IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 12, Issue 6 Ser. I (Nov. – Dec. 2021), PP 01-17
www.iosrjournals.org

The inadequacies of standard market equilibrium models explained by mathematical graph analysis

Paul ROSELE CHIM[1]
BETA EMADD BIO MINEA UR 7485 University of French Guiana

Nestor RADJOU[2]
Expertise & Development French Guiana

Abstract
The merchant mode of wealth distribution probably dates back to the Palaeolithic with the sharing and giving of wealth. However, the market takes on a completely different meaning in the economy of production with the appearance of excesses and deficiencies of production activating the act of exchange. Over time, it has become the mode of allocation that is at the heart of liberal economies. It is the fundamental mechanism of distribution where it constitutes the main mechanism of wealth distribution. Does this mean that it is fair ?
From Smith to Ricardo and Marx, via Walras and Keynes, Political Economy shows us and demonstrates the market as the expression of confrontations, desires and power relations, through the exchange and transfer of resources. It is part of a vision of the world, a conception of the individual and of society with which a state of knowledge is associated, and describes both a flow of wealth distribution and a degree of dissatisfaction or satisfaction resulting from the underlying management of desires.
In order to formally grasp it, outside of any ideology, in this paper, we adopt a mathematical point of view by looking at it as an oriented graph valued by a flow of "goods", which translates all the forms of configuration of economic relations of exchanges and transfers of resources between agents, which, moreover, are regulated by an institutional framework. Through our approach, the object of this study is to show the ins and outs of the standard equilibrium models that inspire current traditional economic policies. After having set the formal modelling framework and characterised the notion of market equilibrium (fiscal and total), we show that any equilibrium proves to be incompatible with variations in the money supply. We thus establish that traditional equilibrium models do not address the crucial economic problem of equitable distribution, and thus the capital-labour relationship. They are modes of investigation that hide the initial inequalities, as well as the impacts of economic and social policies with regard to individuals' desires for well-being.

Keywords
Macrodynamics, GDP, Aggregate investment, Capitalist systems, Economic systems, Quantittative methods.
JEL Classification
C6, P1, E2, E4, E5, E6

Date of Submission: 18-10-2021 Date of Acceptance: 02-11-2021

I. Introduction

The importance of equilibrium models lies in the fact that they are essentially the only ones to inspire the economic and social policies of contemporary market economies. Yet, in view of their results and social realities, these models are challenging. Are they at the service of certain ideologies ? Are they involved in the production of social inequalities ? These are legitimate questions that cannot be answered without questioning their nature and consistency with regard to the social purpose of the economy, which we should first recall.

At all times and in all places, men have needs and in order to satisfy them they have been, since the dawn of humanity, compelled to live in society, which organizes living together on the basis of the production and distribution of the wealth necessary to satisfy the needs, individual and collective, of its individuals. And although they are all different today, societies have nevertheless retained the same framework: three variables - a population, a territory, and a mode of production and distribution of wealth - on which a driving force

[1] HDR in Economics and Management of the University of Paris 1-Pantheon Sorbonne, France, and Doctor of the University of Paris X-Nanterre, France.
[2] Expert Doctor in Mathematics of the University Pierre and Marie Curie, France and Doctor in Economics of the University of Paris IX-Dauphine, France.

operates, i.e. a conception of the world and of the individual that is conveyed, on the one hand, by a governance that manages education and the cohesion of the whole, and, on the other hand, by a cultural and technical complex that ensures a dynamic of progress. Thus, the economy appears as the substratum of any society in which its purpose is to guarantee the living conditions and well-being of the population. How to produce and how to distribute are its essential concerns.

In this perspective, the notion of the market as a means of distributing wealth probably dates back to the Palaeolithic era with the sharing and giving. But the market takes on its full meaning in the agricultural production economy of the Neolithic period, where production excesses and shortfalls appear and give rise to exchanges. However, it was not until Ancient Greece that it asserted its current mechanical form with money and trade. Nevertheless it is after the industrial revolution, in the 19th century, that the market becomes the mode of explanation of the liberal economies where it constitutes the principal mechanism of distribution of wealth. Is this distribution equitable for all that ?

In fact, with regard to today's differences in wealth accumulation, the market appears as the expression of confrontations of desires and power relations, through the realization of exchanges and resource transfers. It is part of a vision of the world, a conception of the individual and of society with which a state of knowledge is associated, and describes both a flow of wealth distribution and a degree of dissatisfaction or satisfaction resulting from the underlying management of desires. To formally grasp it, outside of any ideology, we adopt a mathematical point of view by looking at it as an oriented graph valued by a flow of "goods", which translates all the forms of configuration of economic relations of exchanges and transfers of resources between agents, which moreover are regulated by an institutional framework. Through this approach, the aim of this paper is to show the ins and outs of the standard equilibrium models that inspire current traditional economic policies. After setting the formal modeling framework and characterizing the notion of market equilibrium (fiscal and total), we show that any equilibrium is incompatible with variations in the money supply. It is thus established that traditional equilibrium models do not address the crucial economic problem of equitable distribution, and thus the capital-labour relationship. They are modes of investigation that conceal initial inequalities, as well as the impacts of economic and social policies with regard to individuals' desires for well-being. In particular, it shows that these models, Walrasian and Keynesian, restrict themselves to price or quantity adjustments only, within the framework of a notion of equilibrium that is incompatible with any variation in the money supply. As a result, the Walrasian and Keynesian markets are placed in an institutional environment of simple recirculation of savings and accumulation of wealth by the former to the detriment of the latter.

1. Standardization of equilibrium models

The economic agents are on the one hand individuals, natural persons who have to satisfy needs, especially vital needs. On the other hand, they are institutions which, as legal entities, organize the production and distribution of wealth. All have resources that enable them to produce (labor, goods, services, money ...), consume and accumulate wealth to satisfy their needs. To this end, they are led to exchange their resources, one with the other, within the framework of a functional organization of the society in which they express themselves. These exchanges, which are based on a mode of resource distribution, refer back to the notion of the market, which we first propose to formalize in a single framework, in order to analyze the relevance of academic models of market equilibrium, both Walrasian and Keynesian.

1.1. The market backbone as a value-oriented graph

By definition, we call market, at an instant or over a fixed period, the data (G, Z) of a graph oriented G = (A, U) and valued by a flow Z of resources, where :

The vertices are the elements of A, of the economic agents characterized by the nature of their function (household, company ...) and the resources at their disposal ;

The arcs $u \in U$ $(\subset A \times A)$ are the pairs of co-traders ;

Valuation is an application Z of U in the resource space $F \subset R^n$ such that :

$U \xrightarrow{Z} F$ et on note $Z(u) = Z_u$

Concretely, an arc u = (a, b) and its valuation, $a \xrightarrow{Z_u} b$, mean that the agent a , the offerer, transfers to the agent b , the requester, a quantity Z of its resources, the result of confrontations of desires, negotiations and choices, constrained or not, which give rise, at the end of the market, to the variation of the initial resources of the agents.

With this definition of the market one can, within the framework of graph theory, study the different market configurations, as well as many other problems, such as supply circuits. However, the very high number of peaks, millions or even billions of economic agents, can prove to be an insurmountable obstacle, even for today's most powerful computers. To get around this difficulty, the economy groups agents of the same nature into categories, but grouping is also problematic. Can the behavior of a group be a simple aggregation of individual behaviors ? The answer, which comes from psycho-sociology, separates the microeconomic approach

of classical theories from the macroeconomic approach of Keynesians who, like sociologists, consider the behaviour of a group to be specific and different from the simple sum of its components.
In order to be able to calculate the resource variations of the agents at the end of the market, the incidence matrix associated with the graph G = (A, U) of the market is introduced :

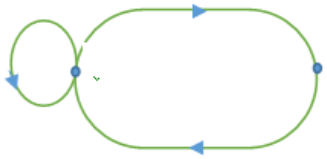
$$M(G) = (\beta_{a,u})_{a \in A,\ u \in U} \qquad \text{with} \qquad \beta_{a,u} = \begin{cases} -1 & si\ u = (a,b)\ et\ a \neq b \\ 1 & si\ u = (b,a)\ et\ a \neq b \\ 0 & otherwise \end{cases}$$

Where each row corresponds to a vertex (an element A) and each column to an arc. (A row thus indicates the number of arcs incident to a vertex and on a column there are various 0 and exactly one 1 and one -1).
And we immediately get the matrix form of the market :
$(S_a)_{a \in A} = M(G).Z$
with $S_a = \sum_{u \in U} \beta_{a,u}.Z_u$ Net change in resources of a
It allows to calculate mechanically, at the end of the market, in real or monetary terms, the resource variations of all the agents. At each peak, an incoming flow is a resource and an outgoing flow a job and for any couple of co-swappers u = (a , b) we have :
$\beta_{a,u}.Z_u + \beta_{b,u}.Z_u = 0$ Principle of double-entry accounting.
It is, obviously, the translation of the employment-resource equality ; what is given by one is received by the other. Moreover, with this relationship we find two important laws of classical economics, the law of Say and the law of Walras.
For this reason, in note for any agent has A :
$U^+(a) =$ set of arcs having as origin
$U^-(a) =$ set of arcs having a as extremely
$U(a) = U^+(a) \cup U^-(a) \quad et \quad U(B) = \bigcup_{a \in B} U(a)\ \ pour\ tout\ B \subset A$
And we can then write the resource variation of an agent a in the form :
$S_a = \sum_{u \in U^+(a)} Z_u - \sum_{u \in U^-(a)} Z_u$ Net balance of exchanges of a with others
Resource input Resource output
By posing :
$D_a = \sum_{u \in U^+(a)} Z_u$ and $D^+ = \bigcup_{a \in A} S_a^+$
$O_a = \sum_{u \in U^-(a)} Z_u$ and $O^- = \bigcup_{a \in A} S_a^-$
We can thus interpret ensemble D_a of the incoming resources as the realization of a global demand for a in return for a global supply O_a, the totality of the resources coming out of a. This makes it possible to write the variation of the resources of any agent a in the form of a difference between demand and supply :
$S_a = D_a - O_a$
It then follows that for any oriented and valued graph (G, Z), as well as for all its subgraphs, the following relation (1) is always verified :
$S_A = \sum_{a \in A} S_a = \sum_{a \in A,\ u \in U} \beta_{au}.Z_u = D^+ - O^- = 0$ (Resource = Employment) (1)
In other words, on any market, the sum $O^-$of all the realized offers is equal to the somme $D^+$of all the realized requests, since what goes out at some goes in at others. From the formal point of view, any market is at its closing globally mechanically balanced $(D^+ = O^-)$ and this formal balance of supply and demand is indeed a statement of the law of Say[3] .
In particular, by noting S_I the variation in the resources of any group of agents I of A, we have :

$$S_I + S_{A-I} = 0$$

In other words, if through the market alone a group of agents I increases its resources, it is necessarily to the detriment of the other $A - I.$. The knowledge of S_I implies that of S_{A-I} and we also find one of the forms of Walras' law[4]: if $S_I = 0$ then $S_{A-I} = 0$
For an illustration, we use $A = \{I\ ,\ J\}$ where I is all the individuals and J is all the "legal persons" of the social organisation (State, administrations, companies, banks, foreigners). The configuration of the market takes the reduced form of the following figure (1) :

[3] "Products are exchanged for products" is one of its original formulations.
[4] Walras' law can also be stated as follows : when equilibrium is reached on (m-1) markets, it is achieved on all m markets



$$whre \begin{cases} u = (J,J) \\ w = (J,I) \\ s = (I,J) \end{cases}$$

Figure 1

and whose matrix expression is :

$$\begin{pmatrix} S_J \\ S_I \end{pmatrix} = M(G).Z = \begin{pmatrix} 0 & -1 & 1 \\ 0 & 1 & -1 \end{pmatrix}.\begin{pmatrix} Z_u \\ Z_w \\ Z_s \end{pmatrix} = \begin{pmatrix} Z_s - & Z_w \\ Z_w - & Z_s \end{pmatrix}$$

with $S_I + S_J = 0$

In this reduced market, individuals I provide institutions J with their labour and savings, in exchange for the income (capital, labour) that they allocate to their consumption and savings. And the institutions, for their part, use what they receive to produce new resources (goods, money...) for the production, consumption and accumulation of wealth. Here we find the simplified architecture of the Walrasian and Keynesian model.

More generally, in any economy where exchanges of resources take place, a market is formally characterised by the fact that it is a valued oriented graph, (G,Z), $G = (A,U)$ whose matrix form is well defined by the system :

$(S_a)_{a \in A} = M(G).Z$ matrix expression

avec $S_a = D_a - O_a$ variation of resource of a

$\sum_{a \in A} S_a = 0$ always checked (key (1))

The number of peaks, the elements of A, is the order of the market and gives an idea of the size and complexity of the market.

This formalism makes it possible to deal with the problems of the distribution of the wealth produced through the study of the configuration of the market and its valuation Z, but the nature of the variations S_a of resources depends on what the agents are. For example, in a monetary economy :

- if the agent a is a household, S_a is the difference between the income received (labour, capital, loans, etc.) and its expenditure on consumption, equipment, premiums, savings, etc.
- if E is the set of "foreign" agents, the rest of the world, S_{rm} is the balance of payments balance, which acts on the volume of the money supply, which is growing pour $S_{rm} > 0$;
- if B is all the banks, $S_B = -S_{A-B}$ corresponds to the variation in the money supply (*creation for* $S_B < 0$ *and destruction for* $S_B > 0$ *)* resulting from the market and it impacts the overall volume of market transactions. When $S_B = 0$ the money supply remains constant and the banks simply put back into circulation the savings they receive. As for the market, it merely redistributes income.

Clearly, with this formal approach to the market, whatever its nature and the way in which it distributes resources, the reality of exchanges and the evolution of the resources of the agents of any market economy are faithfully reflected. This provides a mathematical tool for studying the various aspects of the evolution of the distribution of wealth, in particular by restricting itself to sub-graphs where the market is limited to one or more goods at a time, such as the markets for goods and services, capital, labour, money, etc.

However, this universal model remains at this stage incomplete to grasp the various existing theoretical models. It needs to be supplemented by hypotheses relating to the behaviour of agents, the social context and the institutional framework. In this perspective, it is considered that the variation of resources from the market is the result of the manifestation of human behaviours and relationships, which cannot be dissociated from the organisation and dynamics of the society in which they are expressed. These behaviours are therefore the result of a very large number of variables that should be integrated into this formalisation of the market. For this, two types of variables can be distinguished, one of institutional action noted v is observable and reports on the economic and social policies implemented. The other is an indeterminate variable t (taste, motivation, information...) which can remain hidden from the eyes of observers (economist...). By incorporating them into the data in the above system, the following formal standard study model is defined for any market (I) with :

$(S_a(v,t))_{a \in A} = M(G).Z(v,t)$

$S_a(v,t) = D_a(v,t) - O_a(v,t)$

$\sum_{a \in A} S_a(v,t) = 0$ always checked (key (1))

This model, as an oriented and valued (G,Z) graph, is well adapted to the study of various economic approaches, such as the aggregation of agents, the reduction of the market to one or several goods... For example, the notions of market size, its geographical location, distribution circuit, clientele... are respectively translated in terms of the order of the graph, the connectedness and the notions of path and antecedents of the vertices.

However, in order to exploit and deepen this market modelling, it will generally be necessary to associate certain hypotheses with it. For example, if $H(v,t) = \sum_{a \in A} S_a(v,t) = 0$ and H is assumed to meet the conditions of the implicit function theorem, then the variable t is locally dependent on v , dire $t = \varphi(v)$. In other words, the distribution of resources from the market is punctually determined by the action of the institutional framework. As another example, if we look at the variable v as a parameter and ask for any agent a , , $S_a(v,t) = S_{v,a}(t)$, then, when the function fonction $S_{v,a}$ is sufficiently regular, it is slowly distorted when v varies continuously without changing its nature, except at certain singular points where it changes abruptly in nature. This is what happens when an agent's income reaches a certain level which allows him to change his consumption pattern and social status.

However, it is not possible to examine the traditional equilibrium models of the market economy without introducing money and notions of equilibrium into this standard model.

1.2. Various notions of market equilibrium

Modern economies are monetary economies, where every transaction of goods (goods, services, labour, securities...) has a counterpart in money and there is a duality between the real economy and the monetary one. Hence the existence of two components of the flow Z = (X , Y) of resources, one material X (goods, services, securities...) and the other monetary Y (expenditure, purchase, contribution...) and therefore for every arc u :

$$Z_u = (x_u, y_u) \text{ où } \begin{cases} x_u \in F \subset R^n \quad goods \\ y_u \in \mathbb{R} \quad income\ (currency) \end{cases}$$

Consequently, the formal standard market model can be reduced to a material or monetary form. As with any given price-wage system p , for any given arc u :

$y_u = p.x_u + m_u$

where m_u représente represents a transfer of income (social assistance, taxation, bonus, etc.)

The reduction of a market to its monetary form does not erase the material form and via via px_u allows adjustments by p-prices or quantum. For example, in the goods and services market alone, any material transaction x_u corresponds, via the price-wage system p, to the monetary transaction $y_u = p.x_u$ and vice versa.

Firstly, to define what the idea of the equilibrium of maximum material satisfaction can be, we place ourselves in the framework of the standard formal market model defined in (I), reduced to its material form, that's to say :

$(s_a(v,t))_{a \in A} = M(G).X(v,t)$

with $s_a(v,t) = d_a(v,t) - o_a(v,t)$ (*variation in goods*)

$\sum_{a \in A} s_a(v,t) = 0$ always checked

we conjecture that the variation $s_a(v,t)$, a commodity complex is never zero, so :

$s_a(v,t) = d_a(v,t) - o_a(v,t) \neq 0.$ (**2**)

because it is a matter of exchanging goods and it would be absurd to give exactly what one wants to receive.

Moreover, it is admitted that economic agents are not necessarily satisfied with the transactions they carry out, which do not always correspond to their wishes. Especially since not only do some agents do not have sufficient available resources to acquire the resources they need, they also have to adapt to market constraints. They are therefore led to replace their desired transactions $s_a^*(v,t) = d_a^*(v,t) - o_a^*(v,t)$ by their actual realised transactions $s_a(v,t) = d_a(v,t) - o_a(v,t)$.

So, we pose :

$z_a(v,t) = s_a^*(v,t) - s_a(v,t)$ (3)

Desired Achieved

and this difference is interpreted as a net oversupply/demand by agent a. It is also, for agents, an expression of a degree of dissatisfaction stemming from the market. When $z_a(v,t) = 0$, all agents are fully satisfied, as each agent completes his desired transaction, that's to say :

$s_a(v,t) = s_a^*(v,t)$, where again $[d_a^*(v,t) = d_a(v,t) \quad and \quad o_a^*(v,t) = o_a(v,t)]$.

The real equilibrium of the market is thus defined by the fact that all the agents carry out their desired material transactions. In other words, when :

$(z_a(v,t))_{a \in A} = 0$ Real equilibrium

On the other hand, we can have $Z(v,t) = \sum_{a \in A} z_a(v,t) = 0$ without the real balance being achieved, because without creating new resources, but within a framework of power relations between agents, some may increase their resources to the detriment of others. All the more so since, in view of the realities, such as the egoism that individualism fuels, real equilibrium is an ideal or even a utopia. When it inspires the implementation of economic and social policies, it can even become a tool for exploiting and reinforcing inequalities. For, generally speaking, the desires of one and the other are not totally reconcilable on the market and therefore $z_a(v,t) \neq 0$, for certain (most numerous) agents, who are forced by institutional hierarchisation to adapt their

demand to their available resources. As a result, the fonctions $z_a(v,t)$ express the levels of divergence, conflicts of interest and intensity of power relations, power ...

Moreover, this notion of real equilibrium, that of the satisfaction of the desires of all agents, remains insufficient to recover the notions of equilibrium of the academic, Walrasian and Keynesian models. To remedy this, money should be introduced as the medium of exchange and be placed within the framework of the standard market model, in its monetary version :

$(S_a(v,t))_{a\,\epsilon\,A} = M(G).X(v,t)$

with $S_a(v,t) = D_a(v,t) - O_a(v,t)$ request/offer

$\sum_{a\,\epsilon\,A} S_a(v,t) = 0$ always checked

In this context, and in contrast to the flow $X(v,t)$ of goods, the flow $Y(v,t)$ of money can be interpreted as a numerical function to account for the circulation of money in the market. Thus, if the market is not to amplify inequalities in the initial allocation of agents' disposable incomes, it is essential that the variations in income derived from the market are zero, and therefore that no agent increases its resources at the expense of another.

Hence the definition of fiscal balance that is adopted and which requires the money flow $Y(v,t)$ to be a flow on graph G, that's to say :

$(S_a(v,t))_{a\in A} = M(G).Y(v,t) = 0$ (All budgets are balanced)

This budgetary balance therefore leaves the initial allocations of agents' income unchanged. There is, via the market, neither an increase nor a decrease in agents' income and the money supply (sum of available income) remains constant. This means that, on the one hand, the balance of payments $S_{rm}(v,e) = 0$ is in equilibrium and that, on the other hand, the banks do not create additional money $S_B(v,e) = 0$ and are content to put the savings collected back into circulation; the market simply reallocates income. Thus, like the real balance, the budget balance is an ideal, a utopia, which, by imposing that all agents balance their budget at the end of the market, conceals the hierarchical social structures and power relations that are expressed through the distribution of wealth.

Nevertheless, since the balancing of the market budget is compatible with the dissatisfaction of the agents, it is necessary to complete this notion of balance by introducing the concept of total balance, which consists of the juxtaposition of the actual and fiscal balance. In other words, the market is in total equilibrium when :

$(S_a(v,t))_{a\in A} = M(G).Y(v,t) = 0$ Income invariance

$z(v,t) = (z_a(v,t))_{a\in A} = 0$ maximum satisfaction of everyone

With this fictitious equilibrium, each agent realizes his desires on the market and, moreover, none of them increases or decreases his income on the market ; the increase in income of one agent can only result from the increase of the money supply or the decrease of the income of another. However, excess demand can be zero, $Z(v,t) = \sum_{a\,\epsilon\,A} z_a(v,t) = 0$, without the market being in total equilibrium.

In short, we will show that the architecture of the academic market models, Walrasian and Keynesian, is well defined by the following formal standard model :

$(S_a(v,t))_{a\,\epsilon\,A} = M(G).Z(v,t)$

with $S_a(v,t) = D_a(v,t) - O_a(v,t)$

$\sum_{a\,\epsilon\,A} S_a(v,t) = 0$ always checked , key (1)

whose valuation $Z(v,t)$ is reduced, as far as necessary, to its material component $X(v,t)$ *or its* monetary component $Y(v,t)$.

To which are associated the notions of equilibrium :

Total equilibrium component $\begin{cases} Y(v,t). \text{ is a flow, for the budgetary equilibrium} \\ Z(v,t) = 0 \quad \text{real equilibrium} \end{cases}$

2. Academic Models of Market Equilibrium

The contemporary market economy is dominated by neo-liberal and Keynesian ideologies, even though these remain in many respects questionable, especially as the economic and social policies they generate are not effective in meeting the demands of fair distribution of wealth and social justice. The models they use are based on a Walrasian or Keynesian vision of market equilibrium, the validity of which must be examined in the light of reality.

In this perspective, the problems of production are concealed and only the problem of the distribution of wealth is considered. This brings us back to the formal standard model (I), where the architecture of any market is well defined by an oriented and valued graph $(G,\ Z(v,t))$ where $G = (A,U)$ gives the configuration and the flow $Z(v,t)$ the exchanges of resources carried out:

$(S_a(v,t))_{a\,\epsilon\,A} = M(G).Z(v,t)$ variation resources from the market

With $S_a(v,t) = D_a(v,t) - O_a(v,t)$ Demand and offer realised

$\sum_{a\,\epsilon\,A} S_a(v,t) = 0$ the sum of the variations is always zero,

The valuation $Z(v,t)$ being reduced, as far as necessary, to its material component $X(v,t)$ or its monetary component $Y(v,t)$.

With for any couple (a,b) of co-traders

$$Z_{ab}(v,t) = (x_{ab}(v,t), y_{ab}(v,t)) \ where \begin{cases} x_{ab}(v,t) \in F \subset R^n & \text{goods} \\ y_{ab}(v,t) \in \mathbb{R} & income\ (currency) \end{cases}$$

$and\ y_{ab} = p.x_{ba} + m_{ba}$; p *prices and* m_{ba} *income transfers*

However, each model is characterised by the assumptions associated with it, particularly concerning the classification of its agents, their behaviour and the nature of its resources, as well as by the specification of the exogenous v and endogenous t variables.

2.1. The Walrasian model as a standard total equilibrium model

The Walrasian economy is the archetype of neoclassical theories. Its approach is microeconomic and consists of the study of a standard individual behaviour of its agents with the aim of regulating the economy by the market alone ; the state should limit itself to its regalian functions only. However, to the extent that goods are only exchanged for goods (goods, services, labour, securities, etc.), possibly for cash as a simple intermediary (a pseudo-money), the Walrasian economy is in fact a barter economy. The Walrasian agents $a \in A$ are indeed individuals who are both consumers and producers. They hold resources $= (q_a)_{a \in A}$, produce wealth and, according to their needs, exchange it on the market with the objective of maximising their satisfaction, which is determined by their function of utilité $U_a(x)$, under the constraint of prices and income. And, although each product has its own market, Walrasian theory aggregates them into a single whole, hiding their possible interactions.

It emerges that the Walrasian market is an oriented, symmetrical and valued graph (G,X) well characterised by the formal standard model (I), reduced to its material form :

$(s_a(r,p))_{a \in A} = M(G).X(r,p)$ Change in commodity resources s

With $s_a(r,p) = d_a(r,p) - o_a(r,p) \in F \subset R^n$ excess demand for goods

$\sum_{a \in A} s_a(r,p) = 0$ Always checked, by definition

and to which Walrasian data and hypotheses are associated :

1) An allocation $q = (q_a)_{a \in A}$ of agents' real resources ;
2) The specification of the variables : t = p the cash; $v = r = (pq_a)_{a \in A}$ income ;
3) A utility function $U_a(x)$ for each agent a.

In other words, the production supply $q = (q_a)_{a \in A}$ of Walrasian agents is fixed and, for a cash p , is translated into virtual income $r = (pq_a)_{a \in A}$. As for the agents' behaviour on the market, the utility functions $(U_a(x))_{a \in A}$ evaluate the satisfaction that the agents derive from their choices with the aim of maximising it. The whole edifice of the Walrasian model is thus based on the production offer q , the utility functions $U_a(x)$ and a numerary p, which turns out to be a simple calculation artifice imposed on all Walrasian agents as a common reference frame of exchange value. It allows, among other things, to interpret the product pq_a[5] as the available "income" r_a of the agents, $r_a = pq_a$, and to obtain, via the mathematical notion of scalar product, a monetary expression of the Walrasian market, that's to say :

$\left(S_a(r,p)\right)_{a \in A} = M(G).Y(r,p)$

Where $S_a(r, p) = p.s_a(r, p)$ $(= D_a(r,p) - O_a(r,p))$

This is how the Walrasian equilibrium is defined.

As the supply is in fact fixed by the allocation $q = (q_a)_{a \in A}$ of resources, the model takes as the only demandes $d_a(r,p)$ transaction solutions that can be carried out on the market, the x solutions of the system :

$U_a(x)$ $tel\ que$ $p.x \leq r_a = p.q_a$ (3)

In other words, these solutions $x = d_a(r,p,)$ define the demand functions of the agents and, supposed to be continuous, derivable and decreasing functions of p, they verify $p.d_a(r,p) - r_a = p.(d_a(r,p) - q_a) \leq 0$. The variables $s_a(r,p) = (d_a(r,p) - q_a)$ are then interpreted as excess demand for real resources on the market.

Moreover, in order to achieve their maximisation objective, Walrasian agents proceed by trial and error to price-quantity (or quantity-price) adjustments in order to reach the maximum solutions of systems (3) where

Walrasian law imposes that net excess demand $s_a(p,r)$ be zero in value. In other words, the Walrasian market is in equilibrium only when all agents reach their objective, the solutions maximales $d_a^*(p,r)$:

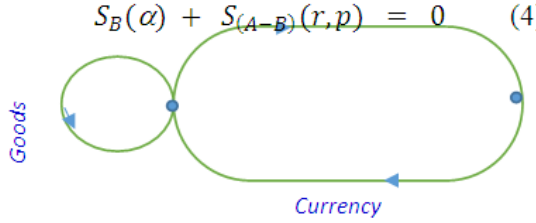
$$d_a^*(r,p) = \max U_a(x) \quad such\ that\ p.d_a^*(r,p) = r_a\ , \quad a \in A \quad (Walrasian\ law)$$

[5] By definition, if $x = (x_1, \dots x_n)$ is a good vector and $p_i\ the\ prix\ of\ the\ good\ x_i$, then $p.y = \sum_{i \leq n} p_i.x_i$ scalar product.

To the maximum solutions $\mathrm{d}_{\mathrm{a}}^{*}(\mathrm{r},\mathrm{p})$ of this system is then associated a request excédentaire $s_a(r,p) = \mathrm{d}_{\mathrm{a}}^{*}(r,p) - q_a$ not null in terms of goods $(\neq 0)$, but null in terms of income, that's to say $S_a(\mathrm{r},\mathrm{p}) = ps_a(\mathrm{r},\mathrm{p}) = 0$ for everything $a \in A$ (Walras' law), which makes the valuation $X(r,p)$ a flow on G.
In summary, the balance of the Walrasian market is defined, via the p-currency, by the system :
$(S_a(r,p))_{a \in A} = M(G).X(r,p) = 0$ Budget balance
With $S_a(r,p) = \mathrm{p}.s_a(r,p) = 0$ (Walras law)
$s_a(r,p) = \mathrm{d}_{\mathrm{a}}^{*}(r,p) - y_a \ (\neq 0)$ Maximum desired transaction of a
And this equilibrium is indeed, by definition, a total equilibrium, because $s_a^*(r,p) = s_a(r,p)$ which is equivalent to $z_a(r,p) = 0$, the desired supply being $o_a^* = q_a$ (*key* (2)).
Clearly, depending on whether or not the cash p is monetary in nature, the Walrasian model raises questions as to the reality of its relevance :

- If numerary p is neither a currency nor a commodity, then we are in the presence of an economy without money, a barter economy where goods are exchanged for goods, and refers to the double coincidence of the needs of agents on the market. Now in a barter economy, the Walrasian equilibrium, which is a total equilibrium, is meaningless ; its realisation is impossible. Even real equilibrium is implausible since it is only realised at the price of equilibrium which requires price flexibility and the intervention of the "invisible hand" of a supreme being. A problem of adjustment of a very large number of free choices of Walrasian agents that even today's computers cannot solve. Also, apart from slavery, serfdom and, where appropriate, the solidarity economy, the remuneration of differentiated work poses a problem. As a result, the introduction of a numerary is a fiction, a simple arithmetic device that makes the Walrasian equilibrium artificial ;
- If the currency is a commodity-currency, the Walrasian currency, introduced only to facilitate trade, the Walrasian model still raises, without answering, many questions. In particular, we ignore the links between the real and monetary economy, as well as the use and exchange values of this money. Worse, supposing that the Walrasian money is integrated into the market and that all the Walrasian agents producing and "offering" this money on the market are designated by B, at a "price", then, according to (1), we still have :

$$S_B(\alpha) + S_{(A-B)}(r,p) = 0 \qquad (4)$$



And since, according to Walrasian law, the market for goods is in équilibre $S_{(A-B)}(r,p) = 0$, the same is true for the money market because $S_B(\alpha) = 0$. From this it is deduced that the Walrasian equilibrium, which is a total equilibrium, is incompatible with the variation of the money supply, as well as with an unbalanced balance of payments, which impacts the money supply since it is ultimately the balance between money inflows and outflows. Moreover, since variations in market income are also zero, the Walrasian equilibrium does not correct, in terms of income, pre-existing inequalities and in particular those of the initial income endowments.
Nevertheless, to claim to be in line with reality, neoclassical models introduce money as an exogenous variable in the framework of a monetary theory that is autonomous to the real economy. Thus they create a dichotomy between the real and monetary sectors, a view which contradicts equation (4) above, otherwise how else to explain the interdependence of $S_B(\alpha)$ et $S_{(A-B)}(r,p)$?
It is therefore an imaginary and fixed vision of the reality of our monetary economies, which obscures the real functions of money, such as speculation and its corollary, the accumulation of wealth. However, these models remain the references for the implementation of liberal economic and social policies.

2.2. The Keynesian model as the standard model of budget balance

In contrast to the microeconomic approach of the Walrasian model, which standardizes individual behaviour and underpins the theories of supply and market regulation of economic activities, the Keynesian model adopts an overall macroeconomic approach in terms of the circuits of resource flows, within the framework of a monetary economy. Firstly, it does not pose the problem of the aggregation of behaviours, and therefore takes as economic agents companies A_e, households A_m , the State A_E, the banques A_b and the rest of the world A_{rm}, without, however, differentiating one from the other within them. Secondly, it opposes Say's "law of outlets", which JM. Keynes interprets it as "supply creates its own demand" and, more generally, he rejects the vision of general equilibrium which imposes the primacy of supply, adjustments through price flexibility, currency neutrality and systematic market self-regulation. The Keynesian model contrasts them with

a theory of the search for the conditions that govern the levels of employment and production on the basis of effective demand and the expectations of economic agents in the face of an uncertain future. Based on psychological considerations and forward-looking behaviour, Keynesian equilibrium is not systematic and challenges the existence of an automatic adjustment mechanism of supply and demand through price and wage flexibility.

However, in concrete terms, the Keynesian model deals with the behaviour of exchanges of resources on the production markets for goods and services, capital, money and labour, which we bring back here to a global Keynesian market whose framework is an oriented and valued graph $(G,\ Z(v,t))$ on the set $A = \{A_e\ ,\ A_m\ ,\ A_b\ ,\ A_E\ ,\ A_{rm}\}$ of Keynesian agents and whose monetary expression :

$\big(S_a(v,t)\big)_{a\ \epsilon\ A} = M(G).Y(v,t)$ Equation variation of market revenues

With $\sum_{a\ \epsilon\ A} S_a = 0$

describes the circulation and variation of income of Keynesian agents, which is also translated in terms of the employment-resource table where I denotes investment, C consumption, G management expenditure, Y national production, R income, E savings, L social benefits, T taxes, Exp exports, Imp imports and M_0 money supply:

	Jobs					Resources				
Eco-agents.	A_e	A_m	A_E	A_b	A_{rm}	A_e	A_m	A_E	A_b	A_{rm}
Goods-services	I	C	G		Exp	Y				Imp
Income Revenue	R						R			
Transfers	T		L				L	T		
Loans/Borrowings		E		M_0		E				

From this, in accordance with Keynesian hypotheses, we deduce the figure (2) below of the configuration of the Keynesian market, as well as the formal variations in the resources of Keynesian agents, namely :

- $S_e = (I + R + T) - (Y + E) = (R + T - Y) + (I - E)$
- $S_m = C + E - (R + L)$
- $S_E = G + L - T$
- $S_{rm} = Exp - Imp$ (Exp-Imp (trade balance))
- $S_b = M_0$ offer of money

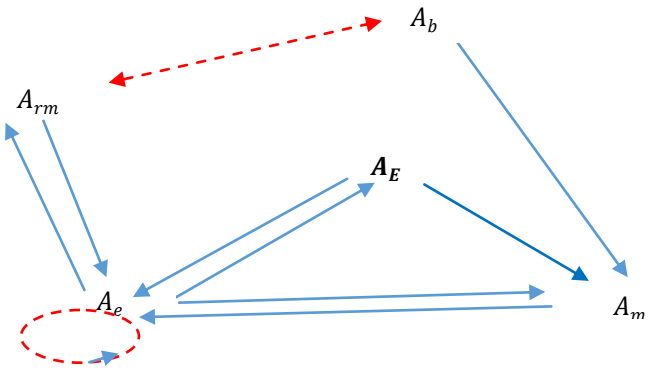


Figure 2

So that, based on the equality-in-use table, on the one hand, we have

$Y + Imp = I + C + G + Exp$

And on the other

$S_e = S_m = S_E = 0$

It is then clear that the Keynesian balance is a balanced budget. Of course, and more explicitly, the Keynesian analysis is deployed on the basis of certain hypotheses, with the aim of evaluating the impacts of the actions of the endogenous variable t on the achievement of markets equilibrium, under the impetus of the exogenous variable exogène $v = (G, T, M)$, that's say budgetary policies G , fiscal policies T and monetary policies M.

- Households receive income $R(Y,i)$ and allocate it to consumption $C(Q,p,i)$, savings $E(i)$ and tax T

Therefore

S(Y,i)= R(Y)- (C(Y,i)+E(i)+T) ;

- Firms produce Q(K , W), where K and W represent capital and labour (productive capacity) respectively. The proceeds of sales $Y = pQ$ go to household income $R(Y,i)$, taxes T and self-financing k. On the other hand, enterprises finance their investment I(i) through household savings. Thus

$S_e(v,t) = Y - (R(Y,i) + T + k)$

$I(i) = E(Y,i)$;

- The government collects $T(v,t)$ of taxes from households and enterprises and uses them for its consumer and capital expenditure $G(v,t)$. Hence :

$S_E(v,t) = T - G$;

Now, to say that the Keynesian production and capital markets are in equilibrium, means that Keynesian agents households A_m , enterprises A_e and Etat A_E simultaneously balance their budgets, through equality of employment and resources, that's to say :

$S_m(v,t) = S_e(v,t) = S_E(v,t) = 0$

And therefore also

$H(v,t) = S_m(v,t) + S_e(v,t) + S_E(v,t) = 0$

Thus, leaving aside the money market and foreign trade, the Keynesian equilibrium of the production market and investment financing is a budget balance, $Y(v,t)$ being a flow over G.

As well as

- Banks collect household savings $E(i)$ and grant M loans, the balance of which is a change in the money supply in circulation.

$S_b(v,t) = M - E(i)$

In fact, the Keynesian model assumes an exogenous supply $M = M_0$ and a household demand[6] $L(Y,i)$, from which the money market equilibrium is achieved when :

$M_0 - L_m(Y,i) = 0$;

- The rest of the world maintains with the other Keynesian agents (trade and transfers) whose balance $S_{rm}(v,t) = BP$ is the balance of payments, reduced to the trade balance; it corresponds to a change in the money supply.

And that for any market, the sum of the variations in the resources of the agents is zero.

$[S_m(v,t) + S_e(v,t) + S_E(v,t)] + [S_b(v,t) + S_{rm}(v,t)] = 0$

where $V(v,t) = S_b(v,t) + S_{rm}(v,t)$ is the change in money supply,

In other words : $H(v,t) + V(v,t) = 0$ and $H(v,t) = 0 \Rightarrow V(v,t) = 0$

The result is that the Keynesian equilibrium of the production and capital market is a budgetary balance, which is not only incompatible with any variation in the money supply, which remains constant, but also leaves the distribution of income between firms, households and the state invariant. However, there is nothing to exclude that within each of these aggregates of Keynesian agents, inequalities in income distribution remain, particularly between wages and dividends. All the more so since $H(v,t) = 0$ is not synonymous with equilibria, but only with a constant money supply in absolute value. Thus, like the Walrasian model, the problem of fair distribution, inequality and social justice is not solved, or even addressed. As for the Keynesian labour market, it makes the link with wealth creation via the production function Q(K,W) and the labour force.

Finally, to return to the classical approach, as well as to the IS-LM model, we first reduce ourselves to the exchanges between households A_m and enterprises A_e , by differentiating their behaviour, notably by adapting the variables v and t . Households A_m receive labour and capital income from enterprises R_m, and they allocate to their consumption C_m and their savings E_m , which are considered as differentiable functions of the national income variables Y , prices p and interest rate i , that's say. :

$R(Y,i) = C(Y,i) + E(Y,i)$

For their part, firms A_e produce and offer their available output Q at a price p for which they expect to earn a national income $Y = p.Q$. Furthermore, by anticipating the evolution of effective demand, the firms call on household savings to invest $K_e(i)$ (in nominal value), according to capital market interest rates i. Hence effective demand :

$D_{ef}(Y,p,i) = C(Y,p,i) + I(i)$D_effective demand

Thus, on the one hand, the available production in value Y is confronted with the effective demand $D_{ef}(Y,i)$ on the production market, and, on the other hand, on the capital market, the savings $E(Y,i)$ of households is confronted with a financing need $K(i)$ of enterprises. Thus, if we ask :

[6] With this hypothesis, the currency put into circulation is then $M_0 = \mathrm{Min}(M, L_m(Y,j))$. In reality, the creation or destruction of money by banks corresponds globally to the difference between credits granted and savings collected.

$h(Y,i) = I(i) - E(Y,i)$
the Keynesian equilibrium of the production market is achieved when :
$Y = D(Y,i) = C(Y) + K(i)$
$h(Y,i) = 0$
or, equivalently, national income Y is assumed to be the same as overall household income:
$Y = R$
$h(Y,i) = 0$
Thus, the implicit question that arises is that of determining the stability of the Keynesian equilibrium and the interdependence of the production and capital markets. In other words, when this equilibrium can be achieved at one point (Y_0, p_0, i_0), can it still be achieved near that point ? In other words, can the equalisation of savings and investment, $h(Y,i) = 0$, remain especially close to (Y_0, i_0), even though it is a question of independent behaviour of savers and investors.
The answer is yes, if we assume that the assumptions of the implicit function theorem are fulfilled. It then follows that in the vicinity of a situation of market equilibrium in (Y_0, i_0), the interest rate i which equals investment and savings is in the vicinity of Y_0, an explicit function of Y, yhat's to say :
$i = \varphi(Y)$ such that $H(Y, \varphi(Y)) = 0$
We thus find the traditional curve (IS) attached to the production market (Figure 3).

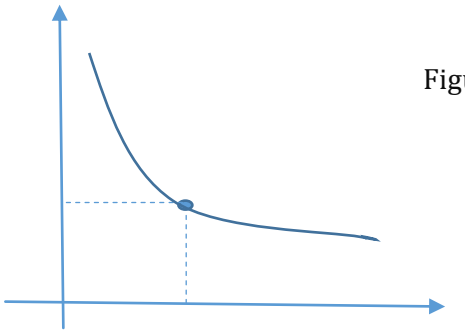


Figure 3

Similarly, to the extent that it is up to the banks A_b to be an intermediary that ensures the re-circulation of household savings, the Keynesian market links its pseudo-currency market to that of production and capital. In this market, the supply of M_0 currency is an exogenous variable set by the monetary authorities, with the formal power to create and distribute money to agents. On the other hand, the demand for money responds to various reasons and to expression :
$L(Y,i) = L_1(Y) + L_2(i)$
where $L_1(Y)$ is a request for liquidity for transaction and settlement purposes in the production market, while $L_2(i)$ is the speculative demand to build up reserve cash for capital market investments. Hence by expressing :
$G_{M_0}(Y,i) = M_0 - L(Y,i)$
The Keynesian balance of the currency market is finally defined by the equation
$G_{M_0}(Y,i) = 0$
and this balance is set by the supply of money M_0 .
Assuming that the conditions of the implicit function theorem are met, the result is that in the vicinity of a balance situation in (Y_0, i_0) of the money market, the interest rate i which equalizes the supply and demand of money is in the vicinity of Y_0 , an explicit function of national income,
$i = \psi(Y)$ such that $G_{M_0}(Y, \psi(Y)) = 0$
We also find the curve (LM) attached to the money market (Figure 4) :

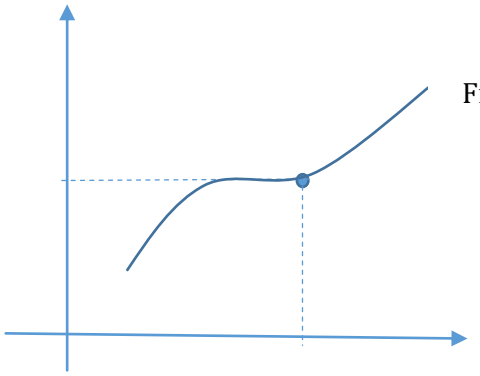


Figure 4

Also, let's pose :
$f_{M_0}(Y) = \psi(Y) - \varphi(Y)$ avec $Y = (y, p)$
the simultaneous equilibrium of the markets of production, capital and money results in the equalisation of the two different determinations, $\varphi(Y)$ and $\psi(Y)$, of the same interest rate. The latter connects two distinct markets and is obtained from differentiated behaviours, even though nothing imposes this equality. Hence the Keynesian global equilibrium and the IS = LM price :
$Y = C_m(Y) + K_e(i)$ (production market)
$f_{M_0}(y, p) = 0$ (Capital and money markets)
However, this equilibrium may be incompatible with the labour market equilibrium defined by the equation $w_m = w_e$ where w_m is the demand for labour (linked to the active population) and w_e is the supply of labour (linked to production y), which is then dependent on effective demand.

3. From barter to the monetary economy, a source of imbalances

Together with giving and sharing in solidarity, barter was probably the first practice of economic exchange and dates back to prehistory. Money as a unit of account and intermediary of exchange appeared much later, in Ancient Greece in the 5th century BC.

In a barter economy, agents are both producers and consumers, demanders and suppliers. Equipped with resources that they produce or possess, they intervene on the market to exchange what they have against those they wish to acquire, and transactions are only possible if the demands of some coincide with the offers of others, if necessary by means of an individual or collective reference system of value. Let us assume that for any pair of co-exchangers u = (a, b), the demand $d_a(v, t)$ of a is equal to the offer $o_a(v, t)$ of b and vice versa. The barter market thus refers to the existence of a double coincidence of the needs of the agents and can only be conceived for small populations where the two can know each other, such as in the family, solidarity and sharing economies of prehistory, antiquity, etc. On the other hand, in societies of anonymity, individualism and large size, barter seems unrealistic as a social mode of wealth distribution, unless one adheres to the ideology of the "invisible hands" or of a supreme being who coordinates the behaviour of each other.

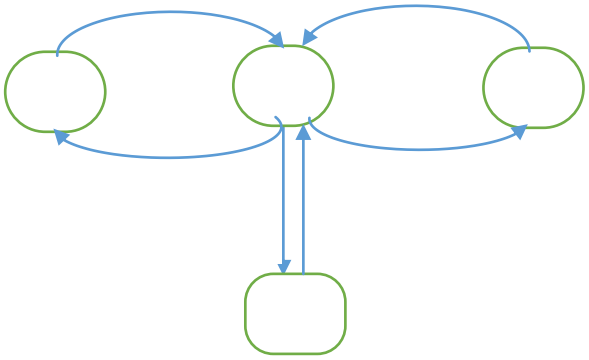
In all circumstances, the barter market refers to the formal standard model (I) in its material form where the market configuration is a symmetrical graph with individuals as vertices. In this framework, the variations of resource ressource $s_a(v, t)$, resulting from the market, can be maximal, but never null according to the conjecture (2). The flow $X(v, t)$ (of resources cannot therefore be a flow over G and the achievement of a balanced budget in a barter economy is impossible, unless a calculation artifice is introduced which reduces the market to a monetary form.

The introduction and institutionalisation of money, as a universal system of reference for values, radically changes the nature of society. Money, as a unit of account, an intermediary of exchange and a store of values, profoundly modifies human relations, notably through the appearance of new behaviours and markets, such as the search for profit, speculation, the exchange market... By being in effect substitutable for all goods, the use of money breaks the symmetry of barter, the double coincidence of needs, makes exchange asymmetrical by dissociating producer and consumer and finally imposes on the market the intervention of an arbitrary reference system of value, the price system. Left to the discretion of the authorities, isn't the value of money itself discretionary ? Admittedly, in theory, the price of a good is the result of an economic calculation, which moreover rests on ideological a priori which are conveyed by the subjective notions of risk, profit, interest... By creating a dichotomy between supply and demand, money has made those who do not have enough to satisfy their needs dependent on those who have too much. Thus, without corrective devices, the market subordinates demand to supply, which no ethics can justify. Consequently, in a monetary economy, the market discriminates between two types of flows, one real (that of goods) and the other monetary, which adds to the

counterpart of real flows, flows of income redistribution and wealth transfers. Money thus clearly plays a driving role in economic activity, where it subordinates the existence and well-being of individuals to the possession of money that can be legally obtained in our societies through labour, capital and debt (credit).

Although monetary economies differ from one another, mainly by the nature of their institutional framework, their culture and their forms of integration into working life (labour, capital...), the study of the market, subject to an analysis of the production and distribution of money, comes back to the standard model above. That is to say, the study of its configuration and its flow of resources, which also involves the study of the behaviour of its economic agents. However, in a monetary economy and contrary to the barter market, the market can be in total equilibrium where the initial allocation of agents' income remains invariant and all are fully satisfied with the tractions they have achieved. But, given the reality of social inequalities, which are obvious, one can only doubt the real existence of such an equilibrium. Unless we believe in the predetermination of behaviour that a supreme being rules.

For an illustration, reference is made to the European economy before the industrial revolution. At that time companies were essentially natural persons and the national currency was reduced to coins, which were issued at the whim of the "Princes". The money supply evolved in stages, but also through "commercial" relations with the rest of the world, which resulted in the inflow and outflow of coins from the territory. In this societal context, economic agents can be grouped into four categories : national companies and institutions A_e, the rest of the world A_{rm}, households A_1whose disposable income is higher than their expenditure (high incomes) and the other A_2 who spend all their income. Hence the reduced market architecture of the time :



$$s = (A_1, A_e)$$
$$t = (A_2, A_e)$$
$$u = (A_e, A_1)$$
$$v = (A_e, A_2)$$
$$m = (A_e, A_{rm})$$
$$n = (A_{rm}, A_E)$$

Figure 5 : the reduced architecture of the market

The matrix expression is :

$$\begin{pmatrix} S_1 \\ S_2 \\ S_J \\ S_E \end{pmatrix} = \begin{pmatrix} 0 & -1 & 1 & 0 & 0 & 0 \\ -1 & 0 & 0 & 1 & 0 & 0 \\ 1 & 1 & -1 & -1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 1 & -1 \end{pmatrix} \cdot \begin{pmatrix} X_s \\ X_t \\ X_v \\ X_u \\ X_m \\ X_n \end{pmatrix} = \begin{pmatrix} X_v - X_t \\ X_u - X_s \\ X_s + X_t - X_v - X_u - X_m + X_n \\ X_m - X_n \end{pmatrix}$$

Where $S_{I1} + S_{I2} + S_J + S_{rm} = 0$.
Or $(S_{I1} + S_{I2} + S_{J-B}) + (S_B + S_{rm}) = 0.$, B the bankers.
$(S_B + S_E)$ representing the change in the money supply.

As a result, in the absence of coin creation or inflow/outflow, the money supply remains constant and transfers of resources are made to the benefit of some, the most riches A_1 and to the detriment of others, the most démunis A_1; employees being legally subordinate to their employers. Today, however, the variation of the money supply is an almost continuous phenomenon.

As for the macroeconomic representation of the contemporary market economy, it can be reduced overall to a standard configuration of the 5 traditional categories of economic agents. These are, on the one hand, the natural persons grouped together in a set A_m of households and, on the other hand, the legal persons that are the ensemble A_e producers of goods and services (enterprise and administration), the Etat A_E, the banks A_b and the rest of the world A_{rm}. So that, from a macroeconomic point of view, the market is reduced

to an oriented and valued graph (G , Z) over the set $A = \{A_e,\ A_m,\ A_E,\ A_{rm}, A_b\}$ and whose matrix expression in monetary terms,

$(S_a(v,t))_{a\,\epsilon\,A} = M(G).Y(v,t)$

with $\sum_{a\,\epsilon\,A} S_a = 0$

makes it possible to study variations in the income of agents S_e , S_m , S_E , S_{rm} , S_b where, for each of them, any incoming flow is income and any outgoing flow is expenditure, except for banks A_b , as money is a debt owed to the bank. As the sum of these resource changes is zero, we can isolate the banks

$$[\,S_e(v,t) + S_m(v,t) + S_E(v,t) + S_{rm}(v,t)\,]$$

and restrict itself, as a first approximation, to the study of the variation in the income of other market agents, as described in the table of resource-use transactions below. Where I is investment, C is consumption, G is management expenditure, Y is domestic production, R is income, E is savings, L is social benefits, T is taxes, Exp is exports, Imp is imports, D is net debt (principal repayment deducted), Tr is foreign transfers and k is interest paid on the loan:

	Jobs					Resources *				
Eco-agents.	A_e	A_{m1}	A_{m2}	A_E	A_{rm}	A_e	A_{m1}	A_{m2}	A_E	A_{rm}
Goods-services	I	C_1	C_2	G	Exp	Y				Imp
Income Revenue	R_e			R_{Em}			R_1	R_2		
Transfers	T_e	T_{m1}	T_{m2}	L_m	Tr^+		L_m		T	Tr^-
Interest Cost	k_e	k_{m1}		k_E						
Loans/Borrowings			E_{m2}			D_e	D_{m1}		D_E	
TOTALS	U_e	U_{m1}	U_{m2}	U_E	U_{rm}	V_e	V_{m1}	V_{m2}	V_E	V_{rm}

From this, we can deduce the configuration of the market, that of its graph in figure (6) below, as well as the variations in agents' resources :

1) The entreprises A_e produce goods and services pQ (in value) whose sales Y amount is allocated to their expenditure : raw materials, income R_{em} (salary and dividend) paid to households, taxes T_e to the government, investissent I_e, debt repayment including k_e of interest. Hence :

$S_e(v,t) = V_e - U_e$

2) A_m households provide labour and capital in return for which they receive R_{em} income from companies, R_{bm} banks and the administration R_{Em} , as well as benefits L_E from the state and they borrow D_m from banks (less depreciation). From the resources they allocate to consommation C_m, to savings E_m, to impôt T_m and to interest payments from dette k_{m1}. Where appropriate, a distinction should be made between low income households, A_{m1} , which most often borrow from D_{m1}. The others reserve A_{m2}, receive interest from banks (included in their income) and some can live without working. Therefore, some of them may live without working.

Hence :

$S_{m1}(v,t) = V_{m1} - U_{m1}$ *et* $S_{m2}(v,t) = V_{m2} - U_{m2}$

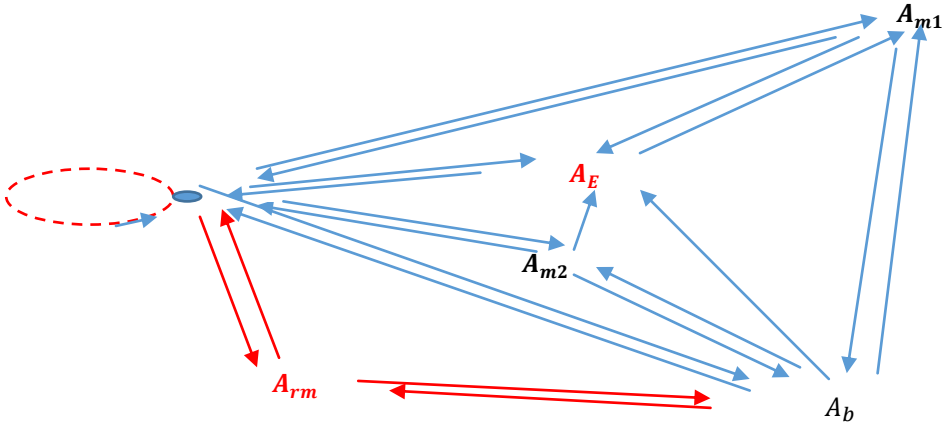


Figure 6 : Configuration of the market by graph

3) The Etat A_E receives tax revenues T and borrows K_E; resources $K_E + T$ which they allocate to household G_E expenditure, income R_{Em} and prestation L_E and interest payments from debt k_E. So, $S_E(v,t) = V_E - U_E$

4) The rest of the world A_{rm} concentrates all exchanges with foreign actors that affect the national economy. These are imports Imp, exports Exp and transfers, the balance of which is the balance of payment BP. Thus :

$$S_{rm}(v,t) = V_{rm} - U_{rm} = BP \begin{cases} if \geq 0 & money\ in \\ if < 0 & money\ out \end{cases}$$

So that we have

$$[\, S_e(v,t) + S_m(v,t) + S_E(v,t) + S_{rm}(v,t)\,] = -S_b(v,t)$$

$$(V_e - U_e) + (V_m - U_m) + (V_E - U_E) + (V_{rm} - U_{rm}) = -S_b(v,t)$$

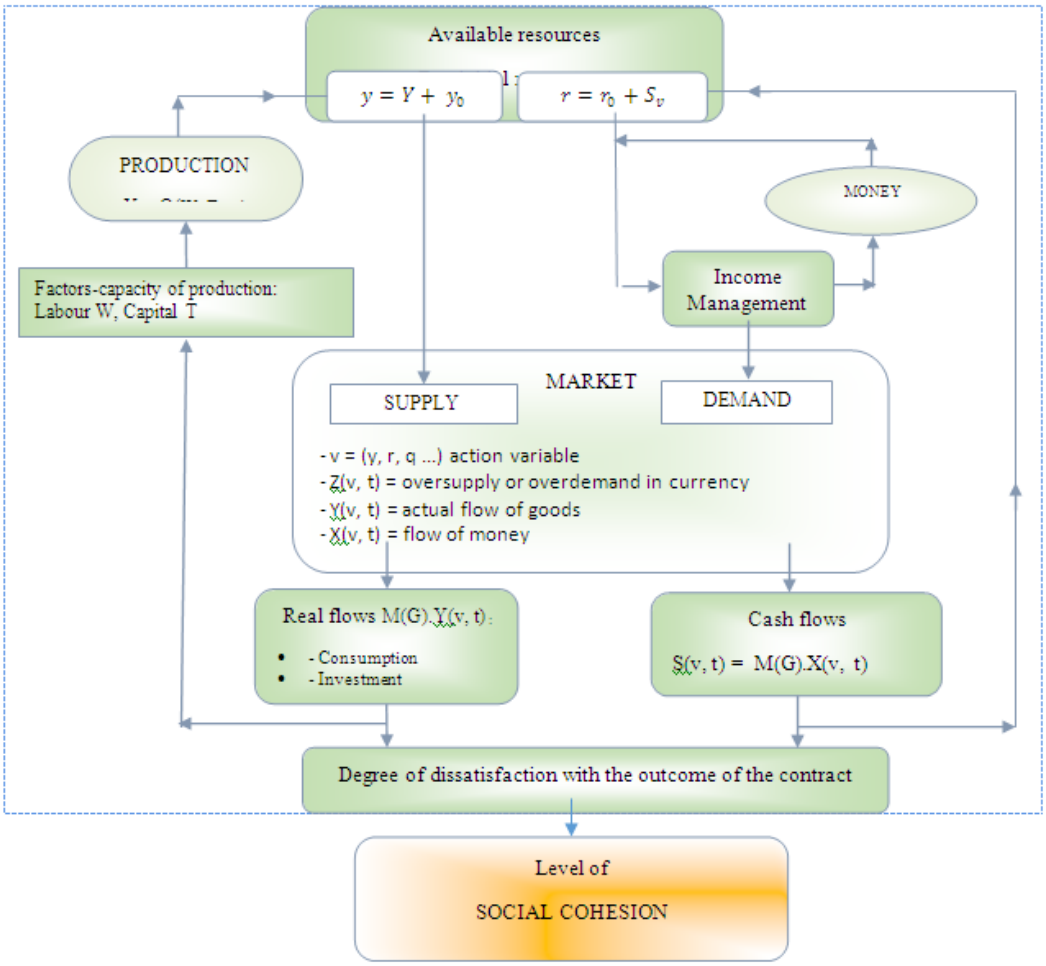
However, the banques A_b collect E_m savings, consume D_b , pay to households with R_{bm} income and grant credit to households, businesses and administrations. So,

$$S_b(v,t) = (E_m + agios) - (\, R_{bm} + D_b\,) \begin{cases} si > 0\,, & creation\ of\ money \\ si < 0\,, & destruction\ of\ money \end{cases}$$

As solde $S_{rm}(v,t)$ corresponds to an inflow or outflow of money, $S_m(v,t) + S_e(v,t) + S_E(v,t)$ corresponds to the overall change in the money supply, which is impacted by the balance of payments balance.

Also, when $S_b(v,t) = S_{rm}(v,t) = 0$, or more generally $S_b(v,t) + S_{rm}(v,t) = 0$, the market equilibrium is a budgetary equilibrium and the money supply remains constant so that the market restructures the disposable incomes of individuals and institutions, presumably to the detriment of low income earners, the A_{m1} who repay more of what they borrow. Finally, bank indebtedness and the variation of the money supply (creation or destruction of money) at market rates is incompatible with budgetary balance ; it affects the allocation of agents' resources and, in the case of creation, it amplifies income inequalities since it is generally created during a bank loan, a debt which has a cost for the borrower.

Finally, with the following diagram, we can get an idea of the internal dynamics of the functioning of a market, as well as its impact on the cohesion of living together.



However, the social context cannot be excluded from the economic analysis of the market. Every society conveys symbolic management (culture, education, power...), creates a formal system of conditions of existence, normalises desires and administers behaviour, particularly that of the market through the institutional action variables v and symbolic t, so that the behaviour of its agents is in fact predetermined by the material and cultural vision of the world conveyed by governance, science, religion, education, training...

For its part, market economics is based on market values that individuals internalise. For example, use values are attached to goods, and two goods with the same use value are differentiated by a set of symbolic signs managed by modes of consumption associated with a hierarchy of social wealth. Agents, through social organisation, are informed of the symbolic and exchange values of the goods and are therefore able to situate themselves socially in relation to each other, and then to assess the relative benefit they would derive from the consumption that their resources allow them to make. Thus, when purchasing power varies regularly, some people end up reaching a local extremum (maximum or minimum) relative to their satisfaction, which leads them to change their consumption patterns and, consequently, to move from one social standard of living to another. However, in order to maintain their differentiation and ensure the continuity of the social hierarchy, the better-off innovate and the system tends to reproduce scarcity through the market, so that the field of goods is continuously shifted. A specific form of this shift in value consists in a symbolic production of the differentiation of the commodity which gives rise, in the modes of consumption, to a substitution of functional consumption by the consumption of the sign. Finally, our market economies are evolving from a functional form to an increasingly symbolic form which augurs well, with the advent of information technology, telematics, biotechnology and genetic manipulation, for the mass production and commercialisation of social relations, communication and management of living things.

II. Concluding Remarks

While equitable distribution is at the heart of the social contestation of economic policies, the academic models that inspire them overshadow the issues of wealth sharing, inequality and social injustice.

The balance of a market (G, Z) , defined by the equation $(S_a(v,t))_{a\,\epsilon\,A} = M(G).Z(v;t) = 0$, is synonymous with invariance in the initial allocation of agent resources $(S_a(v,t) = 0$ for everything a). That is, at the end of the contract, final allocation is equal to the initial allocation, and therefore does not affect the initial inequalities in resources. In monetary terms, with the $Y(v,t)$ flow of income being a stream on the G graph of the market, agents' incomes, as well as the money supply, remain constant at the close of the market. In other words, any change in the money supply, even production and prices, impacts the distribution of income and therefore opposes the achievement of the balance. However, by referring only to traditional models of equilibrium (Walrasians or Keynesians), the neoliberal economic policies of advanced societies obscure the problem of equitable sharing of wealth, although inequalities and social injustices are at the heart of the main challenges that are taking place within these societies. They overshadow the fact that distribution is, of course, the essential object of economic science with production.

Thus, two worlds are at odds in the sharing of wealth, labour and capital. And what is at issue is the economic subordination of labour to capital, which probably has its origins in the deployment of the Neolithic production economy. It is easy to imagine that at the time, some, probably the strongest, appropriated the fertile land, reduced others of their fellows to the slave state and finally declared their possessions private and communicable property by heredity. They then shaped the subordination of labour to capital and its accumulation, which gradually, and especially from the introduction of money and trade, became institutionalized and became the DNA of hierarchical societies that make private property means of production a cardinal value. Since then the field of capital appropriation has expanded, notably with the appropriation of money by debt (the household that borrows repays more than it borrowed). Similarly, through innovations and patents, capital appropriates productive technical progress, even though it is a derivative of science, a collective and universal cultural heritage.

Therefore, the resolution of equitable reparation, as the object of economic science, cannot save an analysis of social governance, which organises the distribution, in the light of the scientific progress that feeds the evolution of the production of wealth. There is nothing to justify the primacy of capital over human labour and, therefore, from birth, the majority of citizens are forced to work in order to live while a small minority can dispense with it and live off the income of their capital. To get an idea : 5 million euros placed at 3% produces an annual income of 150.000 euros, or 12.500 euros per month. Enough to live in opulence ! Unfortunately, by focusing on the analysis of production and the market, mainstream economic science ignores equitable distribution and, as a result, does not address the root causes of problems of social inequality and injustice, which it wrongly refers to the field of sociology and political governance.

References

[1]. Ackley, G., (1961) « Macroeconomic Theory », Macmillan Publihers, New York, USA.
[2]. Berge, C., (1957) « Theory of graphs et its applications », Dunod, Paris, France.
[3]. Christ, C.F., (1978) « A simple Macroeconomic Model with a Government Budget Restraint », Journal of Political Economy, January-February, vol 79, USA.
[4]. Frenkel, J.A., Johnson, H.G., (1976) « The monetary approach to the balance of payments », London Allen and Unwin, England.
[5]. Frenkel, J.A., Gylfason, T., Helliwell, J.F., (1980) « A Synthesis of Monetary and Keynesian Approaches to Short-run Balance of Payments Theory», Economic Journal, 90, september. England.
[6]. Keynes, J.-M., (1923) « A tract on monetary reform », Cambridge University Press, England.
[7]. Keynes, J.-M., (1936) « General theory of employment, interest and money », Cambridge University Press, England.
[8]. Marx, K., (1859) « Critique of political economy », University of Humbolt, Berlin, Deutch.
[9]. Marx, K., (1867) « The capital », University of Humbolt, Berlin, Deutch.
[10]. Modigliani, F., (1971) « Monetary Policy and Consumption » - in « Consumer spending and monetary policy, the linkage », FRB, Boston, USA.
[11]. Muet, P., - A., (1984) « Theories and models of macroeconomics », vol 1, Equilibrium of short- run, Coll Economics and statistics, Economica Publishers, Paris, France.
[12]. Mundell, R., (1968) « International Economics », Mac Millan Publishers, Montreal, Canada.
[13]. Porta, P., L., (1992) « Ricardo David : Notes on Malthus's Measure of Value », Cambridge University Press, England.
[14]. Radjou N., (2002) "Underdevelopment of French Guiana : the mirage of status", paper presented at the CAASSIDD Colloquium, Cayenne, 6 December, French Guiana.
[15]. Radjou N., (2005) "Development and institutional framework", Laboratory Document, CAASSIDD / LEAD EA 2438 Guyana, Cayenne, French Guiana.
[16]. Radjou N., (2007) " Développement, autonomie financière et fiscalité en Outre-Mer ", in " Pour comprendre la Guyane d'aujourd'hui, Edition Ibis Rouge, Guyane, France.
[17]. Roselé Chim, P., (2007) 'Imbalances in development through migration and informality in French Guyana', To understand French Guiana today, Ibis Rouge Publishers, Cayenne, France.
[18]. Roselé Chim, P., (2007) 'International growth pole, innovative effect of the development of the European space industry in French Guiana', *Life and Economics Review*, vol 174–175, Paris, France.
[19]. Roselé Chim, P., (2007) 'Poverty and Inequality: Imbalances in Development in French Guiana', To understand French Guiana today, Ibis Rouge Publishers, Cayenne, France.
[20]. Roselé Chim, P., (2008) 'Geophagy and Geosophy in Development: A Comparative Approach North-East Amazon-East Caribbean', *Canadian Journal of Regional Science*, Montreal, Canada.
[21]. Roselé Chim, P., (2009) 'The Informal Economy and Tourism in the French Amazon', Canadian Review on Territories and Tourism, *Canadian Review on Territories and Tourism*, n°*1*, Montreal, Canada.
[22]. Roselé Chim, P., (2010) 'International growth pole, innovation effect of the development of the European space industry in French Guiana'., *Canadian Journal of Development Studies*, *31*, (*1–2*), Ottawa, Canada.
[23]. Roselé Chim, P., (2010) 'Local aerodromes and territorial development: Spatial analysis French Amazonian-Caribbean', Working papers, BETA MINEA EA 7485, Cayenne: University of French Guiana, France.
[24]. Roselé Chim, P., (2012) 'Economic intelligence and industrial development of territories: Some aspects of sustainability', Working papers, BETA MINEA EA 7485, Cayenne: University of French Guiana, France.
[25]. Roselé Chim P., (2017). « statistical analysis as a principal component over a long period of time », Paper for the International Conference on Management and Governance, University Titu Maresco, Bucarest, Roumania.
[26]. Roselé Chim, P., and Panhuys B., (2018) '*The digitization of the economy and the new dynamics of industrial firms*', ASM-RW-18–603, *Annals of Social Sciences Management Studies*, *2*(*3*), California, USA.
[27]. Roselé Chim, P., (2018) '*Numerical economy and new industrial firm power*', ASM.MS.ID 555573, *Annals of Social Sciences Management Studies*, *1(*5), California, USA.
[28]. Roselé Chim, P., (2019) 'Migration, growth and development in the South American trajectory: Haiti, French Guiana, Brazil, Chile', RIELF International Review of French-speaking Economists n°6, Poznan, Poland.
[29]. Roselé Chim P., and Radjou N., (2020). « Market Equilibrium Models », working papers, BETA MINEA UR 7485, University of French Guyana, Cayenne, Guyane Française, France.
[30]. Seraphin, H., Gowreesunkar, V., and Rosele Chim, P., Duplan Y. J. J. J. and Korstanje, M. (2018) 'Tourism planning and innovation: The Caribbean under the spotlight', *Journal of Destination Marketing and Management*, California, USA.
[31]. Say, J.-B., (1803) " Treatise on Political Economy", 1st Publishing (1803), 6st Publishing (1841), Guillaumin (1972), Calmann-Levy Publishers, Paris, France.
[32]. Smith, A., (1759) "Theory of moral feelings", Catalogue of the Library of Adam Smith, England.
[33]. Smith, A., (1776) "An inquiry into the nature and causes of the wealth of nations", Cannan Publishers, Vol 2, England.
[34]. Smith, A., (1894) "The invisible hand of market", Catalogue of the Library of Adam Smith, England.
[35]. Sraffa, P., (2005) "The works and correspondence of David Ricardo", Indianapolis, Liberty Fund, England.
[36]. Walras, L., (1874) "Elements of pure political economy : social wealth theory", Calmann-Levy Publishers, Paris, France.
[37]. Walras, L., (1874) "Studies in Applied Economics, volume 1" and 2", Calmann-Levy Publishers, Paris, France.

Paul ROSELE CHI, et. al. " The inadequacies of standard market equilibrium models explained by mathematical graph analysis." *IOSR Journal of Economics and Finance (IOSR-JEF)*, 12(06), 2021, pp. 01-17.