THE CLASSICS AFTER WALRAS

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RÉSUMÉ

LES CLASSIQUES APRÈS WALRAS

Cette étude présente en cinq propositions notre critique de la pensée néoclassique et notre projet de restaurer et développer la théorie classique : 1) L'analyse originelle de Walras est formellement incohérente, mais ce n'est pas sur ce terrain qu'il faut critiquer la théorie walrasienne car cette incohérence a été corrigée dans le modèle d'équilibre général intertemporel (EGI), 2) Le rejet de la théorie néoclassique se fonde sur son défaut de pouvoir explicatif vis-à-vis des économies capitalistes (ce qui est particulièrement évident dans l'EGI qui décrit une économie pleinement centralisée et dans laquelle tous les marchés présents et futurs sont ouverts et en équilibre), 3) Le relachement des hypothèses se fait nécessairement au détriment de la rationalité des agents (une propriété essentielle des modèles néo-classiques) et introduit peu de réalisme, 4) Dans les modèles walrasiens, l'équilibrage des marchés se fait par les prix, et non par les quantités comme dans le capitalisme réel, 5) En outre, toutes les ressources (travail, monnaie...) sont traitées sur le même mode que les biens produits, alors que les "marchés" concernés sont particuliers. Deux annexes sont consacrées respectivement à la modélisation de l'analyse classique de la concurrence par la mobilité du capital et aux principaux cadres néo-classiques (Walras, EGI, équilibre temporaire, équilibre temporaire à prix fixes, non-tâtonnement et le modèle de F. Fisher).

ABSTRACT

THE CLASSICS AFTER WALRAS

The rejection of the neoclassical perspective and our project to restore and develop the work of the classics, is presented *via* five propositions. We argue that : 1) Walras original analysis is flawed, but this does not define the grounds on which Walrasian economics should be rejected, since this inconsistency has been corrected by the General Intertemporal Equilibrium model (GIE), 2) The rejection of the neoclassical analysis must be based on its deficient explanatory power concerning capitalist economies (this is evident in the totally unrealistic framework of the GIE, fully centralized and in which all spot and future markets are open and in equilibrium), 3) The relaxation of the stringency of the assumptions of neoclassical models introduces very little realism and is performed at the expense of the rationality of agents (a core property of neoclassical economics), 4) In Walrasian models the equilibration of markets is realized by prices, and not quantities as in real capitalism, 5) Moreover, all resources (labor, money) are treated in a manner which replicates the mechanisms of the commodity market, whereas the actual functionings of these "markets" are specific. Two appendices are devoted to the modeling of the classical conception of competition by capital mobility and to the main neoclassical frameworks (Walras, GIE, Temporary equilibrium, Temporary equilibrium with fixed prices, Non-*tâtonnement*, and the model of F. Fisher).

MOTS CLEFS : Classiques, Néo-Classiques, Prix de production, Équilibre général intertemporel, Équilibre temporaire, Rationalité, Walras.
KEYWORDS : Classicals, Neoclassicals, Prices of Production, General Intertemporal Equilibrium, Temporary Equilibrium, Rationality, Walras.
J.E.L. Nomenclature : 020.

THE CLASSICS AFTER WALRAS

This study will use the term *classics* to refer to the works of Smith, Ricardo, and Marx, *i.e.*, to Marx himself and to the two economists, that Marx labelled "scientific" as opposed to "vulgar" economists. *Walras* is representative of the Walrasian school as a whole and is often used as the symbol of the neoclassical train of thought in general.

Below, we will attempt to set out as briefly as possible the main grounds on which our rejection of the neoclassical perspective is founded — in particular, our rejection of the Walrasian perspective. These reasons lie behing our project to restore the classical foundations of economic theory, as they prevailed prior to the Walrasian revolution. These reasons have been arranged into the five propositions below.

The general thesis is that the Walrasian theory should not be rejected because of its possible lack of formal coherence, rather its weakness derives from its lack of explanatory power vis-à-vis capitalist economies. The Walrasian analysis is the theory of some of other unindentified social systems.

Proposition 1 - The formalism involved in Walras' treatment of capital (section 5 of the *Éléments* (1874) is erroneous. But Walras' construction cannot be rejected on such grounds, since this lack of consistency was later corrected (General Intertemporal Equilibrium, Temporary Equilibrium).

1.1 Walras' project was to define a **new concept of equilibrium** different from the classical concept of long-term equilibrium (prices of production with a uniform profit rate and associated outputs). His basic paradigm is that of the equilibration of markets through flexible prices, in an exchange economy without production (Sections 1, 2, and 3 of the *Éléments*). The extension of this paradigm to the treatment of production with productive services (section 4) does not pose any problem with respect to the internal consistency of the model, provided that only consumption goods are produced.

1.2 In the **theory of produced capital** (products which are used for production), these goods appear on two distinct markets: on the product market, and on the market for productive services. On each of these markets, the product has a different price : the price of the good, on the one hand, and its "user-cost", on the other hand. In an equilibrium a certain relation exists between these two prices, in which the notion of a uniform *rate of net income* over produced capitals is implied. **Walras' theory also contains a formalism which mirrors the equal remuneration of capitals among industries**, similar to that which defines classical production prices (see appendix).

1.3 Walras' system is not formally consistent, because the prices of produced capital goods are determined twice. They are assumed to simultaneously satisfy equations similar to those of production prices as well as another set of equations that account for the clearing of markets by prices. **Walras' mistake** originates from his desire to include in his new framework (immediate clearing of the market by prices) a property which actually belongs to long-term equilibrium (the equal remuneration of capitals).

Within the neoclassical train of thought, Walras' mistake can be corrected in three manners :

1.4 A first manner of escaping from Walras' formal inconsistency is **to abandon the theory of produced capitals**. In this case, one dimension of Walras' project will be overlooked. In models in which the theory of produced capitals is abandoned (atemporal equilibrium, temporary equilibrium), production does not take time and inputs and outputs of capital goods are traded on the same market. In this framework, there is no possibility of incorporating the notion of capital advanced at the beginning of the production period, and to consider prices of production. Of course, the double determination is superceded, since only one set of equations remains.

1.5 The second alternative is far less developed. In the neoclassical literature, one can find models in which the conception of equilibrium is similar to that of the classics : models of the von Neumann type or models of intertemporal stationary equilibrium. In these models, initial endowments are not provided, but are determined like other unknowns, and prices are equal to prices of production, and are not determined on the market. For the same reason as above, the double determination disappears.

1.6 The framework of the **general intertemporal equilibrium** defines a unique approach avoiding Walras' inconsistency, without rejecting any components of his project. This model represents the most sophisticated presentation of the Walrasian paradigm. All markets, spot and future, are immediately equilibrated by prices, and the profit rates, in a definition (which is not that of the classics, *cf.* 1.7) consistent with this framework, are uniform. (If returns are not constant, marginal, and not average, profit rates are uniform (*cf.* MALINVAUD E. 1972).) The double determination of prices is superceded by the switch to an explicitly temporal framework of analysis. Production takes time, and inputs are purchased on a market different from that on which outputs are sold and, thus, are evaluated at different prices in the "price of production" equation. Demand for each commodity, in particular for the inputs, are given. An *intertemporal* framework is adopted, in which all variables are determined simultaneously : the demand for inputs in period 1, which depends on the production in period 1, which depends on the demand in period 2, in particular the demand for inputs, which itself depends on the production in period 2, and so on.

1.7 Modern Walrasian models (intertemporal equilibrium, temporary equilibrium, etc.) **are formally consistent**. Accordingly, Pierangelo Garegnani (1960) is incorrect in his assertion that the Walrasian theory is consistent only if a single commodity exists. However, his criticism points to a crucial aspect of Walras' analysis : **The production price equations** *in the strict sense* **and the equation for the determination of prices by the equalization of supply and demand are not compatible in the general case**, even in modern walrasian models. By production price "in the strict sense", we mean the use of a single set of prices to evaluate inputs and outputs. Frank Hahn's (1982) interpretation is the exact opposite of that of Garegnani : From the inconsistency of the two sets of equations, he concludes that production prices have no interest (*cf.* DUMÉNIL G., LÉVY D. 1985).

1.8 It is possible to show that, in a general intertemporal equilibrium over an infinite horizon and constant return to scale, relative prices tend progressively toward relative production prices as the number of periods is increased (*cf.* DUMÉNIL G., LÉVY D. 1985). Although neoclassical economists are not eager to stress the convergence of their views with the theory of prices of production, this property would allow them to

contend that their conception of long-term equilibrium prices is similar to that of the classics.

1.9 The restoration of the formal consistency of Walras' project, in the theory of general intertemporal equilibrium, was only achieved **at the expense of its realism**. This thesis will be made explicit in the two following propositions. Proposition 2 is confined to the framework of general intertemporal equilibrium, while proposition 3 contends that every attempt, from within the neoclassical train of thought, to avoid this irrelevance has failed.

Proposition 2 - In a general intertemporal equilibrium model, the behavior of economic agents is described under the assumption of perfect information, opening and clearing of all markets, spot or future. This approach to economic behavior defines "equilibrium microeconomics". From these assumptions it follows that equilibrium prices must be determined *ex ante* **by a centralized** *tâtonnement*, **prior to any actual economic activity (***ex ante* **equilibrium). In real capitalism, economic agents make their decisions in a decentralized sequential fashion, on the basis of limited information. These decisions are made in situations of disequilibrium. Equilibrium is the possible outcome of an actual dynamic process (***ex post* **equilibrium).**

2.1 In the general intertemporal equilibrium model, prices are determined in a process which occurs prior to economic activity, the Walrasian *tâtonnement*, realized by the auctioneer. In the *tâtonnement*, the auctioneer announces prices for all markets (for all present and future goods), which are still disequilibrium prices. Economic agents indicate what would be their decisions in terms of quantities, if these prices prevailed and insured the clearing of all markets. In this process, information is exchanged, but no real action (transaction, production) is undertaken. The *tâtonnement* is a sequential adjustment process in which the auctioneer modifies the prices announced until equilibrium prices are determined.

2.2 Fortunately, the Walrasian *tâtonnement* is not the only possible manner of determining an equilibrium. At least one **simple and natural type of behavior in disequilibrium and uncertainty** exists, which can lead the economy toward equilibrium in a decentralized manner. We refer here to "adjustment". In a sequential manner, agents confront disequilibria and modify their behavior accordingly :

$$\cdots \rightarrow \begin{pmatrix} \text{Observation of} \\ \text{disequilibrium} \end{pmatrix} \rightarrow \begin{pmatrix} \text{Modification of} \\ \text{behavior} \end{pmatrix} \rightarrow \cdots$$

Both the decisions and the gathering of information are united in a single process. Agents simultaneously while observing the results of their actions : Actions are modified on the basis of new experiences derived from their observations of the past. In their analysis of competition (and, in particular, with respect to capital mobility), the classics adopt this simple description of decision making. The factual relevance of this analysis of firm behavior has been verified by numerous empirical studies.

2.3 The explanatory power of adjustment applied to economics is as broad as when applied to other aspects of human behavior. Within the economic field, adjustment can account for the determination of prices, decisions to produce,

to invest, to allocate capital, etc. It can also account for policy decisions. In each case, the evidence of disequilibrium induces a modification in the behavior of the agent involved. Examples of such disequilibria are the deviations of the ratios of inventories and capacity utilization rates from the values of these variables which are considered to be normal (or optimal) by firms. Profitability differentials are further examples. Variations in the general level of prices (*i.e.*, the rate of inflation) is the disequilibrium which drives monetary authorities. A firm adjusts its level of activity and prices in response to the level of its inventories of finished goods. The migration of capital follows profitability differentials. The degree to which extra financial resources, such as bank loans, are collected for investment is influenced by the capacity utilization rate of fixed capital. The rate of growth of the amount of money is constantly checked by monetary authorities to control the rate of inflation.

2.4 The modeling of behavior in terms of adjustment requires the *construction of sequential models* (dynamic models) **capable of converging toward equilibria.** It is a general characteristic of these models that equilibrium is obtained as an *outcome*, and that this achievement is *conditional*. In particular, these mechanisms can insure the convergence of the economy toward a classical long-term equilibrium (see Appendix I). The combination of the centripetal forces which insure this convergence and constant shocks results in a process of *gravitation*, such as that considered by the classics. The conditions to which convergence is subject correspond to the fact that reactions to disequilibria must be sufficient, yet not excessive at the same time. (Think of the driver of a car, who wants to adjust his direction.)

2.5 The prominent status given to adjustment in the modeling of decision making in disequilibrium does not imply that maximizing — the maximization of an objective function — is irrelevant. The complex relationship between adjustment and maximizing can be sketched as follows:

• There is no bridge between the *simple form* of maximizing and adjustment.

• There is a relationship between the *simple* form of adjustment and *sophisticated* models of maximizing. In models of behaviors for enterprises which are *price- and quantity-makers*, and in which: 1) Uncertainty concerning the demand function for each enterprise exists, 2) Disequilibrium costs are considered (cost of holding inventories, cost of changing the level of output), 3) Intertemporal maximizing is realized, the form of the optimal behavior is that of adjustment to disequilibrium (*cf.* HOLT C.C., MODIGLIANI F., MUTH J.F., SIMON H.A. 1960, BLINDER A.S. 1982 and 1986, and DUMÉNIL G., LÉVY D. 1990(a)). These models define what could be called "optimal adjustment".

For these reasons, a foundation of a simple form of adjustment is crucial. On such a basis, it is possible to build rather simple models that have real explanatory power with respect to capitalist economies — a property which is not shared by traditional neoclassical maximizing behaviors.

The point at stake in this debate is whether the infirmities of capitalist economies are the expression of irrational decisions of agents. We believe that this is not the case, and that the consideration of optimal adjustment can contribute to clarification.

2.6 Adjustment is not totally absent from neoclassical or Keynesian mainstream economics. As a general proposition, one can even state that **adjustment is generally accepted, whenever disequilibrium is considered.** This requirement is

obvious within Walrasian microeconomics, in which disequilibrium is confined to the *tâtonnement* process : The behavior of the neoclassical auctioneer is adjustment. Adjustment is also part of mainstream analysis in a second sense : This description of behaviors is so simple and natural, that it pervades the informal presentation of every paradigm. It can, in particular, be located in numerous empirical studies. Last, it must be recalled that a number of non-conventional Keynesian models or other heterodox models are based on adjustment procedures (TOBIN J. 1975, MALINVAUD E. 1982, KORNAI J., MARTOS B. 1981, METZLER L.A. 1941, LOVELL M. 1962, and DAY R.H., GROVES T. 1975 (ed.)). It is always the decision to produce which is considered in these models. However, these approaches to economic theory have always remained marginal and have been, for all practical purposes, excluded from the mainstream.

Proposition 3 - When neoclassical economists want to make their models more relevant with respect to capitalist economies, they relax a number of assumptions of the general intertemporal equilibrium model. In doing so, they create several types of difficulties :
• The actual gain in realism is quite limited, and possibly fictitious.
• Firm behavior is no longer rational (expectations are not rational).
• Assumptions become *ad hoc* (for example, the agents know the true model of the economy).
• The model cannot be specified (for example, the optimal learning process cannot be determined).
Every advance toward realism is associated with a further abandonment of the founding principles, and optimality can only be preserved in the most unrealistic frameworks. In any event, these models are rejected by most defenders of the purest orthodoxy.

To follow the neoclassicals in their analyses, one must keep in mind a number of puzzling features of their universe. In this world, two types of markets are considered : 1) Markets which are *open* for present or future commodities, *i.e.*, spot or future markets, 2) Future markets which are *closed*, and for which no direct information is available. In the general intertemporal equilibrium model, only markets of the first type are considered : All spot or future markets are open. In the Walrasian temporary equilibrium model, the markets for future commodities are closed. In all Walrasian models, economic agents know that all markets which are open will be in equilibrium and are informed of equilibrium prices. In a similar manner, in a non-Walrasian temporary equilibrium with fixed prices, the agents are aware of all constraints (concerning quantities) which will prevail on the markets that are open. "Decision in equilibrium" refers to the full knowledge of what will happen on the markets which will immediately follow the decision making process. Conversely, "decision in disequilibrium" refers to a situation in which economic agents make their decisions without the benefit of knowing the outcome of markets which will follow their decision, even markets which are open. In this latter context, an agent can possibly know prices in advance, but he/she at least ignores the behavior of other agents and, thus, the manner in which the market will unfold.

3.1 The rigor of the general intertemporal equilibrium model can be relaxed in three different ways :
• Some markets are closed. This is the case in the Walrasian temporary equilibrium

model, in which all future markets are closed. A Walrasian equilibrium, thus, prevails only on spot markets.
• Some markets are closed and constrained equilibria exist on other markets. This is the case of the temporary equilibrium model with fixed prices — the framework in which the so-called "theory of disequilibrium" (in fact the theory of "non-Walrasian equilibrium") has been developed.
• Some markets are closed and true disequilibrium is taken into account on markets which are open (decision in disequilibrium). This is the case, for example, in the Franklin Fisher model (1983) or in models with uncertainty (HOLT C.C., MODIGLIANI F., MUTH J.F., SIMON H.A. 1960 and BLINDER A.S. 1982 and 1986).

3.2 All neoclassical attempts to account for the functioning of capitalist economies are deficient. Depending on the frameworks, one of the following can arise : **Decisions are still centralized (3.3), the theory of capital is abandoned (3.4), behaviors in disequilibrium are accounted for by equilibrium microeconomics (3.5), behaviors are arbitrary and assumptions** *ad hoc* **(3.5 and 3.8 below), only partial equilibrium is considered (3.6).**

3.3 Equilibrium and disequilibrium neoclassical models **usually remain centralized**. In all equilibrium models, a centralized *tâtonnement* process is required prior to actual economic activity. This is the case, for example, in a temporary equilibrium model in which the auctioneer announces prices on markets that are open and to determine equilibrium prices. This is also the case in the "theory of disequilibrium" (non-Walrasian equilibria) in which the auctioneer computes and announces all rationings (*tâtonnement* on quantities). In Hahn et Negishi's model (1962), the so-called non-*tâtonnement* model, markets are actually in disequilibrium, but an auctioneer is still necessary since the agents are *price-takers* and prices must be modified at each period. *Game theory* models will not be considered in this study. We must mention, however, that in these models, no auctioneer exists : Economic agents, through a type of collective bargaining, compute equilibrium strategies. However, the actual process is still centralized. Only Fisher (1983) has built a decentralized framework from which the auctioneer or any centralized agency has been banished (*cf.* 3.5).

3.4 In all models in which production occurs instantaneously, no capital is advanced and, thus, no profit rates are considered. An important dimension of Walras' project is, therefore, abandoned, and **a prominent feature of capitalism is overlooked,** *i.e.***, capital itself.** All temporary equilibrium models have this limitation.

3.5 The problem associated with the **modeling of behaviors in disequilibrium** can only be addressed in models in which disequilibrium exists, as in models of non-*tâtonnement* and in the Fisher model. However, the modeling of behaviors in these two models is not acceptable :
• In the non-*tâtonnement* model, equilibrium microeconomics are applied directly to situations of disequilibrium : Economic agents maximize their objective function on the basis of the disequilibrium prices announced by the auctioneer, as if these prices were equal to Walrasian equilibrium prices. Thus, agents are assumed to be "surprised" at each period when they notice that rationing prevails on the market !
• In the Fisher model (1983), no auctioneer exists and markets do not clear. The behaviors described by Fisher can be analyzed in three steps. First agents form their

expectations concerning the prices which will be decided by other agents, and the constraints on quantities that they will confront on the market. Second they decide on their own prices. Third, they optimize on this basis, in order to decide on their own *quantities* (produced and supplied, or demanded). The two first steps do no correspond to rational behaviors. Thus, the complete process cannot claim rationality. In this framework, Fisher cannot prove that an equilibrium exists, nor can be a *fortiori* demonstrate the stability of this equilibrium. For this reason, he makes the *ad hoc* assumption of *no favorable surprise*. Even under this untenable assumption, Fisher still cannot determine the nature of the equilibrium (a Walrasian or non-Walrasian equilibrium).

3.6 Models of "optimal adjustment" (*cf.* 2.5), in which price and quantity makers act in a context of uncertainty (HOLT C.C., MODIGLIANI F., MUTH J.F., SIMON H.A. 1960 and BLINDER A.S. 1982 and 1986), are interesting in several respects, but the framework of analysis is restricted to partial equilibrium, and only output and price decisions are considered (and not investment). These models are complex, and the conclusions are limited. The behavioral equations which are obtained confirm the relevance of sensible assumptions about behavior (for example, large inventories invoke a reduction of production). The optimal values of the reaction parameters can be computed.

3.7 The trinity "maximizing, rationality, and optimality" is an obsession in neoclassical theory. Recall that we mean here : 1) *Maximizing*, maximizing an objective function, 2) *Rationality*, the attribute of a behavior in which the best use is made of available information, 3) *Optimality* (Pareto-Optimality), the attribute of a situation of the economy which makes it superior to any other in some specified respect. This obsessional attitude is difficult to defend (*cf.* 3.8 to 3.9). Maximizing is not intrinsically rational and does not necessarily lead to an optimum.

3.8 Maximizing is only rational under the assumption of rational expectations. **It is the rational character of expectations concerning all markets which renders rational the maximizing of an objective function.** Without the *ad hoc* assumption that agents know the true model of the economy (*i.e.*, all production functions and utility functions, the rules of functionings, the characteristics of other agents, endowments, etc.), the concept of **rational expectations** cannot be formalized, since the rational learning process of the true model of the economy is unknown. (The present stage of economic knowledge proves that even no sensible learning process of the true model of the economy has been identified to date.)

3.9 The demonstration that a situation is an optimum one rests on the strict assumptions of perfect information concerning the present and future. This assumption holds in two different frameworks : that of the general intertemporal equilibrium (the auctioneer computes and announces all prices for all spot and future markets) and that of the Walrasian temporary equilibrium with perfect expectations (prices on the present market are computed and announced by the auctioneer, prices for future markets are perfectly anticipated by individual agents). Even within this framework, equilibrium is not always optimal.

Proposition 4 - In Walrasian microeconomics, the equilibration of markets is realized by prices. In real capitalism, this equilibration is primarily ac-

complished by quantities. This is true for the long run (mobility of capital) and the short run (determination of the capacity utilization rate of fixed capital).

4.1 In a Walrasian equilibrium, **the equilibration of markets is realized through prices**. This corresponds to the definition of a Walrasian equilibrium: In a given state of initial endowments, a set of prices can be determined which insures the clearing of the markets (on the basis of individual optimizing). Whenever demand or initial endowments change, equilibrium prices also change.

4.2 In real capitalism, *the main field on which price competition is waged is intra-industry competition*. The outcome of this competition is the establishment of a unique price for the industry. The impact of price competition among industries, related to demand substitution, is very limited. In the short run, modifications of prices may result in substitution among (but little else):
• Various types of resources (machinery/labor, consumption goods/production goods, for example). This effect is negligible.
• Various types of goods with similar use values (margarine *vs.* butter, meat *vs.* chicken). Price variations probably allow the alleviation of small disequilibria.

4.3 The absence of important stockpiling in the short run, **is not the consequence of the determination of prices at levels which insure the clearing of the market** (as is supposedly the case following Walras analysis), nor is it the consequence of capital mobility — a slow process. In the short run, the equilibration of the market is realized **by the adjustment of the capacity utilization rate of fixed capital.** We call this mechanism "direct control of quantities". It was already described by Ricardo (1817, Ch. 4), and its factual relevance is obvious. In the crisis of the steel industry, it is clear that: 1) Excess capacity in the production of steel did not provoke a fall in prices to low values stimulating demand to levels corresponding to available capacity (even if prices diminish to a certain extent), 2) Inventories corresponding to years of output at normal capacity were not accumulated. Instead, capacity utilization rates remained below normal for years.

4.4 In real capitalism, market clearing in the long run is obtained **as a result of the migration of capital.** A lasting bullish demand results in a high capacity utilization rate, a higher price, a larger profit rate and, consequently, a stronger inducement to invest. When demand is modified, capital is displaced, but equilibrium prices — prices of production — are maintained (they are determined by the conditions of production: technology and wages). If returns are not constant, as is the case if natural resources are considered (if rents exist), equilibrium prices indirectly depend on demand, through technology.

4.5 The neoclassical model, closest to real capitalism, is perhaps **temporary equilibrium with fixed prices**. What we call "classical short-term equilibrium", in which the stocks of fixed capital are given, and markets tend to clear as a result of the adjustment of the capacity utilization rate, is "similar" in some respects to a temporary equilibrium with fixed prices. The classical long-term equilibrium could be compared with a series of temporary equilibria with fixed prices to which the following mechanisms would be added (*cf.* DUMÉNIL G., LÉVY D. 1990(c), Part IV): 1) Between

two periods, prices would be adjusted on the basis of the disequilibria between supply and demand manifested on the previous market, 2) Capital would be displaced following profitability differentials. To our knowledge, these various components have never been combined. PICARD P. 1982 considered a series of temporary equilibria with fixed prices, correcting prices from one period to the other, but without capital mobility. SONNENSCHEIN H. 1982 studied a model in which a succession of Walrasian equilibria is considered with capital mobility.

4.6 The acknowledgement of the primary importance of equilibrations by quantities in the construction of disequilibrium microeconomics leads to the consideration of a framework in which macro phenomena are, from the outset, based on micro behaviors. In other words, these microeconomics directly provide the **foundations for macroeconomics.** In this framework, it is possible to study phenomena such as overheating, stagnation, recession, and the complete business cycle (see DUMÉNIL G., LÉVY D. 1987(b) and 1989(b)).

Proposition 5 - Walrasian microeconomics provide a similar treatment of all resources (products, land, labor, money). In real capitalism, the functioning of the "markets" for each of these resources is quite specific.

In the interest of brevity, the investigation will be limited to the *labor market* and the determination of the wage rate.

5.1 As in the case of the market for products, **no short-term price equilibration exists on the labor market** :
• With respect to the demand for labor, production functions are rigid in the short-run (no short-run substitution exists between capital and labor). A fall in the wage rate does not result in any additional demand for labor (or only little), and symmetrically for a rising wage rate.
• Concerning the effect on the labor supply of a variation of wages, the sign of the effect is not even obvious. If wages are cut, it some workers may stop working because their remuneration (the utility of their consumption goods) no longer compensates for the difficulty of their task (the disutility of labor). Conversely, the same reduction of wages might well induce other members of the family to seek employment, since a single wage is no longer sufficient. If wages increase, the same ambiguity exists.
The mere postulation of a negatively sloped demand schedule for labor, in the short run, is not justified, as is the case for the positive slope of the supply curve and, consequently, the labor market cannot clear through the determination of prices in the short run.

5.2 The equilibration by quantities (by the capacity utilization rate) in the short run, while very efficient for commodities, **cannot be extended to the labor market**. This is because labor *is not* a product. In the short or average run the labor supply must be considered constant.

5.3 In the short run, since the labor supply can be considered constant, **disequilibria on the labor market** mirror the fluctuation of the activity of the whole productive system :
• When the economy gravitates around normal equilibrium, the amplitude of the fluctuation of employment is limited. Variations can be observed in some industries, but

these fluctuations tend to compensate.
• The level of employment is actually determined by the ongoing phase of the business cycle (balanced growth, overheating, stagnation) — what Marx called "the vicissitudes of the accumulation of capital".

5.4 Disequilibria on the labor market last longer than on the commodity market. This property is not the expression of the absence of short-term price equilibration, since this problem is common to the two types markets : labor market and commodity market (*cf.* proposition 5.1). This duration of disequilibria on the labor market results from the absence of a short-term equilibration by quantities for labor (*cf.* proposition 5.2). The time span required by quantity equilibration on the commodity market is quite a bit shorter than the duration of the business cycle. For this reason, excess inventories only exist in a precise stage of the business cycle, before recession occurs, and for a short period of time. Symmetrically, rationing is scarce and limited in size. With respect to labor, disequilibria mirror the phases of the business cycle (*cf.* proposition 5.3) : lasting unemployment, or lasting overemployment (if enterprises are rationed).

5.5 If one considers, however, the movement of capitalism over a long period, it is clear that **unemployment has always been confined to certain limits** (usually less than 15 percent). A type of very-long-term (or historical) "equilibrium" seems to prevail on the labor market. This phenomenon can be explained in two manners which are presented in the three following paragraphs (5.6 to 5.8).

5.6 A number of analyses link the equilibration of the labor market in the very long term to **the determination of a very-long-term equilibrium rate of wages**. This was the case for Smith and Ricardo, as well as for economists such as Kaldor (1957) or Solow (1956) in the controversy over balanced growth which developed after World War II. A very-long-term equilibrium rate of wages is, thus, determined which insures the equality between two rates of growth (that of the demand for labor and that of labor force). Depending on the economist, the rate of wages influences either the rate of growth of the labor force (Smith et Ricardo), the rate of accumulation (Kaldor), or technology (Solow).

5.7 The fact that technology and the rate of accumulation depend on wages is probably not immaterial to the very-long-term profile of employment. However, these relationships possess two important characteristics : **The time span of their action covers several cycles (transcycle determination)**[1], **and they are overdetermined by extra-economic interventions**.

5.8 The movement of the economy forward is strongly dependent on the availability of labor, and social order depends on the confinement of the unemployment rate to certain limits. For these reasons, the equilibration of the labor market required constant extra-economic manipulations — to a much greater degree than the limited intervention which was necessary to achieve the convergence toward equilibrium on the commodity market. The concrete forms of this intervention are well-known. We mean here the set of laws and regulations concerning : immigration and emigration, female labor, the employment of children, the age of retirement, rural emigration, etc. **Labor supply**

1. Kaldor (1957) alludes to this "transcycle" action.

is determined primarily in the very long term by such manipulations and cannot be considered exogenous, or a mere function of wages.

5.9 We already contended that the notion of a short-term equilibrium wage rate is meaningless. For the above reasons, the **notion of a long-term equilibrium rate of wages has also little relevance.**

5.10 The real wage evolves through the business cycle in relation to these extra-economic manipulations. Its level, at a given instant, is the combined effect of past determinations and the present juncture.

5.11 The above analysis of the labor market **is in accord with Marx's analysis**, but not with Smith and Ricardo.

APPENDIX I - THE MODELING OF THE CLASSICAL ANALYSIS OF COMPETITION

Before 1983, very little work had been devoted to the demonstration of the consistency of the classical analysis of competition (with the exception of EGIDI M. 1975). Hobuo Nikaido argued in an unpublished paper that the conditions for the convergence of market prices toward prices of production are very restrictive (*cf.* NIKAIDO H. 1977, later published in NIKAIDO H. 1983). In France, in 1981, a special issue of the *Cahiers d'Économie Politique* was devoted to this topic, with rather critical conclusions (*cf.* BENETTI C. 1981 and CARTELIER J. 1981).

In a conference in Paris, organized by the Observatoire Français des Conjonctures Économiques, we presented in 1983 the first demonstration of the relevance of the classical analysis of competition (*cf.* DUMÉNIL G., LÉVY D. 1987(d)).

An important step forward was accomplished in 1984 in the University of *Paris X-Nanterre* where a conference was held on the issue of the classical analysis of gravitation, organized by the RCP "*Systèmes de Prix de Production*" of the *Centre National de la Recherche Scientifique*. Several models were presented and the research developed in a series of papers and publications, for example, ARENA R., FROESCHLE C., TORRE D. 1988, BOGGIO L. 1985 and 1986, FLASCHEL P., SEMMLER W. 1987, FRANKE R. 1987, and our paper DUMÉNIL G., LÉVY D. 1987(a).[2] A second conference on the same topic was held in 1990 in Siena (organized by the University of Siena). A number of models were presented, often by the same participants (ARENA R., FROESCHLE C., TORRE D. 1990, BOGGIO L. 1990, DUMÉNIL G., LÉVY D. 1990(b), FLASCHEL P. 1990, KRAUSE U. 1990, KUBIN I. 1990, and SEMMLER W. 1990).[3]

2. Since then we further developed our analysis. DUMÉNIL G., LÉVY D. 1989(a) provides the analytic treatment of a model with three commodities and one capitalist, with fixed capital. DUMÉNIL G., LÉVY D. 1987(c) is devoted to the analytic treatment of a model with any number of commodities and capitalists, without fixed capital. The same treatment of any number of commodities is presented in DUMÉNIL G., LÉVY D. 1991, but with only one capitalist. Our most recent study is DUMÉNIL G., LÉVY D. 1990(b).

3. In DUMÉNIL G., LÉVY D. 1990(d), we review these contributions, propose a classification, and suggest an interpretation of the still diverging conclusions.

APPENDIX II - NEOCLASSICAL FRAMEWORKS OF ANALYSIS

Léon Walras

Reference : WALRAS L. 1874.

Walras' project was to build a general theory in three stages :

1. *The theory of exchange* (Sections 1, 2 and 3 of the *Éléments*). This is the basic paradigm in Walrasian thought. The amounts of each commodity (endowments) are given. The issue is the determination of prices clearing the market in one transaction.

2. *The theory of production* (Section 4). The quantities of productive factors — the services of land, labor, and capital — are given : the unknowns are outputs and prices.

3. *The theory of capitalisation* (Section 5). Walras acknowledges the fact that productive factors such as the "services of capital" are different in nature from other factors : Capital goods provide productive services, but simultaneously are themselves the results of production, *i.e.*, products.

From the point of view of theoretical consistency, the theory of capitalisation corresponds to the problematic part of Walras' work. In his theory of capital, Walras attaches two different prices to each capital good : the price of this good as a product, denoted P_k, and the price of the productive service of this good, denoted p_k. This latter price is also called the "user cost of capital". *In an equilibrium, the two prices are related* :

$$p_k = (i + c_k) P_k \tag{1}$$

in which i is a uniform rate of return and $c_k P_k$ represents the depreciation allowance of fixed capital (plus a risk premium).

From the absence of "gains" (Walras' *bénéfices*) at equilibrium, *i.e.*, the absence of superprofits in the classical terminology, follows the equality between the production cost and the price of the output (the parameter $a_{j,k}$ denotes the amount of productive factor j required in order to produce one unit of capital good k) :

$$P_k = \sum_j a_{j,k} p_j \tag{2}$$

Using equation 1, abstracting from land and assuming that only one type of labor (with the subscript 0) and l types of produced capital goods exist, equation 2 can be written :

$$P_k = \underbrace{a_{0,k} p_0}_{\substack{\textit{Wages}}} + \underbrace{\sum_{j=1}^{l} a_{j,k} c_j P_j}_{\substack{\textit{Depreciation}\\ \textit{allowances}}} + \underbrace{i \sum_{j=1}^{l} a_{j,k} P_j}_{\substack{\textit{Profits on}\\ \textit{capital advanced}}}$$

In a model where no fixed capital exists and only circulating inputs are considered, $c_j = 1$ and the equation above becomes :

$$P_k = a_{0,k} p_0 + (1 + i) \sum_{j=1}^{l} a_{j,k} P_j \tag{3}$$

This equation is the equivalent of the classical equation for production prices in the Walrasian system. The rate of return is uniform throughout the economy.

Walras' mistake is that the price of capital goods is determined twice :

- By the equalization between supply and demand on the productive factor market (and this determines prices p_k) ;
- By production costs in the "production price" equation 3 (and this determines prices P_k).

Equation 1 is not satisfyied in the general case.

General Intertemporal Equilibrium

References : DEBREU G. 1959 and MALINVAUD E. 1972.

The general intertemporal equilibrium model is built in a temporal framework in which a finite or infinite number of periods is considered. Production takes time. The objective functions of economic agents (profits of enterprises, utility functions of consumers) are intertemporal functions.

All markets, spot or future markets, are open. Equilibrium prices, *i.e.*, prices which insure the clearing of all markets (spot or future) are simultaneously determined by the auctioneer through a *tâtonnement*. When the *tâtonnement* is over, actual economic processes occur. Although time is considered, this model is not sequential, since all decisions are made (for all periods) at the beginning of the whole process.

Prices insure the clearing of all markets on the basis of initial endowments, as well as a uniform return to capitals. Thus, this model satisfies the original project of Walras of combining these two properties. This is obtained as a result of the existence of different sets of prices : The inputs and outputs of a same production process are evaluated at different prices. Only over an infinite horizon and with constant returns to scale, do the relative prices of inputs and outputs equalize. Such prices are similar to classical prices of production (*cf.* DUMÉNIL G., LÉVY D. 1985).

General Temporary Equilibrium

Reference : GRANDMONT J.M. 1977.

The general temporary equilibrium model is built in a temporal sequential framework. Production, however, does not take time (production is instantaneous). Outputs and the inputs which were used in their production are purchased and sold on the same market. No product is transfered from one period to the next. The production of one period is realized on the basis of its own output. Agents have intertemporal preferences.

One must distinguish the markets for future commodities (which are closed) and the markets for present commodities which are open. The existence of closed future markets induces the agents to hold money.

A Walrasian equilibrium prevails on the markets which are open. The auctioneer determines equilibrium prices and announces these prices. The auctioneer does not consider future markets. Prices on these markets must be anticipated by the agents themselves. How these expectations are formed is part of the behavior of individual agents. They maximize on the basis of present prices announced by the auctioneer and expected future prices.

In the general case, expectations are not fulfilled, and the plans of individual agents for the future are not compatible. At each new period, the new spot markets are open and economic agents modify their plans.

Temporary Equilibrium with Fixed Prices (The Theory of Disequilibrium)

Reference : BENASSY J.P. 1982.

The framework is that of temporary equilibrium, but prices are given on the markets which are open. An auctioneer is required, but his/her function is to announce rationings (instead of prices) and to determine the equilibrium which is constrained by the rigidity of prices.

Non-*tâtonnement*

Reference : HAHN F., NEGISHI T. 1962.

This model is built in a sequential framework without production. In spite of the name of the model, an auctioneer exists. He/she announces a set of prices which is not the equilibrium set. Agents, however, behave as if these prices were equilibrium prices. They maximize without considering the rationings which will exist on the market. Transactions occur following a given rationing scheme. This chain of events is repeated until agents no longer transact and prices announced by the auctioneer stabilize. Then, consumption occurs.

Equilibrium Microeconomics within Disequilibrium: F. Fisher

Reference : FISHER F.M. 1983.

F. Fisher's project (1983) is to build a framework in which the agents act within disequilibrium, without auctioneer. They form expectations and fix a number of prices and, then, maximize on this basis. Transactions occur at each period, following given rationing schemes.

In this framework, it is impossible to obtain even the smallest result. Fisher borrows from Hahn and Negishi (*cf.* above) their assumption of "*no favorable surprise*". In the Fisher model, this assumption is totally *ad hoc* but, on this basis, Fisher can demonstrate the existence and stability of an equilibrium.

References

ARENA R., FROESCHLE C., TORRE D. 1988, "Formation des prix et équilibre classique, Un examen préliminaire," *Revue économique*, Vol. 39, #6, pp. 1097-1117.

ARENA R., FROESCHLE C., TORRE D. 1990, "Gravitation Theory : Two Illustrative Models," *Political Economy*, Vol. 6, #1-2, pp. 287-307.

BENASSY J.P. 1982, *The Economics of Market Disequilibrium*, Academic Press, New York, London.

BENETTI C. 1981, "La question de la gravitation des prix de marché dans *La Richesse des Nations*," *Cahiers d'économie politique*, Vol. 6, pp. 9-31.

BLINDER A.S. 1982, "Inventories and Sticky Prices : More on the Microfoundations of Macroeconomics," *The American Economic Review*, Vol. 72, #3, pp. 334-348.

BLINDER A.S. 1986, "Can the Production Smoothing Model of Inventory Behavior Be Saved," *The Quarterly Journal of Economics*, Vol. CI, #3, pp. 431-453.

BOGGIO L. 1985, "On the Stability of Production Prices," *Metroeconomica*, Vol. 37, #3, pp. 241-267.

BOGGIO L. 1986, Stability of Production Prices in a Model of General Interdependence, in SEMMLER W. 1986.

BOGGIO L. 1990, "The Dynamic Stability of Production Prices : A Synthetic Discussion of Models and Results," *Political Economy*, Vol. 6, #1-2, pp. 47-58.

CARTELIER J. 1981, "Marchandise homothétique, capital financier et loi de Say : de la convergence des prix de marché vers les prix naturels," *Cahiers d'économie politique*, #6, pp. 33-52.

DAY R.H., GROVES T. 1975, *Adaptive Economic Models*, Academic Press, New York, San Francisco, London.

DEBREU G. 1959, *Theory of Value : An Axiomatic Analysis of Economic Equilibrium*, John Wileys and Sons, New York, London.

DUMÉNIL G., LÉVY D. 1985, "The Classicals and the Neoclassicals, A Rejoinder to Frank Hahn," *Cambridge Journal of Economics*, Vol. 9, #4, pp. 327-345.

DUMÉNIL G., LÉVY D. 1987(a), "The Dynamics of Competition : A Restoration of the Classical Analysis," *Cambridge Journal of Economics*, Vol. 11, #2, pp. 133-164.

DUMÉNIL G., LÉVY D. 1987(b), "The Macroeconomics of Disequilibrium," *Journal of Economic Behavior and Organization*, Vol. 8, pp. 377-395.

DUMÉNIL G., LÉVY D. 1987(c), The Stability of Long-Term Equilibrium in a General Disequilibrium Model, Cepremap, #8717, Paris.

DUMÉNIL G., LÉVY D. 1987(d), La concurrence capitaliste : un processus dynamique, pp. 127-154, in FITOUSSI J.P., MUET P.A. 1987.

DUMÉNIL G., LÉVY D. 1989(a), "The Analytics of the Competitive Process in a Fixed Capital Environment," *The Manchester School*, Vol. LVII, #1, pp. 34-57.

DUMÉNIL G., LÉVY D. 1989(b), The Real and Financial Determinants of Stability : The Law of the Tendency Toward Increasing Instability, pp. 87-115, in SEMMLER W. 1989.

DUMÉNIL G., LÉVY D. 1990(a), The Rationality of Adjustment Behavior in a Model of Monopolistic Competition, pp. 224-242, in QUANDT R.E., TRISKA D. 1990.

DUMÉNIL G., LÉVY D. 1990(b), "Stability in Capitalism: Are Long-Term Positions the Problem?," *Political Economy*, Vol. 6, #1-2, pp. 229-264.

DUMÉNIL G., LÉVY D. 1990(c), A Note on Structural Change, Economic Dynamics, and Crisis, Paper Presented at the Conference "Topics in Structural Change and Economic Dynamics", organized by the Editorial Board of *Structural Change and Economic Dynamics*, Universita di Siena, July 13-14, 1990.

DUMÉNIL G., LÉVY D. 1990(d), "Convergence to Long-Period Positions. An Addendum," *Political Economy*, Vol. 6, #1-2, pp. 265-278.

DUMÉNIL G., LÉVY D. 1991, "Micro Adjustment Toward Long-Term Equilibrium," *Journal of Economic Theory*, Vol. 53, #2, pp. 369-395.

EGIDI M. 1975, "Stabilità ed Instabilità negli Schemi Sraffiani," *Economia Internazionale*, Vol. XXVII, pp. 3-41.

FISHER F.M. 1983, *Disequilibrium Foundations of Equilibrium Dynamics*, Cambridge University Press, Cambridge.

FITOUSSI J.P., MUET P.A. 1987, *Macrodynamique et déséquilibres*, Économica, Paris.

FLASCHEL P. 1990, "Cross-Dual Dynamics, Derivative Control and Global Stability: A Neoclassical Presentation of a Classical Theme," *Political Economy*, Vol. 6, #1-2, pp. 73-94.

FLASCHEL P., SEMMLER W. 1987, "Classical and Neoclassical Competitive Adjustment Processes," *The Manchester School*, Vol. LV, #1, pp. 13-37.

FRANKE R. 1987, *Production Prices and Dynamical Processes of the Gravitation of Market Prices*, Peter Lang, Frankfurt am Main, Bern, New York, Paris.

GAREGNANI P. 1960, *Il capitale nelle teorie della distribuzione*, Giuffrè, Milano.

GRANDMONT J.M. 1977, "Temporary General Equilibrium Theory," *Econometrica*, Vol. 45, pp. 535-572.

HAHN F. 1982, "The neo-Ricardians," *Cambridge Journal of Economics*, Vol. 6, #4, pp. 353-374.

HAHN F., NEGISHI T. 1962, "A Theorem on Non-Tâtonnement Stability," *Econometrica*, Vol. 30, pp. 463-469.

HÉNIN P.Y., MICHEL P. 1982, *Croissance et Accumulation en Déséquilibre*, Économica, Paris.

HOLT C.C., MODIGLIANI F., MUTH J.F., SIMON H.A. 1960, *Planning Production, Inventories, and Work Force*, Prentice-Hall, Englewood Cliffs, N.J..

KALDOR N. 1957, "A Model of Economic Growth," *Economic Journal*, Vol. 67, #268, pp. 591-624.

KORNAI J., MARTOS B. 1981, *Non-Price Control*, North Holland, Amsterdam, New York, Oxford.

KRAUSE U. 1990, "Gravitation Processes and Technical Change: Convergence to Fractal Patterns and Path Stability," *Political Economy*, Vol. 6, #1-2, pp. 317-327.

KUBIN I. 1990, "Market Prices and Natural Prices: A Model with a Value Effectual Demand," *Political Economy*, Vol. 6, #1-2, pp. 175-192.

LOVELL M. 1962, "Buffer Stocks, Sales Expectations, and Stability: A Multi-Sector Analysis of the Inventory Cycle," *Econometrica*, Vol. 30, #2, pp. 267-296.

MALINVAUD E. 1972, *Lectures on Microeconomic Theory*, North Holland, Amsterdam, New York, Oxford.

MALINVAUD E. 1982, *Théorie macro-économique, tome 2*, Dunod, Paris.

METZLER L.A. 1941, "The Nature and Stability of Inventory Cycles," *Review of Economic Statistics*, Vol. III, pp. 113-129.

NIKAIDO H. 1977, Refutation of the Dynamic Equalization of Profit Rates in Marx's Scheme of Reproduction, Department of Economics, University of Southern California.

NIKAIDO H. 1983, "Marx on Competition," *Zeitschrift für Nationalökonomie*, Vol. 43, #4, pp. 337-362.

PICARD P. 1982, Inflation, Croissance et Déséquilibre, in HÉNIN P.Y., MICHEL P. 1982.

QUANDT R.E., TRISKA D. 1990, *Optimal Decisions in Markets and Planned Economies*, Westview Press, Boulder, San Francisco, London.

RICARDO D. 1817, *The Principles of Political Economy and Taxation*, Dent and Son, London, 1960.

SEMMLER W. 1986 (ed.), *Competition, Instability, and Nonlinear Cycles*, Springer Verlag, Berlin.

SEMMLER W. 1989 (ed.), *Financial Dynamics and Business Cycles: New Perspectives*, Sharpe, Armonk, New York; London, England.

SEMMLER W. 1990, "On Composite Market Dynamics: Simultaneous Microeconomic Price and Quantity Adjustments," *Political Economy*, Vol. 6, #1-2, pp. 193-220.

SOLOW R.M. 1956, "The Theory of Capitalist Development, A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics*, Vol. 70, pp. 65-94.

SONNENSCHEIN H. 1982, "Price Dynamics Based on the Adjustment of Firms," *The American Economic Review*, Vol. 72, #5, pp. 1088-1096.

TOBIN J. 1975, "Keynesian Models of Recession and Depression," *The American Economic Review*, Papers and Proceedings of the AEA.

WALRAS L. 1874, *Éléments d'économie politique pure, ou théorie de la richesse sociale*, R. Pichon et R. Durand-Auzias, Paris, 1952.