Viability and Equilibrium:
ISLM Revisited

by

Jean Cartelier*


Working Paper No. 23


May 1989

*Universite de Picardie, France

More than fifty years after the publication of Keynes' General Theory and of the review article by Hicks, ISLM remains the basic model for teaching Keynesian macroeconomics. Some Keynesians have rightly insisted on the inadequacies of ISLM in capturing Keynes' thought but have not converted the profession to their views. The same fate may befall this paper whose aim is to suggest an alternative class-room model in the Keynesian and Kaleckian tradition. Nevertheless, in accordance with Orange's lucid motto,"il n'est pas nécessaire d'espérer pour entreprendre ni de réussir pour persévérer"...

The main thesis is that the concept of static equilibrium, central to ISLM, is not adequate to express the most fundamental aspect of the Keynesian revolution. The first section of the paper is devoted to a defense of the more general concept of viability. Static equilibrium will appear as but one particular example of this larger notion.

A very simple model is presented in the second section. Its distinctive feature, aside from its inclusion of the ISLM equations, is to make a clear distinction between the macroeconomic relations exhibiting the consequences of the decisions of the agents on the one hand and the principles according to which these decisions are taken and carried out on the other. The concept of static equilibrium,by contrast, is founded on the confusion of the two: a necessary condition for individual actions to be effective is their mutual compatibility.

The third section deals very briefly with the implications of the model for the analysis of macroeconomic policy.

I

## VIABILITY VERSUS EQUILIBRIUM ?

Static equilibrium refers to a situation of mutual compatibility of individual economic actions. The solution of the system of equations determines the prices and quantities so that the desired actions of <u>all</u> agents can be simultaneously realized. Within this framework, it is impossible to think of economic magnitudes being effective outside equilibrium (not being the solution of the system of equations). An instantaneous mechanism of adjustment is thus supposed to drive the economy towards the point of rest (if unique). The infinite velocity of this adjustment is a necessary hypothesis if one does not wish to elucidate the dynamic process and deal with transitory situations.

The clear awareness of the self-contradictory character of speaking of effective non-equilibrium magnitudes is the positive outcome of the rational expectations school and of its critics of traditional dynamic modelling. It is equally a justification <u>ex post facto</u> of the growing variety of equilibria (temporary, K, Nash-, conjectural equilibria etc.) economic theory creates in order to keep up with new problems.

Keynesians (or Kaleckians) refuse the methodology of static equilibrium and its implications. Two good general reasons may be invoked for that rebuttal. The first is that the economy is monetary in essence. The second is the asymmetry of the relations between entrepreneurs and other people (wage-earners typically).

That economy be monetary in essence does not essentially mean there exists a link between present and future (as so often Keynesians maintain)[1]. More decisive is that each agent has at his disposal a means of making effective his planned actions more or

less independently of their compatibility with those of all others. By contrast, the traditional view of the feasibility of transactions requires, as in the Walrasian _tâtonnement_, a general coordination of _all_ agents. The mere existence of money reveals that a different coordination prevails in the economy.

In that sense, money and equilibrium can be viewed as two substitutable notions each expressing a particular organization of economic relations. Being accepted by all agents, money is equivalent to the consent of the economy _as a whole_ to the action of its possessor. It allows him, to a certain extent, to transform a private and subjective project into a social and objective action.

On a very different plane, the asymmetry between entrepreneurs and the other agents leads one to discard the tool of static equilibrium as well.

According to Keynes and Kalecki, only entrepreneurs have the capacity to determine the level of the economic activity through their expenditures. Other agents can react but they cannot make this level change _for the period under consideration_. The economic hierarchy (we shall see that it is founded on monetary considerations) is formally expressed by the _recursivity_ of the model. For every given period entrepreneurs' decisions influence non-entrepreneurs and the reverse is not true. General interdependence and mutual compatibility and thus static equilibrium cease to be relevant in this context.

However, individual decisions are still voluntary ones. Economic agents act freely under general constraints and aim to maximize their advantage (profit or welfare). The point raised in this paper does not concern so much the rationality of the behaviour of entrepreneurs or wage-earners but the way their actions are coordinated.

Let us see more precisely what is meant by that in a very simple macroeconomic framework.

<a> Entrepreneurs come first. They fix the amount of their desired level of activity on the basis of their expectations or, what amounts to the same, they determine a desired level of expenditures.

Two sorts of expenditures have to be distinguished. The first ones are directed towards other entrepreneurs (Keynes calls them _investment_ in Chapter 6 of _General Theory_) and the second towards non-entrepreneurs (_factor cost_ according to Keynes). For the sake of simplicity we shall suppose that these factor costs are the sole costs incurred by entrepreneurs. Thus the expenditures ˎbetween entrepreneurs represent the expenditure of expected profits.

But deciding a given amount of planned expenditures (according to the effective demand principle) is not sufficient to make them effective. Two additional conditions have to be fulfilled.

The first one has been recently intensively studied under the heading of _finance motive_. Entrepreneurs have to raise funds in order to execute their plans. Here enters the banking and financial system. In accepting or refusing to finance the projects of the entrepreneurs, the banking system acts as a coordinator which selects according to different criteria (prudential ratios or agreement on the state of expectations) the socially acceptable commitments of the entrepreneurs.

The second condition, far more neglected, is that people to whom expenditures are directed accept the operation. Though a general compatibility is not required, obviously _no economic trans-action can take place without the agreement of people who are party to it_ (unless we are able to explain why this condition is not necessary as will be the case for the workers).

Concerning expenditures between entrepreneurs, Keynes himself proposes a solution when he makes the hypothesis that entrepreneurs in the equipment goods sector work on order. In a sense this "solution"is not satisfactory since the traditional problem of mutual compatibility (restricted to the equipment sector goods) seems to be left unsolved. However, the mode of coordination due

to the presence of money modifies the terms of the problem.

As a consequence of the monetary character of the economy, entrepreneurs have to execute their plans without knowing their immediate consequences. That means, in contrast with an economy driven by the auctioneer, that a considerable amount of information is not available. Carrying out their decisions, entrepreneurs are looking for information. The relevant information is determined by their first intentions. With an auctioneer each entrepreneur knows all the prices. In a monetary economy each entrepreneur looks for the prices of the sole commodities in which he is interested. The entrepreneur acquires certain information on the conditions of realization of project A because he plans to realize this project A. Some information relating to another project (B) could, if available, make him switch to B. But the information will never come to him because he does not have the opportunity to try to carry out project B.

Moreover, the investment decisions of the entrepreneurs (in fact the expenditure of current expected profits) are made, not on the basis of the current profitability, but on that of the prospect of future profits. "We must not forget that, in the case of durable goods, the producer's short-term expectations are based on the current long-term expectations of the investor; and it is of the nature of long-term expectations that they cannot be checked at short intervals in the light of realised results" (Keynes General Theory p. 51). In other terms, the investment is not related to other decisions for the current period (nor are the receipts of the entrepreneurs in the equipment sector).

To sum up, the coordination relating to the investment expenditures, which gives sense to Keynes' hypothesis, is quite different from that attached to the notion of equilibrium and reminds us that the market does not exist but as a consequence of the impossibility of coordinating a priori the actions of the individuals.

Concerning the factor costs expenditures, the argument is quite different. We shall limit ourselves to the case of wages (interest payments are the consequence of prior commitments and do not raise any problems of mutual acceptance) which are the main factor cost (the sole considered in the model below).

It must be emphasized that nominal wage is not determined on a market in the ordinary sense of the term. The collective bargaining between entrepreneurs and wage-earners may bring about a wage-scale, a wage level or some kind of price-indexation but never a determined level of employment! "Price" is determined not "quantity". Trying to save the idea of a labor market by saying that labor supply is infinitely inelastic in relation to nominal wage is not the best way to take into account the fundamental asymmetry between entrepreneurs and wage-earners.

We must recall here our central theme, namely the executability of economic plans or decisions. The possession of money or the access to credit is the general prerequisite for being able to undertake economic actions. Now wage-earners are such precisely because they are not able to work on their own account and to be autonomous agents carrying out their own plans. They cannot benefit from credit creation[2]. They need money and the only way of getting it is to be waged.

The payment of the wages in this sense does not require a mutual acceptance since people are not on the same footing. In order to capture this idea the term of rapport salarial has been coined and elucidated in different ways[3].

Thus, a central feature of the economy is the working of a banking system. Whether people have, or have not, access to money created by credit they are, or are not, affected by the effective demand principle. The banking system plays part of the role of the Walrasian auctioneer, allowing the entrepreneurs to make their decisions effective. However, in sharp contrast with the Walrasian system, this coordination is independent from the general mutual compatibility of actions and from the existence of equilibrium.

<b> Now come the wage-earners. Once wage and employment have been determined they are free to use the money as they will[4]. According to the traditional maximization of a utility function under the budgetary constraint of the wage or according to whatever other principle, they fix their consumption and their saving, the latter taking the form of the variation of the amount of bonds (supposed to be perpetuities) owned or of the variation of their current account at the banks.

Here too we have to inquire into the conditions of execution of these plans.

Obviously, there is no problem for the bank deposits since workers perceive their revenue under this form. It is always possible, in principle, to accumulate all the wage in deposits.

For consumption things run differently. Even if entrepreneurs are price-setters and workers price-takers, it may happen that some desired transactions are actually impossible, supply being short. More generally, we have to make clear whether some adjustments on the market may or may not take place. These adjustments consist of prices or inventories variations. In the model below these difficulties will be overlooked in order not to obscure the main point: in any case, whatever these secondary adjustments may be, they do not modify the current level of employment nor the amount of investment. Here again we find the recursivity of the system.

For the sake of simplicity we shall suppose that entrepreneurs issue perpetuities "on tap". The idea is that long term indebtedness is always preferable to short term indebtedness to banks. Workers can thus always realize their desired transactions in bonds.

<c> It must now be emphasized that the realization of desired actions more or less independently of their mutual compatibility has a counterpart: <u>the final outcome may be highly undesirable and, at least, involuntary</u>. This is, of course, a marked contrast to equilibrium.

In a monetary economy the form taken by this is very clear and precise: some of the entrepreneurs (or all) experience a deficit. Others may realize positive balances. Some cannot repay to the banking system the money they had raised for financing their expenditures. They may incur bankruptcy. The theoretical problems raised by the settlement of the balances are too complex to be discussed here[5]. We shall suppose instead that, within certain limits, it is always possible to make the excess agents finance, directly or indirectly, the deficit agents. Whenever such a spontaneous finance cannot take place a <u>lender of last resort</u> has the option to solve or not to solve the problem. In the latter case it is possible to speak of a major crisis, in that some fundamental rules of the game have to be changed (think of the Gold Standard for instance or of the entire structure of the financial system). In the former case, that of spontaneous finance, the system may be in a state of <u>viability</u>, which means that the current rules of the game are not put into danger[6].

We have seen that the banking and financial system plays a central role at the two ends of the economic process. First it allows entrepreneurs to make their projects effective (or not if they are too far from prevalent conventions). Second it more or less guarantees that the unforeseen consequences of these actions are not too damageable for the economy as a whole. But this is less the effect of Providence or of a clear-cut perception of the system by the monetary authority than the involuntary consequence of the adoption of certain rules or conventions. <u>By viability we mean here the set of all the possible situations of the economy which do not violate these rules</u>.

Each element of this set is potentially observable and measurable since its realization is possible. Equilibrium is then no more the condition of the effectiveness of an economic situation. In a monetary economy the coordination works in such a way that equilibrium is only a particular case among all the viable positions, where all the entrepreneurs' balances are spon-

taneously equal to zero.

<d> The preceding developments enable us to do the following:

(i) To elaborate effective dynamic processes which are not simple virtual paths towards static equilibrium (see the Walrasian <u>tâtonnement</u>). All the points of these effective paths will be observable situations (if included in the viability set) interesting for their own sake; if stable, these paths will lead the economy towards an equilibrium. Equilibrium is then defined in a dynamic sense as the limit point of an orbit. It may or may not coincide with the static one according to the shape of the dynamic system (path effects are the rule in non linear models).

(ii) To examine anew the problem of the relation between investment and saving.

Two points are well-known: the equality between saving and investment is an equilibrium condition for both orthodox theory and ISLM model, whereas for Keynes and Kalecki saving and investment are two different names for the same thing. From this one may conclude either that Keynes and Kalecki are wrong or that ISLM is not a correct expression of their ideas. Mainstream economists maintain that both hold. They have accredited the opinion that ISLM was a correct formulation because Keynes' theory was not correct in its original terms .

In the framework sketched above, it is perfectly clear that investment and saving are "merely different aspects of the same thing" (Keynes <u>General Theory</u> p.74) <u>even in effective situations out of equilibrium</u> (that is to say viable).

If pI and wN are, respectively, the investment and the factor cost, pC the consumption expenditures, saving, defined as the excess of income over consumption is another name for investment. Profits are equal to the excess of receipts (pI+pC) over the costs (wN) and are the saving of the entrepreneurs (by definition they do not consume). If we add to this saving that of wage-earners (equal to wN-pC) we find the investment.

This identity is impossible to fit into a theory dominated by the notion of equilibrium. There is a natural room for it as soon as the concept of viability has been substituted for equilibrium. But this implies not only a change in words but a change in theory, namely the elucidation of the coordination of individual actions in a monetary economy with a <u>rapport salarial</u>.

II

## THE MODEL

Let us assume an oversimplified one-good economy with two groups of agents, entrepreneurs and workers, and a banking and financial system. The latter is reduced to a lender of last resort which fixes exogeneously the rate of interest and provides entrepreneurs with the quantity of the means of payment they need through credit creation. Entrepreneurs have to repay the credit at the end of the period.

Entrepreneurs determine their investment expenditures for the period according to the familiar equation:

$$(1) \quad pI = LT - er$$

where LT is the state of long term expectations exogeneously given and r the rate of the interest depending on the banking system.

They settle their current level of activity wN on the basis of their short term expectations. As we know part of these are the consequence of (1) since entrepreneurs of the equipment sector[7] work on order. Other elements are the anticipation of the extent of the market for consumption and the general conditions made by the Bank. The value of the expected proceeds R being fixed, the amount of wages is deduced through the predetermined mark up m:

$$(2) \quad wN = R/m$$

As a matter of fact, it is possible to show that m is determined by microeconomic considerations as shown in the appendix.

If pI and wN are such that the banking system provides funds for their realization, <u>entrepreneurs can execute their plans independently of their consequences upon other people</u>. It is then possible to study the macroeconomic relations showing the effects of these decisions (on the entrepreneurs themselves through the reactions of workers) without making any implication regarding the effective levels of investment and employment. Clearly this would be nonsense in a model like ISLM where the sole effective quantities are equilibrium ones.

The reactions of wage-earners are given by the consumption function and that of hoarding. The former is very simple indeed:

(3)   pC = b wN

If we introduce a public sector, we have to add the public expenditure (exogeneously determined):

(3a) pC = b wN + pG

The saving of workers takes the form of a variation in their deposit accounts M or in their bonds portfolio T. The former is given by:

(4)   M = f wN - g r

the latter by difference (T=wN-pC-M):

(4a) T = (1-b-f) wN + g r

Taking into account the way wage-earners react to entrepreneurs' decisions, it is possible to show some fundamental macroeconomic relations.

The effective profit of the entrepreneurs is the excess of receipts over the costs:

(5)   P = pC + pI + pG - wN

or:

(5a) P = pI + pG - (1-b) wN

Equation (5a) is the simplest expression of Kalecki's principle. Entrepreneurs as a whole earn what they spend because they determine, to a certain point, the level of their "budgetary constraint". There is in fact no constraint at all: by pushing up the amount of their investment expenditure, they increase at the

same time the amount of their receipts. If it were not possible
for them to fix the level of their expenditures (which in turn
implies a determinate relation to the banking system) there would
be no room for Kalecki's principle.

The effective profit may differ from the expected one, which
is equal, by definition, to:

$$(6) \quad P^e = (m-1) \; wN$$

The equality between expected and realized profit is obtained
for:

$$(R) \quad wN = (pI+pG)/(m-b)$$

It is easy to verify that the condition (R) is equivalent to
the IS curve of the ISLM model. It is the consequence of the
equality $R = pQ = pC + pI + pG$. Using (1) for expressing pI in
function of r we get from (R):

$$(IS) \quad wN = (LT + pG)/(m-b) - (e/m-b) \; r$$

On the other hand, the difference between total receipts and total
expenditures gives the amount of additional indebtedness D that
entrepreneurs must accept[8]:

$$(7) \quad D = pI + wN - pI - pC - pG$$

The deficit is equal to workers' saving minus public deficit.
If we suppose that entrepreneurs do not wish to be indebted to the
banking system, the condition of not incurring insolvency is that
the deficit be totally financed through the perpetuities issues.
Assuming public deficit pG is always financed by bonds, it is easy
to check that the condition of solvency of the entrepreneurs is
given by the constancy of the deposits of the workers, that is:

$$(LM) \quad wN = (g/f)r$$

Using (1), this condition may be expressed as a relation
between wN and pI:

$$(S) \quad wN = (gLT/ef) - (g/ef) \; pI$$

One is tempted to solve the system ISLM or the system RS.
Doing so, one finds the set of values for r, wN and pI which are
compatible with the simultaneous fulfillment of the two conditions,
relating respectively to the rentability (R) and to the solvency

(S). These values are:

$$r+ = [f(LT+pG)]/[g(m-b)+ef]$$
$$(8) \quad wN+= [g(LT+pG)]/[g(m-b)+ef]$$
$$pI+= [g(m-b)LT-efpG]/[g(m-b)+ef]$$

In the traditional methodology of static equilibrium the meaning of (8) is very clear: they are the sole values which could be effective because they define the equilibrium situation. Here the story is not the same. The relations (R) and (S) [or (IS) and (LM)] tell us nothing about the effective values of pI and wN which depend only on LT, r and R (and not on f, g or b). The interest of (R) and (S) is they allow us to characterize the effective situation of the economy given from outside the system ISLM [or RS].

Putting aside for the moment the question of the limits due to the banking system, an effective situation is any point [wN>0, pI>0] of the schema 1a (or any point [wN>0, r>0] of schema 1b). If such a point lies to the right (to the left) of (R), entrepreneurs would experience a rentability inferior (superior) to what they expected. Conversely if the point is situated to the right (left) of (S), entrepreneurs would be, from the point of view of solvency, in a worse (better) situation.

The plane is thus divided into four regions dependent upon the signs of the unexpected differences in rentability and solvency. These differences have no effect <u>during the period</u> on the value of pI and wN. It is, however, quite natural to think that they have an influence on the decisions of entrepreneurs in future periods. It is on such basic considerations that a very simple dynamic model may be built.

In regions 1 and 3 rentability and solvency considerations are acting in the same direction: the change of the current activity will be unambiguously positive (region 1) or negative (region 3). In regions 2 and 4 the two influences are of opposing signs and the outcome will depend on the relative strength of the influence of rentability and solvency: the current activity may

1 (a)
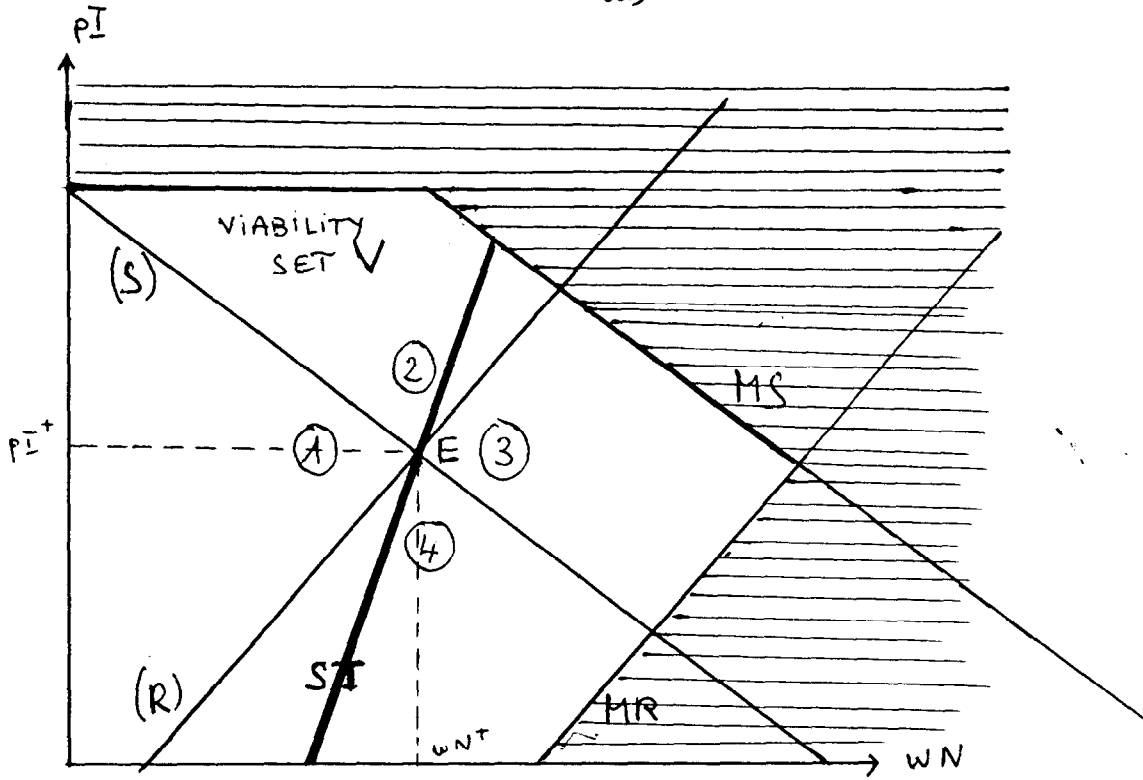


1 (b)
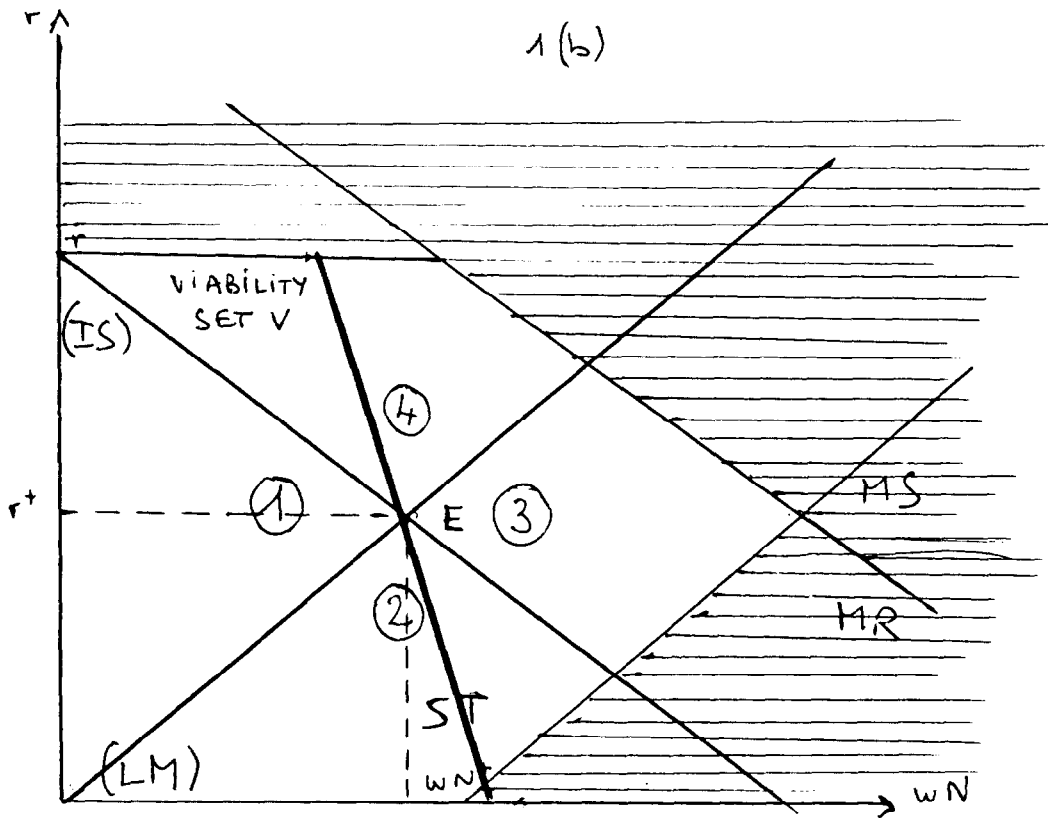
change positively or negatively according to the weight of the two influences.

In order to formalize very simply this idea, we shall assume that the change in the state of short term expectations of the entrepreneurs depends on the observations of unexpected results in the following way:

$$(9) \quad dR/dt = k_1(P-P^e) - k_2B$$

where B is the variation of the indebtedness with the banking system, equal to M.

The form adopted in (9) is very simple. It guarantees however that, even if $P = P^e$, the financial position of entrepreneurs plays a role in the motion of the economy over time (this would not be the case if the two factors were combined in a multiplicative manner)[9].

Since $dwN/dt = (1/m)\, dR/dt$ we get, substituting P, $P^e$ and B for their values in (5a), (6) and (4):

$$(10) \quad dwN/dt = (k_1/m)pI-(1/m)[k_1(m-b)+k_2f]wN$$
$$+(1/m)(k_1pG+k_2gr)$$

The general solution of (10) is:

$$(*) \quad wN_{(t)} = wN* + wN_{(0)}\, e^{-(1/m)[k1(m-b)+k2f]t}$$

where wN* is the stationary solution of (10) and $wN_{(0)}$ an initial condition. wN* will indicate the limit point of (10), if stable. It will be an equilibrium situation in the dynamic sense. The stationary solution is:

$$(11) \quad wN* = [k_1(pI+pG)+k_2gr]/[k_1(m-b)+k_2f]$$

It is easy to check that the path generated by (*) is stable: when t tends to infinity, wN(t) tends to wN*.

It is worth noticing that wN* will differ in general from the wN+ solution of the ISLM model. <u>The economy will not tend towards the static equilibrium E but towards one of the points of the line ST which depends on the value of the exogeneous rate of interest</u>. The shape of ST is positive if we suppose that the rentability motive acts stronger than the solvency motive, as is done in schema 1. wN* is a weighted average of wN given by (R) and wN given by

(S). For example, if the lender of last resort pegs the rate of interest at r+, wN* will coincide with wN+[10].

This very simple proposition is obviously dependent upon the ability of the banking system to alleviate the unexpected outcomes of the voluntary decisions of agents. It is not unreasonable to think there are some limits to the willingness of the bank to allow entrepreneurs to execute all their decisions (with the risk of experiencing bankruptcy). More generally, the rules of the game are such that all the points of the plane (wn,pI) are not possible. For the sake of illustration we shall take very simple and crude rules specifying maximum levels for tolerable differences either in rentability (MR) or in solvency (MS). These limits are represented on the schema by the straight lines MR and MS respectively.

The model is now completed with the delimitation of a viability set V which contains all the allowed effective situations. These can be classified in three classes:

(a) the static equilibrium E (the ISLM solution)

(b) the points of ST (being in V) which are dynamic equilibria reflecting the existence of a special mode of coordination between agents

(c) the points of V which are effective outside equilibrium situations (this sounds self-contradictory in static equilibrium methodology).

Properties of the dynamic equilibria (ST) are obviously those acknowledged by Keynes and Keynesian "Fundamentalists". Two of them are to be emphasized.

The equilibrium is restricted to entrepreneurs (effective demand principle) so that nothing is implied for the workers (except that N =< $\underline{N}$ where $\underline{N}$ is the amount of labour). The asymmetry between workers and entrepreneurs has as a consequence the incapacity of the workers to effect a change in such situations (through purely economic actions). If the level of activity wN* is such that, at the current level of wage w, more than N* workers

are willing to be waged there will be <u>involuntary unemployment</u>. Nothing can cure that unemployment (the price is endogeneous as shown in the appendix) except a public policy (either by changing the rate of interest or by augmenting pG).

There is <u>no monetary neutrality</u> in the economy. A change in the rate of interest (the only monetary exogeneous variable) alters the current level of economic activity and the investment (and their equilibrium level as well) as it is easy to see on schema 1 or by looking at equation (10).

## III

## A BRIEF LOOK AT ECONOMIC POLICY

Economic policy analysis in text-books is confined to comparative statics. It is the direct consequence of reasoning along the static equilibrium approach. The successive steps of the reasoning are well-known: put the model in reduced form, take the partial derivatives for economic policy exogeneous variables and comment on the values thus obtained. This leads to conclusions about the comparative efficiency of alternative economic policies according to the value of the different policy multipiers.

The legitimacy of this approach is beyond doubt, but the validity of its conclusions depends heavily upon a proof of the stability of the equilibria compared. This proof is so rarely supplied that one may think it is not even necessary...

In the framework proposed here there is no danger of overlooking the point <u>since the stationary state wN* cannot be reckoned independently of the dynamic system</u> and of the intensity of the different forces at work ($k_1$ and $k_2$).

It is beyond the scope of this paper to deal with economic policy issues. What follows is just for the sake of methodological purpose. Two cases will be examined which differ according to

the rule adopted by the lender of last resort.

Let us suppose first that the lender of last **resort is** concerned with the solvency of the banking system. If we admit that the normal activity of the banks is to provide entrepreneurs with a sufficient quantity of means of payment" and not to finance unexpected deficits, every increase in the loans to entregreneurs (at the end of the period) not only diminishes the solvency of the entrepreneurs but that of the banks as well. In that case the lender of last resort has to raise the rate of interest in order to prevent a further **decrease in** the solvency of the banks. This rule is reversible and the rate of interest would be lowered if entrepreneurs were able to be creditors of the banking system (whenever they experience high levels of bonds subscription). Formally:

$$(11) \quad dr/dt = k_3 B = k_3 (fwN-gr)$$

As $dpI/dt = -e \, dr/dt$ [see equation **(1)**], the system which describes the path of the economy is:

$$
\begin{aligned}
dpI/dt &= -k_3 efwN + k_3 egr \\
dwN/dt &= (k_1/m) pI - (1/m)[k_1(mb)+k_2 f]wN \\
&\quad + (1/m)(k_1 pG + k_2 gr)
\end{aligned}
$$
**(S1)**

The stationary solution of **(S1)** is nothing but the **wN+** and **pI+** which is the same as the static equilibrium of the ISLM model. This conclusion is quite natural since the rule followed by the monetary authority is congruent with the satisfaction of condition **(S)**. The rate of interest ceases to vary when the solvency of the entrepreneurs is granted. As (10) is stable and under the influence of the rentability motive, **wN\*** will be equal to **wN+.** Moreover, it appears that **(S1)** is **stable**[12]. A comparative statics analysis would have given the same result: replacing r by r+ in the static system formed by (R) and (S) would obviously give **wN+** and pI+.

Incidentally, it should be noticed that no stationary solution of **(10)**, except for r=r+, makes the long term expectations compatible with the short term ones. It is therefore necessary

that the monetary authority intervene by adjusting the rate of interest. Without this action the rate of interest has no equilibrium value from a Keynesian point of view[13].

A second example can be studied wherein the lender of last resort attempts now to drive the economy towards a predeterminate financial structure, say a fixed profits/investment ratio a*. It will raise (decrease) the rate of interest if the observed P/pI is below (above) a*. Formally, the economic policy is:

$$(12) \quad dr/dt = - k_4(P - a*pI)$$

Accordingly, the dynamic system is now, (replacing P by its value):

$$(S2) \quad \begin{aligned} dpI/dt &= ek_4(1-a*)pI - ek_4(1-b)wN+ek_4pG \\ dwN/dt &= (k_1/m)pI \quad - (1/m)[k_1(m-b)+k_2f]wN \\ &\quad +(1/m)(k_1pG+k_2gr) \end{aligned}$$

In general the stationary solution of (S2) will differ from (S1) since the stationary rate corresponding to rule (12) is not equal to r+ except by chance for a particular value of a*[14]. It appears here that economic policy aims cannot be determined on purely normative grounds. The rule (12) fails because it is not relevant for entrepreneurs. They do not take, in this model, the P/pI ratio into consideration. This simple case is an illustration of the difficulties of shaping a "structural" economic policy.

Furthermore system (S2) is stable or unstable depending on the value of the parameters. All things being equal, the stronger the action of implementing a* (that means $k_4$ high) the greater the risk of instability[15]. It is the same for the intensity of the entrepreneurs' reaction to variations in the rate of interest.

This second example shows how irrelevant it may be to study economic policy with comparative statics only.

APPENDIX

On some microeconomic foundations of the model

Assumptions made in the text are rather crude. The pedagogical purpose cannot account for all the oversimplifications of the model. One assumption is crucial which states that entrepreneurs fix their price according to a predetermined mark-up pricing rule. As nominal wage and technology are supposed to be constant, this assumption amounts to that of exogeneous fixed price.

Kalecki's degree of monopoly theory is not very satisfactory since, according to its author, it seems independent of any maximizing behavior of the entrepreneur. "In view of the uncertainties faced in the process of price fixing it will not be assumed that the firm attempts to maximize its profits in any precise sort of manner"[16].

However, it is well known that it is possible to make the determination of the mark up the outcome of the maximization of profits.

Let us consider the entrepreneur i. He has to decide the price $p_i$ and the current level of the activity $wN_i$. His constraints are the technique of production, given by:

$$\text{(a)} \quad q_i = x_i N_i$$

and the proceeds he expects to get from his decisions. It seems sensible to assume that the share $y^e_i$ of the anticipated market $R^e_i$ the entrepreneur expects to get depends on the price $p_i$ as compared with the average price $p^e_i$ he thinks the market will exhibit. The higher the ratio $p_i/p^e_i$ the smaller his market share. Note that $p^e_i$ may differ from one entrepreneur to another. For the sake of simplicity we shall retain a linear negative relationship between $y^e_i$ and the ratio $(p_i/p^e_i)$:

$$\text{(b)} \quad y^e_i = u_i - z(p_i/p^e_i) \quad \text{with } 0 < z < u_i < 1$$

The expected profits of entrepreneur i are then:

$$\text{(c)} \quad P^e_i = [u_i - z(p_i/p^e_i)]R^e_i - (q_i/x_i)w$$

Since $q_i = (R^e_i/p_i)y^e_i$, (c) may be written:

(d)     $P^e_i = [u_i - z(p_i/p^e_i)]R^e_i[1-(w/x_ip_i)]$

The price $p_i$ which corresponds to the maximization of expected profits is given by making the partial derivative $(u_iw/x_ip^2_i)$ - $(z/p^e_i)$ equal to zero - the second order derivative is negative. We get:

(e)     $p*_i = (u_i/z)^{.5}(w/x_i)^{.5}(p^e_i)^{.5}$

The expression (e) conforms to Kalecki's result except for the linearity. The price is a function of the cost of production $(w/x_i)$ and of the expected average price of the sector $(p^e_i)$.

If entrepreneurs expect the average price to be related to average cost by a mark-up reflecting average conditions of production and market, say:

(f)     $p^e_i = (u/z)(w/x)$

where $u$ and $x$ are the corresponding macroeconomic counterparts of $u_i$ and $x_i$ (for the sake of simplicity $u$ and $x$ are supposed to be known by entrepreneurs), the equation (e) becomes:

(g)     $p*_i = (h/j)(u_i/z)(w/x_i)$

where $h$ and $j$ indicate the relative position of entrepreneur $i$ as compared with the economy as a whole [ $u = h^2 u_i$ and $x = j^2 x_i$).

In the case of the representative entrepreneur, the price is given by

(h)     $p* = (u/z)(w/x)$

with $(u/z)=m$ (see text).

From $p*_i$ it is possible to deduce $q*_i$ and $N_i$:

(i)     $q*_i = y^e_iR^e_i/p*_i = (j_izx_i/h_iu_iw)[(h_iu_i - z_ij)/h_i]R^e_i$

(j)     $wN*_i = wq*_i/x_i = (j_iz/h_iu_i)[(h_iu_i-zj_i)/h_i]R^e_i$

Consequently, we have all the elements necessary to determine from individual entrepreneurs' decisions not only the aggregate level of the activity $wN$ but the feed back effects upon the rentability and the solvency of entrepreneurs (if we add an assumption on the distribution of the bonds subscription between entrepreneurs).

FOOTNOTES

1.  In orthodox theory this link (store of value) is the unique attribute of money which allows the price of money to be positive at equilibrium (see the overlapping generations models). Far from being a specific feature of Keynes' thought (or its main interest), the weight attached to this alleged function of money constitutes the main common point with orthodoxy! Moreover it prevents the investigation of other directions.

2.  The consumption credit ought not to be confused with credit. Briefly: consumption credit is reimbursed through future wages (intertemporal allocation of income) whereas production credit is repaid with sales.

3.  C. Benetti and J. Cartelier (Marchands, salariat et capitalistes Paris 1980 Maspéro) characterize the wage relationship as monetary submission. Generally it has been argued that the payment of the wage does not imply the delivery of a determinate quantity of labor. The execution of the "contract" requires thus particular procedures more or less related to production. This has been extensively studied by orthodox (Stiglitz) or heterodox authors (S.Bowles,R.Boyer etc.).

4.  Incidentally, it is worth recalling that this is a very important difference from classical economics where the asymmetry between entrepreneurs and workers is expressed by making the real wage part of the means of production.

5.  See C. Benetti and J. Cartelier "Monnaie et formation des grandeurs economiques" in La formation des grandeurs economiques Encyclopedie Diderot PUF Paris forthcoming 1989

6.  The term reproduction might be more appropriate with the obvious advantage that it refers to a respectable tradition. But Classical economists and modern Neoricardians seem to have not had much to say about the executability of transactions out of equilibrium. Their neglect for money is obviously at the heart of this gap.

7.  One may find it useless to speak of an equipment goods sector in a one-good economy.  This is, however, correct if it is recalled that investment is not defined by the use value of the goods but only by the nature of the agents doing the transaction. As Keynes put it: "The criterion [between consumption and investment] must obviously correspond to where we draw the line between the consumer and the entrepreneur"(GT p.62)

8. It is assumed that the economy is described ab ovo without any accumulated financial assets.  This hypothesis is obviously inessential and, in any case, the reasoning could be adapted to more realistic assumptions.

9.  A different assumption could be made to take into consideration an idea advocated by H. Minsky: entrepreneurs`are not very aware of their financial position until it reaches a critical level, say B*.  Equation (9) would be:

(9a)    $dR/dt = k_1(P-P^e) - k_2(B - B*)$

Under this assumption, the equilibrium locus would be:

(11a)    $wN* = [k_1(pI+pG)+k_2(gr+B*)]/[k_1(m-b)+k_2f]$

The locus would not even contain E!

10.  It must be recalled that in this model r, as an exogeneous variable, replaces the money supply of the ISLM model.  It does not sound unreasonable to say that r is fixed conventionally (see General Theory chapter 15).  In the ISLM framework r is endogeneously determined; in the model presented it is the degree of solvency of entrepreneurs which is endogeneously determined. This (sole) departure from ISLM theory is the straight consequence of having assumed a monetary coordination of the actions of entrepreneurs.

11.  It would be very easy to take into account the interest paid by the entrepreneurs; it would be part of the factor costs.  The banks would spend these receipts either in investment or in wages.

12.  Determinant of the matrix of the homogeneous system is positive $[k_1k_3ef/m > 0]$ and the trace is negative $\{-(1/m)[k_1(m-b)+k_2f\}$.

13.  The same is true for the Classics and for Marx.

14.  It would be the case only if $a*= [g(m-1)(LT+pG)]/[g(m-b)LT-efpG]$.

15.  The trace of the coefficients matrix of the homogeneous system is positive or negative according to whether mek4 is greater or less than $k_1(m-b)+k_2f$.  The determinant is positive (negative) if $(1-b)/(1-a*)$ is greater (less) than $k_1(m-b)+k_2f$.

16.    M.Kalecki "Costs and prices" in <u>Selected essays on the dynamics of the capitalist economy</u> Cambridge University Press 1971 (p.44)