shift away of purely competitive mechanisms towards an administred regulation of fordist-keynesian flavour does help in such a move towards a new mode of developement. Under this respect, the period 1945-1973 is without any historical precedent : stable and high growth, propelled by a simultaneous evolution of productivity and real wage (Table 2).

One sees clearly the differences with the traditional long wave interpretation "à la Kondratiev". Of course, each of the three accumulation regimes are experiencing a long boom and then a period of decline, stagnation and crisis. But beneath these rough macroeconomic regularities, the underlying mechanisms and the factors explaining the downswing are quite different : exhaustion of the reserve army of wage-earners in extensive accumulation, demand with respect to capacity dynamisms in intensive accumulation, adverse evolutions in profit rates in intensive accumulation with mass consumption.

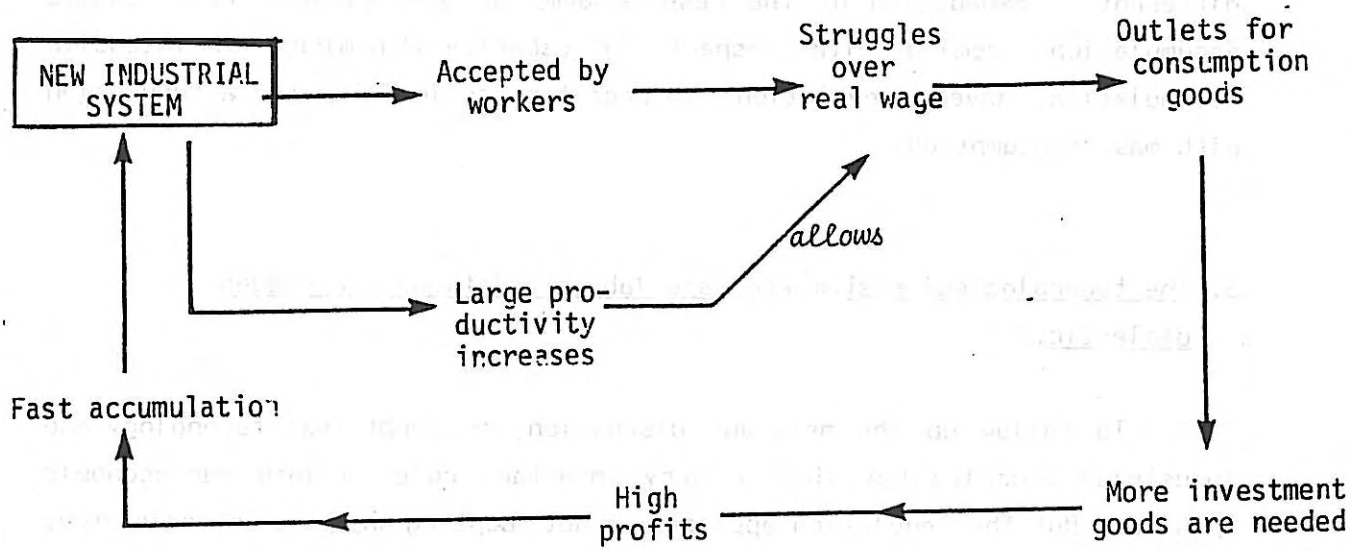
3. The technological system and wage labour relations : a hidden dialectic.

To follow up the previous discussion, no doubt that technology and industrial organization plays a very important role in long run economic dynamics. But the regulation approach is not adopting any pure determinism by technological factors : everything is up to the compatibility with basic institutional forms and the ability of the mode of regulation to deal with the kind of disequilibria or conflicts that characterize accumulation. One can give no better evidence of this general proposition than the interwar period.

° *Technological change but not new wage labour nexus : the interwar crisis.*

Many empirical researches do converge towards the general conclusion that the technical system underwent a drastic change after world war I : generalization of electrical power and new mechanical devices —for example the assembly line—, emerging new goods such as cars, home

GRAPH 3 : THE VIRTUOUS CIRCLE OF MONOPOLIST GROWTH



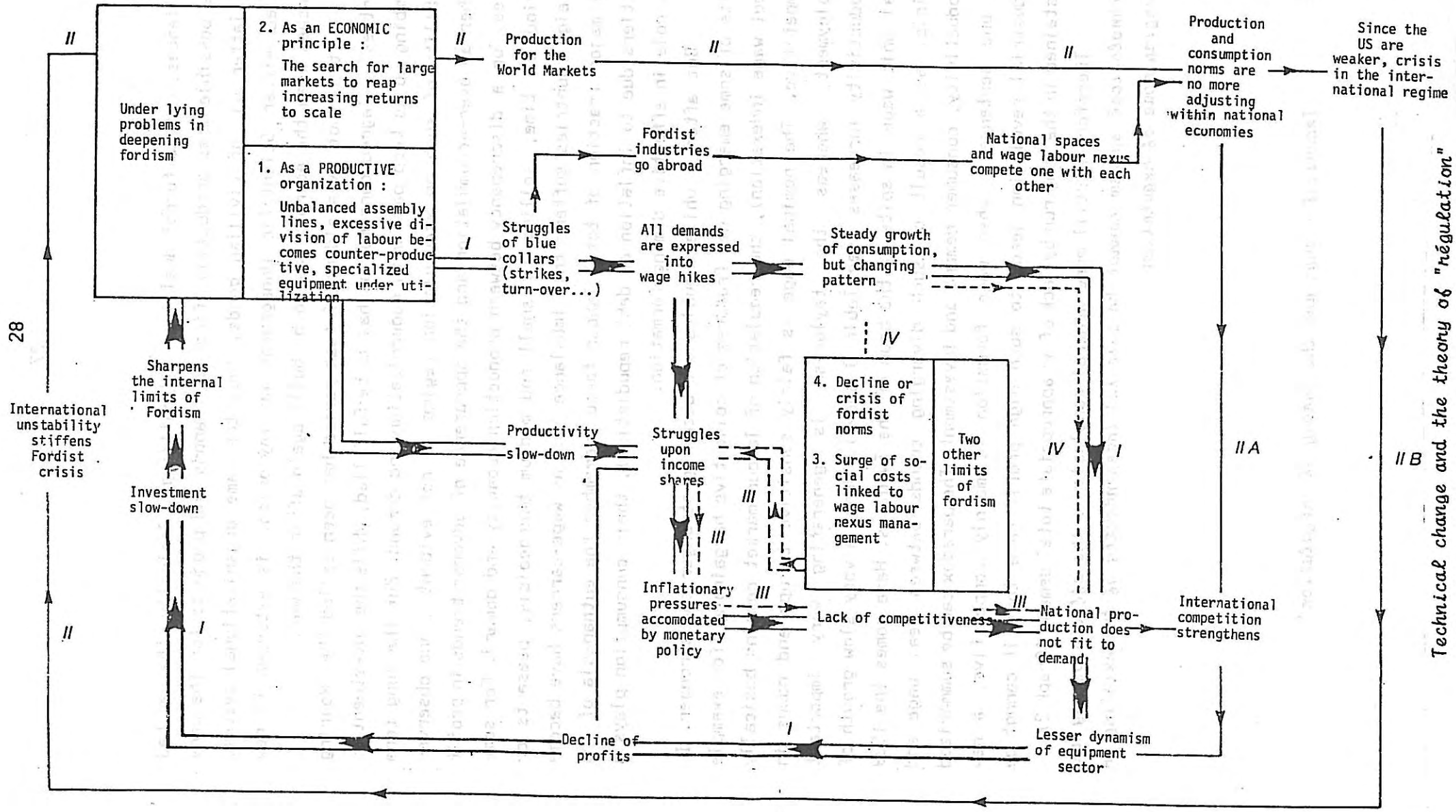
appliances, not to forget dwellings and buildings. Basically, the war had made possible mass production, first of weapons and products for the army but latter on, of civilian goods. Thus the same organizational system, called either Scientific Management or Taylorism, is extended to new branches when the economy has to be built again after the war.

It is not by accident if that period has been called the "Roaring Twenties" : lagged consumption has to be fulfilled, while the investment is climbing up to keep pace with modernization and demand. But the long term viability of such an accumulation regime is not evident : one observes either an over-accumulation and the appearence of adverse trends in profit rates, or a discrepancy between production capacity and demand. For some period of time, selling to small and medium bourgeoisie, peasants or foreign countries softens this imbalance. But as wage-earners have become the major fraction of total labour force (remember the euthanasia of the rentiers due to inflation or debt repudiation), their consumption plays a key role in effective demand formation.

But after a while troubles are becoming stronger and stronger. In spite of some emerging new features of collective bargaining (for example about wage indexation), the regulation of labour market remains basically competitive. The nominal wage is fairly sensitive to ups and downs in employment, whereas the taylorism is generating very important productivity increases (see Table 3 above). Hence a very slow growth of real unit wage in spite of the boom of the Twenties. Here comes the 1929 crisis, as a result of such diverging trends between real wage and productivity, consumer demand and investment. The paradox can be summarized in one sentence : when wage formation is mainly competitive, a new industrial revolution leads to such high profit rate that it cannot be sustained in the long run by lack of an appropriate total demand (Graph 2).

Therefore a still more general conclusion : *the effects of any new technological system cannot be assessed independently of the existing or emerging mode of regulation.*

GRAPH 4 : FROM GROWTH TO CRISIS : A SIMPLIFIED ANALYSIS



Technical change and the theory of "régulation"

° *A compatibility between the technical system and the capital/labour compromise : the Post World War II fordist regime.*

More or less, the same technological basis will be extended or implemented into new sectors, after 1945. As a first approximation, the Twenties and the Sixties can be said to belong to the same technological paradigm. But then, how to explain that growth replaced stagnation as a long run tendancy and that contrary to contemporaries fears, the collapse of 1929 did not take place again in the Fifties ? The answer of the regulation approach is simple enough : due to drastic social and political transformations, a new regulation replaces the old one and makes compatible fast technological changes with a quasi-full employment and a sustained growth.

The more drastic shift affects the wage labour nexus. On one side, workers and unions accept capitalist modernization and do not jeopardize scientific management and the taylorian methods. On the other side, managers agree to share productivity gains with wage earners, so that the wage norm is now that employees benefit from economic progress, whatever the branch, the size of the firms, the localization and the skills. Thus, this new form of collective bargaining is diffusing through the whole system and is generating a *permanent improvement in consumption norms*. Since simultaneously, investments are creating new and modern capacities, the process becomes now self sustained. More demand for consumption goods induces investment opportunities in the related sectors, hence outlets for equipment goods producers who earn high profit. Thus, a virtuous circle in which the monopolist regulation mode is both stabilizing growth and promoting it (Graph 3).

According to this view, the major difference with the interwar period lies in *the regulation mode* and not that much in the technological system. Of course, other institutional changes help in passing from one mode to another, or in some cases are made possible by the shift towards a fordist wage labour relationships. So *oligopolistic competition* is stabilizing the possible struggles between firms, by preventing price cuts as a usual tool for getting market shares. Similarly, the US hegemony is warranting an international regime in which the various OECD countries can

jointly grow, without any strong competitive pressure : when the state of business is good in the US, everybody is benefiting from it. Finally, *keynesian counter- cyclical policies* give the final touch of the fordist regime : money and public spending are conceived as means for preventing any discrepancy out of full employment or reducing the inflationary pressures.

Interestingly enough, this conclusion is converging with what think most of the specialists of technical progress : the success of keynesian policy was up to *a coherent and dynamic technical system*. If the later enters into crisis, so does the former. Just to risk a metaphor : the keynesian policies were the accelerator and the brake, not necessarily the engine for growth. Now a fourth result has to be stressed upon.

4. <u>The limits of fordism as a social, economic and technical regime : the present crisis</u>.

Needless to say, this regime was very attractive for quite everybody : profit rates were kept at a high level, workers used to benefit from rising living standards and almost no risk of unemployment, the State could extend public and welfare expenditures without any vocal dissent. The speeding up of growth could pay for such income uses. But then how does this Eldorado come to an end ? The answer is straightforward : the very development of the fordist regime leads to new conflicts and imbalances which, up to some threshold, induce tendancies towards stagnation and/or unstability. A priori three of these limits are to be studied (Graph 4).

° *Fordism becomes counter productive.*

From a very technical point of view, the search for increasing returns to scale leads to larger and larger manufacturing plants, which do produce a significant part of total markets. It is then more difficult to keep the balance of the assembly line with respect to the pace of demand, qualitatively (the change in models) and quantitatively (adaptation to short run shocks). According to another argument, fordism is fairly

efficient as regards labour and capital productivity when it replaces older systems, but it becomes harder and harder to get the same results when the issue is to deepen -and no more to extend- the same organizational methods. Hence a possible decline in productivity growth rates (in the US at the mid-Sixties) or/and in capital efficiency (in almost all OECD countries since the same period). But a third factor can also play a role : blue collar workers are revolting against taylorian and fordian methods by turn-over, absenteism, shirking about work intensity. In many case, they convert their protest into wage demands (remember the hot May 1968 or Autumn 1969). Hence a possible profit squeeze, as far as firms cannot pass into the price their cost increases, due to strong external competition. Let us detail these two other limits.

° *From national complementarities to the struggle for external competitiveness*

In fact, fordism is mainly a socio-economical principle of organization and not only a technological one. Since usually the larger plants are the more efficient, once national monopolies are set up, they tend to compete one with each other at the world level. Thus, the oligopolistic pricing which was stabilized at home, turns into competitive pressures for external markets, in such a manner that the previous price formation weakens or even breaks down. In a sense, if competition had led to monopoly, nowsdays monopoly turns back into competition ! This change is far reaching, since it destabilizes the mark up pricing, and consequently, the past mechanisms for wage formation. The national economies are no more the space upon which production and consumption norms are jointly evolving. For example, a given firm or country benefits from high wages elsewhere but is hurt by wage increases faster at home than for foreign competitors.

Simultaneously, *the erosion of US hegemony* is introducing many factors of unstability : unstable expectations about the value of dollar when the fixed exchange rate system turns into a flexible one ; lesser multiplier effects of US growth over other OECD countries ; competitive struggles between Japan and US, and eventually Europe, upon new products and technologies. In the Eighties the focusing of a lasting and huge US external deficit on one side, of German and Japanese surplus on the other,

does trigger many protectionnist devices...in spite of free trade statements of most governments. Roughly speaking, the growth of one country is seen to take place at the expense of another one ; thus, the search for competitiveness is spreading all over the system and spurs on stagnationnist tendancies.

Let us emphasize that this very complex evolution is closely related to technological factors (the mastering of new techniques and products), socio-economic ones (the possibility in adjusting within the existing wage labour nexus), not to forget financial and monetary determinants (place in financial intermediation and degree of autonomy of each national monetary policy).

° *The contradictory effects of fordist wage formation : positive over demand, possibly negative over profit.*

Since the end of the Sixties to the early Eighties, advanced capitalist countries suffered from evils, quite at odds with those the interwar period. A quasi perfect indexation of nominal wage over consumer prices, jointly with oligopolistic pricing, is generating a wage-price-profit spiral, culminating after the two oil shocks with two digits inflation. Hence pressures for reversing the previously accommodating monetary policies, the stronger, the weaker each national productive system is. Basically, the fordist collective bargaining is sustaining demand via a form of real wage rigidity, as previously taken into account. This explains why the recessions initiated in 1973 or 1979 have not been the repetition of the collapse observed from 1929 to 1932. Moreover the speed of adjustment of employment is lower, in such a way that firms are hoarding labour as a quasi fixed factors...at least at the begining of the present crisis !

But this process has an evident drawback : if the shock is mainly about a deterioration in terms of trade, and if the national economy is price taker at the world level, then the profit rate is squeezed. Furthermore the existing monopolist regulation is unable to restore its previous level, since that kind of perturbations was never observed in the past. Thus the investment slackens, which leads to less capacity, and productivity growth, since a slower enbodiement of technical progress and diffusion of new production processes take place. So contrary to the

interwar crisis, *the profit rate is now to low* by comparison with demand dynamism. The major structural crises repeat themselves but are not at all the same as regards their origin and stake. As mentioned earlier, the present crisis does not seem to be solved within the existing development mode. All its components or at least a large part of them, have to evolve : search for a new technical paradigm (post fordist, but for more precision see section V), reorganization of the wage labour nexus (short term flexibility of wage and employment or/and adaptation to a "new" New Deal), original principles for economic policy, negociation of a new international regime in order to solve the debt problem, as well as to mitigate competitive struggles between large OECD countries.

Let us hope that these results have some interest for the scholars in technical change. Our leitmotiv is simple even more a little naïve ; *the fate of any technological system cannot be disentangled from social (particularly the wage labour nexus), and economic determinants (evolution of the mode of development as a whole)*. But quite rightly the reader might consider this statement as fairly too general and ask for more detailed hypotheses and analyses.

IV - A RESEARCH AGENDA.

Actually, some of these investigations focusing upon the role of technology in the "régulation" approach have been elaborated during the last decade. The interested reader will find a series of these researchs in section II of references. Let us summarize briefly the main domains covered and present possible extension of these lines of analysis.

1. Confronting the basic hypotheses to the findings in Science and Technology researches.

As technology is not the only point of entry within the "régulation" approach, more detailed analyses are needed to substantiate the succession of three historical stages extensive, intensive without and then with mass consumption accumulation regime. It should be interesting to survey the existing literature and check if the features allowed to technology are confirmed or not. Just to give an example, D.A. HOUNSHELL (1984) shows that the original model of industrial organization by Ford is replaced by a more flexible one during the Twenties and Thirties. Contrary to a now common belief, the first crisis of the pure fordism model takes place during the interwar period. So, the present one should be the second, in such a way that product differenciation within mass consumption would not be totally new.

At a more conceptual level, it should be stimulating to compare this approach with the notions elaborated by SPRU in order to interpret the vast amount of case studies, sectoral and global analyses made since one or two decades (see section III of references). In particular, the concepts of technological system and technological paradigm (G. DOSI (1982)) display the same features as the "régulation" approach for institutional forms. A priori, one could imagine to marry these two lines of analysis. The convergences are already very significant : in a sense the mismatch between technology and institution (C. PEREZ (1981)) is closely related to what has been said about structural crisis (section III of the present paper).

2. Formalizing various accumulation regimes not only the fordist one.

Whatever the results obtained so, a second agenda concerns macroeconomic theory. All the previous hypotheses have been kept fairly too general, without any analysis of their coherence. For such a purpose, a minimum of formalization is called for, especially in order to check under that conditions a regime is structurally stable or on the contrary, runs into a major crisis. Prototypes of such models have already been proposed and even

submitted to various econometric tests. For example, a cross section and medium term kaldorian model seems to confirm the role of increasing returns in post WWII growth (R. BOYER, P. PETIT (1981)), and the breaking down of this model since the early or mid-Seventies (R. BOYER, P. RALLE (1986b)). Similarly the significance of the fordism model for the US economy has been investigated (L. CAUSSAT (1981)).

Nevertheless, many points remain rather obscure and call for new analyses. First, a minimal and very simplified model of fordism has to be agreeded upon by the "régulationnists" themselves. The interested reader will find such a tentative in a recent paper (R. BOYER, B. CORIAT (1987)) which in a sense synthetises some previous works (M. AGLIETTA (1974), B. BILLAUDOT (1976), H. BERTRAND (1978), (1983)). Second, a more general approach has to deal with the extreme variability accross countries and historical periods of accumulation regimes and regulation modes. Hence a vast research program which ideally would combine different productivity regimes —linked among other to the precise technological system— with various demand regimes —associated to given mechanisms for income distribution and the demand generation— (R. BOYER (1987)). More generally, theoreticians should work about launching the basis of *a macroeconomy of technological change*.

3. Searching for the roots of the present crisis : what role for technology ?

But the analysis should not be restricted to the sole study of equilibrium growth paths, i.e. only to self stabilizing processes, as most macroeconomic theory do. We need to understand the causes of crisis, considered as period of stagnation and/or large unstabilities. As mentionned earlier, the very success of a regulation mode might lead to a slow shift in structural parameters, such that the system becomes globally unstable. Therefore, a possible explanation why the long waves only point out as a key question, and a way to analyse precisely their underlying social and economic determinants. In this respect the régulation approach is converging with other recent analyses (E. SCREPANTI (1986), G. HANAPPI (1986), R.M. GOODWIN

(1986)).

Furthermore, a special attention should be devoted to the origins of the present crisis. Combining a theoretical fordist model with some estimates of the key parameters would allow to answer to a difficult but central question : would the exhaustion of the technological system have led to a form of another of crisis, quite apart from the changes affecting distribution of income and the dynamic of the world economy (H. BERTRAND (1983)) ? Similarly, are the so-called fordist rigidities a major cause or only the unentended consequences of a crisis originating from economic and social factors ? Subsequent work should check the validity of very preliminary works already available (R. BOYER, B. CORIAT (1987)). A more confident answer should enlighten the puzzle about the exact role of technology during the present crisis.

4. What could be the next accumulation regime and technological system ?

The previous analysis, if correct, has an important consequences : one can no more rely upon cyclical regularities (the kondratieff waves) for assessing the date and the conditions for a way out of the present disorder. The underlying complex process is of course dependant upon past conditions, but not totally since social struggles, political choices, happy (or dramatic) innovations as well as hazard, do shape the final outcomes even unintentionally. Therefore a major challenge for economic analysis : discarding any ambition of forecasting long term feature, can it nevertheless assess the viability of a given set of changes in institutional forms and technology ?

Of course this exercice in "macroeconomic fiction" is tricky indeed, but seems worthwhile. It would allow to discuss the long run consequences of economic and social policies, whereas the usual debates too frequently focuses upon short or medium term issues. First tentative steps in that direction seem promising, if not conclusive (R. BOYER, B. CORIAT (1987), R. BOYER (1987)). These analyses give two major hints. First, measures

encouraging technological change and policies of return to the market seem to be rather contradictory, as far as economic stability and the fight against mass unemployment are concerned. Second, contrary to a now widely held view, public and private forms of cooperation might help a lot in promoting a new growth regime.

Let us hope that this paper, however imperfect and lacking, will stimulate new researches in this area.

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