Methodological implications of the of extension of the number of considered markets in a non-Walrasian equilibrium model

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*A*bstract: *This paper deals with the consequences of the extension of the number of markets that are taken into consideration in a non-Walrasian equilibrium model. It is reviewed the initial content of the theory of non-Walrasian equilibrium and emphasizes the main modelling factors of the respective equilibrium. It proposes the inclusion of the capital market in the model of non-Walrasian equilibrium and is also reveals the implications of the extension of the respective model to the classification of types of non-Walrasian equilibrium and to the content of macroeconomic and structural policies. Also, it proposes an econometric method for the estimation of the type of unemployment. The respective methodology is practically used in the case of Romania for the period 1991-2004.*

Keywords: mobilizing factor for economic activity, full Keynesian unemployment, partial Keynesian unemployment

JEL Classification: D5, E2, O4

1. Introduction

The current economic crisis offers new arguments in favour of the idea that the "natural state" of the economic system is the disequilibrium between the supply and demand in the different markets. Consequently, the idea of general equilibrium

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theory proposed by L. Walras, i.e. the perfect equality between supply and demand in all the markets of the economic system, are difficult to be found in the economic reality. In this context, the theories that postulate that the economic system may operate even in the context of "non-Walrasian equilibrium" could offer support for an improved analysis of the economic situation and for the design and implementation of policy measures in order to overcome the crises and to ensure the ground for a sustainable economic growth. In order to use efficiently the respective models it is very important to review their main properties and to identify the possible innovations, which can improve the explanatory power of the economic situation.

2. Original content of the theory of non-Walrasian equilibrium

The theory of non-Walrasian equilibrium originated in the R. Clower and A. Leijohnfuvud's re-interpretation of the significance of the Keynesian theory related to the labour market operation. Initially, this theoretical approach was called "Keynesian counterrevolution" and acted in opposition to the assimilation of the Keynesian vision within the neoclassical synthesis determinated especially by the Hicks-Hansen model.

It was shown that in Keynes' vision the ground state of the economic system is disequilibrium, caused by the fact that economic agents have incomplete information, nominal wages are rigid and prices generally have a slow motion related to economic reality. Therefore, it is not possible to ensure the balance between supply and demand assumed by the Walrasian model of general equilibrium.

The assumptions adopted by R. Clower and A. Leijohnfuvud contributed to the definition of the concept of non-Walrasian equilibrium (J.P. Benassy, 1986). The theory of non-Walrasian equilibrium takes into account the interdependencies between markets and the role of the institutional factors in the economic system operation. Under these conditions, a "hierarchy of markets" occurs. The main place in the respective hierarchy is granted to the labour market, because in the respective market generates the most important part of the incomes, which is the determinant factor of the economic activity dynamics.

Depending on the ratio established between supply and demand, it can be identified the following situation on a market, namely:

a) Balanced market, if supply equals the demand;

b) Sellers' market, if supply is smaller than the demand;

c) Buyers' market, if supply is greater demand.

3. Correlation between the features of the economic mechanism and the typology of non-Walrasian equilibrium

When we analyze the disequilibrium between supply and demand it is important to determine the meaning of the imbalance as well as the size of the respective imbalance. If we compare this with the thermodynamic systems, also in the case of economic system we may speak about the situations of "close to equilibrium" and "far from equilibrium"[1]. The situation "close to equilibrium" is easier to be achieved when an economic growth at a moderate rate is registered. But when the economic growth rate is very high, it is possible that the imbalances in the economic system become more stressed and finally the economic and social development is blocked.

During a recession or crises period, it is difficult to maintain the economic system in the situation "close to equilibrium". Consequently, in order to restore the economy on the growth path, the action of the market forces has to be accompanied by the institutional factors implication. This way, the limitation and even the elimination of the structural imbalances can be ensured. The international experiences show that market forces can provide a very good coordination of the economic activities only when we are faced with a "close to equilibrium situation".

In order to identify the causes and the consequences of the imbalances in the economic system, it is important to make a careful analysis of their features.

In the standard form of non-Walrasian equilibrium, only two markets are taken into account, namely: a) the market of goods and services; and b) the labour market.

In this context, depending on the ratio between goods and services supply (S_{GS}) and demand (D_{GS}), and the labour supply (S_L) and demand (D_L), respectively one may identify four types of non-walrasian equilibrium, namely:

A) Keynesian, if $S_{GS} > D_{GS}$ and $S_L > D_L$;

B) Classical unemployment, if $S_{GS} < D_{GS}$ and $S_L > D_L$;

C) Repressed inflation, if $S_{GS} < D_{GS}$ and $S_L < D_L$;

D) Supracapitalization (under consumption) if $S_{GS} > D_{GS}$ and $S_L < D_L$.

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[1] *Related to the characteristic features of the thermodynamic systems in the state of "close to equilibrium " and "far from equilibrium", see (I. Prigogine, 1992).*

The probable occurrence of the above-mentioned types of non-walrasian equilibrium depends not only on the phases of the business cycle, but also on the nature of the economic mechanism, degree of economic development of a country and the power relationship between the social partners.

Therefore, in case of a consolidated market economy the occurrence of supracapitalization is practically excluded, because the respective type of non-Walrasian equilibrium is determinated mainly by major errors in the capital allocation in large areas of economic activities. But in the respective economic system, the entrepreneurs' concern about the profit maximization causes that large and persistent errors in the capital allocation probability are practically near zero. For this reason, in some papers, the supracapitalization situation is not taken into account.

But such a solution causes methodological difficulties, because it would not be possible to have a continuous transition from the Keynesian unemployment to the repressed inflation. Therefore, in order to avoid the problems mentioned above in the graphical representation of the non-Walrasian equilibrium, one may consider that supracapitalization is a border line between the Keynesian unemployment and repressed inflation (F.M: Pavelescu, 2003).

Other cases of non-Walrasian equilibrium are those in which there is equilibrium between supply and demand on one market and disequilibrium on another market. Thus, **partial repressed inflation** can defined, if there is equality between the supply and demand on the labour market (full employment of active population) and a deficit of supply on the goods and services market. Also, the **fully mixed unemployment** can be identified, if there is equilibrium between supply and demand for goods and services and a deficit of demand on the labour market. (M. Peytriagnet, 1986)[1].

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[1] *It is to be noticed that the standard theory of non-Walrasian equilibria represents the roots of the so-called "Marx-Schumpeter-Keynes vision" of the economy. The respective theoretical orientation postulates that market economy is a very performing but unstable economic system. Due to this fact, the evolution of a market economy is a cyclical one, i.e. the periods of booms alternates with periods of recession and economic crise. The cause of economic crises is seen by the above-mentioned theoretical orientation in the existence of "too much capitalism" (Keynesian unemployment) or of 'too less' capitalism" (classical unemployment). Therefore, it appears to be very important that the economic policy be the result of a correct evaluation of economic and social situation. Also, in many situations, the success of an economic policy stands in its pragmatism and not in its ideological orientation.*

4. The impact of the capital market consideration on the non-Walrasian equilibrium model

The theoretical premises initially taken into account in building the models of non-Walrasian equilibrium were those of an economy that is closed to the external flows of goods, services and production factors. Also, only a single production factor, namely labour force was considered. The level of wages (price of the production factor mentioned above) in real terms and their proportion in the total added value was considered the determinant variable in the definition of the type of non-Walrasian equilibrium.

But during the last decades, in the context of globalization and continuous increase in the role of market mechanisms in the functioning of the economic systems, a change in the hierarchy of the market has taken place. Thus, the role of the capital market became more and more important in ensuring the economic stability in the short run and in generating sustainable growth in the long run.

Consequently, some papers, (E. Wasmer, Ph. Veil (2004), E. Wasmer (2009)) presented the idea of building models of non-Walrasian equilibrium of three markets, which, beyond the goods and service market and labour market, also included the capital market. Such an idea is interesting, because the new theoretical framework would permit a deeper analysis of the types of non-walrasian equilibrium identification of the causes, which determines the occurrence of the respective situations and finally the elaboration and implementation of guiding lines for the public authorities and social partners in order to maintain the economic system in the situation of "close to equilibrium"

Adding a new market to the standard model of non-Walrasian equilibrium has a series of important consequences for several aspects of analysis. Therefore, the representation of the types of non-Walrasian equilibrium, which is possible to be defined from the theoretical point of view, has to be made in three-dimensional space[1].

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[1] *We notice that adding a new market to the model of non-Walrasian equilibrium leads to an increase by another dimension of the space in which the situations of deviation from the walrasian equilibrium are represented. In fact, the number of dimensions of the spaces in case of a model of non-Walrasian equilibrium, which considers the market of goods and services and the markets of n production factors, is equal with n+1, while the possible maximum number of types of non-Walrasian equilibrium is 2^{n+1}.*

Also, it is very important to define the level of supply of goods and services from the point of view of each production factor taken into consideration in comparison with the level of total (registered) demand[1]. Therefore, we deal with two new indicators: a) supply of goods and services from the point of view of effective supply of labour force ($S_{GS(Lef)}$) and b) supply of goods and services from the point of view of effective supply of capital ($S_{GS(Kef)}$), respectively.

The level of above-mentioned indicators can be computed in comparison with the level of the total (registered) demand, having in view the notion of pressure of demand on (fixed) capital (TDPressK), defined in (E. Dobrescu, 2009).

$$TD\Pr essK = \frac{TD}{K} \quad (1)$$

where:

TD = the value of total (registered) demand

K = the value of (fixed) capital

Therefore, we can obtain: $S_{GS(Kef)} = TD\Pr essK * K_{av}$ (2)

where:

K_{av} = the capital available for investment in productive assets in the analysed period.

Analogously, we may define the notion of pressure of demand on labour force (TDPressL) and on this base we may determine $S_{GS(Lef)}$. But in this case, we have to take into account that TDPressL, which is a form of labour productivity, is not the same for the employed persons and for the unemployed persons.

Consequently, we may define a coefficient α, which is the ratio between the TDPressL of unemployed and employed persons, respectively.

Under these conditions, the supply of goods and services from the point of view of effective labour supply ($S_{GS(Lef)}$) may be written:

$$S_{GS(Lef)} = TD * (1 + \frac{\alpha * RU}{1 - RU}) \qquad (3)$$

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[1] *The total demand is the sum of private consumption, government consumption, gross capital formation and total exports.*

The comparison of $S_{GS(Kef)}$ with $S_{GS(Lef)}$ permits to obtain the available goods and services supply (S_{GSav}), according to the formula:

$$S_{GSav} = \min(S_{GS(Lef)}, S_{GS(Kef)}) \qquad (4)$$

Consequently, we may speak about the "restrictive production factor" for the available goods and services supply.

If $S_{GS(Lef)} > S_{GS(Kef)}$, the restrictive production factor is capital.

If $S_{GS(Lef)} < S_{GS(Kef)}$ the restrictive production factor is labour force.

In the standard methodology of models of non-Walrasian equilibrium, the comparison of the level of solvent demand (D_{GSef})[1] with the level of S_{GSav} allows as to obtain the three types of non-Walrasian equilibrium mentioned above. Taking into account the markets for two production factor and the definition of supply of goods and services in terms of each production factor allows for an extension of the analysis content.

Therefore, it is well-known that one of the major objectives of the macroeconomic policy is to avoid the occurrence of the shortage on the goods and services market, on the one hand, and the full employment of production factors, on the other hand. In case of the model of non-Walrasian equilibrium proposed in this paper, the respective objective of macroeconomic policy may be expressed by formula (5):

$$MPO = \max(S_{GS(Kef)}, S_{GS(Lef)}, D_{GSef}) \qquad (5)$$

The comparison of the indicators $S_{GS(Kef)}$, $S_{GS(Lef)}$ and D_{GSef} allows us to define the restrictive and the mobilizing factor of economic activity in the short run. Therefore, the indicator of maximum value is the mobilizing factor; the indicator with the minimum value is the restrictive factor of economic activity in the short run.

Obviously, between the level of economic activity allowed by the restrictive factor ($S_{GS(rf)}$) and the level of economic activity required by the mobilizing factor ($S_{GS(mf)}$) there is always a gap. Depending on the deviation of the ratio $\dfrac{S_{GS(rf)}}{S_{GS(mf)}}$

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[1] *By total demand we understand the sum of private consumption, government expenditures, gross capital formation and exports.*

from the unit value, and also on the variables that play the role of restrictive and mobilizing factor we may appreciate the characteristic features of the economic situation

5. Redefinition of the types of non-Walrasian equilibrium in the context of an economic system with three markets (goods and services, capital, labour)

If we consider, on the one hand, the labour, capital and goods and services markets and, on the other hand, the notions of restrictive and mobilizing factor of economic activity in the short run, it is necessary to make some changes in the definition of types of non-Walrasian equilibrium. In fact, for a model with markets at least two production factors[1], we have to deal with three types of equilibrium, namely:

A) Non-Walrasian equilibrium in which the restrictive factor is the demand for goods and services and the mobilizing factor is the production factors;

B) Non-Walrasian equilibrium in which the restrictive factor is one of the production factors and the mobilizing factor is another production factors;

C) Non-Walrasian equilibrium in which the restrictive factor is one of the production factors and the mobilizing factor is the demand for goods and services.

Compared with the standard methodology, the redefinition of the non-Walrasian equilibrium mentioned above results in the identification of two types of Keynesian unemployment and in a transfer of some situations, initially included in the classical unemployment, to the repressed inflation.

Thus, one may identify two types of Keynesian unemployment, namely:

a) **Full Keynesian unemployment**, when the mobilizing factor is capital, while the restrictive factor of economic activity is aggregate demand. In this case, $S_{GS(L)} < S_{GS(K)}$. Consequently, the full employment of the labour force may be achieved with the help of aggregate demand stimulation. But if the target of the

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[1] *In fact, the number of production factors and their markets may be extended by more than two. For example, we can take into consideration the energy market or the main raw material markets. But if the number of the production factors sensibly increases, it is important to establish a hierarchy of the production factors and to model the economic policy according to the respective hierarchy.*

macroeconomic policy is to achieve the full employment of both production factors (active population and capital available for investment in economic activity) it is necessary that the institutional framework allows for the increase in the rate of activity of the working age population at the level required by $S_{GS(K)}$.

b. **Partial Keynesian unemployment** occurs when the mobilizing factor is the labour force. In this situation, the stimulation of the aggregate demand of goods and services is not sufficient for ensuring full employment. It is also required that public authorities take measures in order to increase the degree of allocation in economic activities of the potential supply of capital and, if it is necessary, for the expansion in real terms of the respective supply.

Classical unemployment represents the form of non-Walrasian equilibrium in which the restrictive factor is the capital and the mobilizing factor is the labour force. Consequently, the full employment of labour force may be achieved if the macroeconomic policy stimulates the mobilization and increase in real terms the capital supply. Also, the measure taken in order to support an expansion of the aggregate demand of goods and services has not to be neglected.

The **main** feature of the repressed **inflation** is the fact that the mobilizing factor of the economic activity in the short run is the aggregate demand of goods and services. Like in case of Keynesian unemployment, we **may distinguish between two types of repressed inflation**, namely:

a) Repressed **inflation** generated by relative or absolute shortage of capital. In the standard methodology of this type of non-Walrasian equilibrium it is considered as a variant of classical unemployment. Under these conditions, the macroeconomic policy has to be focused on achieving a balance between supply and demand on goods and services market. A special attention has to be paid to the growth in capital supply. Also, it is necessary to support technological changes in order to determine a sensible growth in capital productivity.

b) Repressed **inflation** generated by relative or absolute shortage of labour force. This type of non-Walrasian equilibrium reveals a series of blockages in the labour force supply such as: low participation of working age population or a low level of labour productivity. Low efficiency of the respective production factor at the same time with a decreased ratio of the profits to wages could generate a reduced degree of allocation in economic activities of the potential capital supply. Under these conditions, the main guidelines of the macroeconomic policy has to be: a) promotion of technological changes and implicitly the labour productivity growth; b) modelling the ratio between wages

and profits in a such a way to obtain a significant increase in rate of activity of the working age population, on one hand, and an improved degree of allocation in economic activities of the potential capital supply.

The types of non-Walrasian equilibrium can be identified both at the macroeconomic level and at economic branch level. Due to the different degree of aggregation, it is possible that the type of non-Walrasian equilibrium detected at the macroeconomic level may not be the same with the situation at the economic branch level. In other words, it is possible that all the three types of non-Walrasian equilibrium co-exist at the level of economic branches. For these reasons, it is necessary that macroeconomic policy, whose objectives are strongly influenced by the non-Walrasian equilibrium registered at the level of the whole economy, be accompanied by the implementation of structural policies. Thus, it can ensure the efficient operation of the labour market, incentives for innovation and technological changes and identification of new opportunities for capital investments.

6. An estimation of the type of unemployment in Romania

The identification of the type of non-Walrasian equilibrium at the macroeconomic level is not a very ease target. Major difficulties occur because at the macroeconomic level the statistical data available are those that refer to the total (registered) demand, rate of unemployment, employment and fixed capital.

Consequently, in order to detect the type of non-Walrasian equilibrium at the macroeconomic level in Romania we intend to determine econometrically the relative level (i.e., in comparison with the total (registered) demand) of the solvent demand and of the supply of capital available to be invested.

Firstly, we define econometric equations for:

a) total (registered) demand; and

b) stock of (fixed) capital.

Secondly, if the respective equations give reliable results (i.e., the values of the coefficient of determination are greater than 0.75) we consider that the estimate values of the resultative variables represent:

a) solvent demand, approximated by the trend of total (registered) demand; and

b) supply of capital available to be invested, approximated by the trend of stock of (fixed) capital.

Thirdly, based on formulas (2) and (3) it is possible to determine the relative level of the supply of goods and services from the point of view of labour force and capital, respectively.

We proposed as econometrical equations:

a) a combined semitranslog and disembodied technical progress function for the total demand; and

b) an autoregression function for the capital stock.

Based on the data presented in E. Dobrescu (2006), we obtained the following results:

$\ln (TD_t) = -0.24162 + 0.022959 \cdot t + 0.227482 \cdot \ln^2(K_t)$ $R^2 = 0.798481$

$\quad\quad\quad$ (-5.14915) (3.124153)   (0.532631)

and

$K_t = 0.000772 + 0.976193 \cdot K_{t-1}$ $R^2 = 0.887932$

$\quad$ (0.008346) (9.750806)

N.B. R^2 = coefficient of the determination value. In the brackets we present the computed values of Student Test.

Having in view a value of 0.75 for the coefficient α, the estimated values for TD_t and K_t and formulas (2) and (3) it is possible to determine the indicators which permit the identification of the type of unemployment in Romania during 1991-2004 (Table 1).

Table 1 - Estimated levels of indicators defining the non-Walrasian equilibrium in Romania during 1991-2004

1990=100

Year	TD_{ef}	TD_{trend}	$S_{GS(SLef)}$	$S_{GS(SKef)}$	Type of unemployment
1991	87.1	82.3	89.1	88.5	Partial Keynesian
1992	84.7	84.1	90.3	79.5	Classical
1993	82.9	86.1	90.1	78.3	Classical
1994	87.5	88.2	95.6	83.0	Classical
1995	94.2	90.2	101.7	91.2	Classical
1996	97.8	92.3	103.0	95.7	Classical
1997	94.5	94.4	101.4	95.5	Partial Keynesian
1998	89.6	96.6	97.4	95.1	Partial Keynesian

Year	TD$_{ef}$	TD$_{trend}$	S$_{GS(SLef)}$	S$_{GS(SKef)}$	Type of unemployment
1999	92.2	99.8	101.5	106.4	Full Keynesian
2000	97.6	103.9	106.1	109.1	Full Keynesian
2001	103.1	107.2	110.6	105.9	Partial Keynesian
2002	110.3	110.6	117.8	112.8	Partial Keynesian
2003	115.5	111.8	122.4	105.8	Classical
2004	126.7	113.9	133.7	120.1	Classical

Note: Computations are based on the data from E. Dobrescu (2006).

The estimate presented in Table 1 shows that the classical unemployment is the predominant form of the non-Walrasian equilibrium in Romania during the analysed period. The respective type of unemployment occurred both during the first transformational recession and during the rapid economic growth of mid - 1990's and 2003-2004. The full Keynesian unemployment appears as an exception, being identified only in 1999-2000.

These results highlight the fact the structural adjustment of the economy, especially in the 1990's and in the early 2000's led to a continuous decrease in the tangible fixed capital. In this context, the economic growth and the efficient use of human resources are hampered by the lack of productive capacities. The major lesson to be learnt from this analysis of the above-mentioned data is that the macroeconomic policy must strongly focus on providing incentives for investments both on quantitative and qualitative sides. At the same time one must not neglect the importance of an adequate management of private and governmental consumption through the fiscal policy.

7. Conclusions

The main original contribution of the present paper is the proposal to use a model of non-Walrasian equilibrium with three markets, respectively the goods and services market, labour market and capital market. This is an extension of the standard model of non-Walrasian equilibrium, which takes into account only the goods and services market and labour market. In this context, the restrictive and mobilizing factors for the economic activity in the short run are identified.

Based on these methodological innovations, the types of non-Walrasian equilibrium are redefined. It is important to note that the new definition of the types of non-Walrasian equilibrium can be used also when the markets of production factors are taken into account. The extended model of non-Walrasian equilibrium may prove to be a useful tool in designing and implementing the macroeconomic and structural policies.

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