REAL WAGES HETEROGENEOUS CYCLICALITY: A THEORETICAL EXPLANATION[1]

Reporte de Investigación[2]

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Abastract:

According to current literature referred to empirical evidence, neoclassical theory has shown its limits in explaining the heterogeneity in the adjustment of real wages over the business cycle in most of local and international analysis. The main implication of it concerns to the incapability of predicting wages and employment tendencies, and so in deriving efficient policy criteria to govern the resulting macroeconomic pathologies. Before it, the aim of this paper is to propose an alternative theoretical explanation based on a reconsideration of competitive firm theory. The results reached from a model built over a small variation in the hypothesis referred to the objective function of the competitive firm, lead to a significant divergence in real wage-employment relation, and to an also significant convergence between the empirical tendencies of real wages cyclicality and what this model predicts for each case considered herein.

ECONLIT Classification: A130, J010, J160, J200, J310, D690

Key words: Wages, Employment, Distribution, Unemployment

1. INTRODUCTION

Following the conclusions of recent and past international and local empirical analysis, it is undeniable that the cyclical character shown by real wages along and over the business cycle has been highly heterogeneous, and that the theoretical robustness of the neoclassical approach to explain the observed tendencies has been seriously challenged and weakly sustained overtime. The doubts about the pertinence of traditional hypothesis to explain the wage-employment relations in a competitive market economy have increased to the point that seems necessary to essay a deep revision of theoretical fundaments. The main references utilized for our research concern to Geary and Kennan (1982), Solon, Barsky and Parker (1994), Huang, Liu and Phaneuf (2002), Shin and Solon (2006), Martins (2007), Castle and Hendry (2007), y Messina, Strozzi and Turunen (2009).

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The aim of this research is to provide a theoretical model to explain a competitive economy and particularly its wage-employment cyclicality as well as the causal relation between involuntary unemployment and real wages. For it we assume at the beginning the simplest macroeconomic framework for a closed economy: a two agent system (a consumer and a producer), with a single non durable good, and labor as the unique variable production factor. Everything happens during the only one period observed. Then we expand the analysis to an open economy performed under the assumption that it imports all inputs utilized by its producers besides some goods for final consumption and we proceed to study economies with different degrees of industrial development, measured the latest through the structural dependence shown by the industry in its imported inputs elasticity.

The results allow us to consistently explain as well the positive or direct tendencies in the relation real wages-employment, as the inverse relations, making possible to clearly distinguish the analytical conditions under which each type of relation is described.

2. A BASIC MODEL

We suppose the existence of a single representative consumer with an infinite life horizon, whose decisions result from a maximization of a utility function subject to his budget restriction, and a representative firm that fixes its production plans through the maximization of a profit rate function subject to the technological restriction in which not only infrastructure but also organization exists and is represented as a part of what labor does for production; all this, instead of the traditional profits function over which neoclassical representations of firms are usually based on, and the production function which only represents the *hardware* or infrastructure of technology. The environmental conditions are established for a competitive, privet property and decentralized system.

The traditional production function with decreasing returns does not allow the maximization of profit rate, except where profit rate becomes infinite, and production and factor quantities are both zero. So, in order to make feasible the analytical representation of a firm that maximizes the profit rate over the efficiency frontier of the production function with non-zero production and employment, another element will be included: the distinction between the labor needed to organize the firm and the labor employed directly on production. The main implication of it, is the change in the concept of firm itself. Traditionally, firms are though as agents pursuing profit goals just to the point where the engineering of production allows it, and the organization is completely left away of the definition. Here, we will take into account firms engineering as well as its organization. The latest will be considered as the labor effort that firms must pursue in order to attend all contracts needed to acquire inputs and to sale its product, which implies, under the assumption of perfect information, that the quantity of labor employed in the firms organization will be directly related with the size of market.

Let us denote labor by l, product by q, profit by Π, profit rate by π, nominal wage by w, and product price by p. The subindex d and s will indicate demand or supply, respectively. Variable $l*$ will correspond to the quantity of labor employed by the firm in order to organize all its processes. In other words, $l*$ will be directly proportional to the number of contracts established by the firm in order to employ labor and to sell product, which will depend of the size of product market. It must be stated now that $l*$ will not introduce neither increasing returns nor indivisibilities. Moreover, taking into account the traditional hypothesis, $l*$ would not imply any change in the first order conditions for the firm.

Since the main analytical difference of our model derives from the firm's behavioral representation, we will start by analyzing it.

2.1 Firms

Usual neoclassical representations of firms correspond to the following equations, including now the concept $l*$:

$$max\ \Pi = pq_s - wl_d \tag{1}$$

$$\text{s.t. } q_s = f(l_d - l^*),\ \ f' > 0,\ f'' < 0, \tag{2}$$

where $l_d > l^*$. The general case in the neoclassical tradition corresponds to $l^* = 0$; however, for any case this kind of production function does not modify the first order conditions:

$$f' = \frac{w}{p}, \tag{3}$$

$$q_s = f(l_d - l^*) \tag{4}$$

With these two equations is possible to solve for employment and production optimum levels for the firm, once real wage is know. Now, let us define profits level Π of equation (1), as the result of a profit rate (π) applied to the total cost to produce q (in this case, total wages):

$$\Pi = \pi(wl_d), \tag{5}$$

and replacing it in (1), the objective function becomes the profit rate instead of its level. Then, the maximizing behavior of this agent will be given by:

$$\max(1+\pi) = \frac{pq_s}{wl_d}, \tag{6}$$

$$\text{s.t. } q_s = f(l_d - l^*),\ f' > 0,\ f'' < 0, \tag{7}$$

for any $l_d > l^*$. Solving it, we obtain the following equilibrium conditions:

$$\frac{df(l_d - l^*)}{dl_d} \frac{l_d}{f(l_d - l^*)} = 1, \quad (8)$$

$$q_s = f(l_d - l^*), \forall l_d > l^* \quad (9)$$

Thus, the representative firm's equilibrium plan to maximize π, is found at the point of the production function where marginal product equals average product.[3] Given the real wage, the slope of the *isorate* of profit function will depend exclusively on π.

In order to calculate employment and production equilibrium levels, it is needed to solve the system given by the first order conditions (8) and (9). To see this, suppose that function (7) is homogeneous of degree μ, $\mu > 0$, in $(l_d - l^*)$. Then, in virtue of Euler's theorem, (9) can be written as follows:

$$\mu q_s = \frac{df(l_d - l^*)}{dl_d}(l_d - l^*) \quad (10)$$

Replacing (10) into (8) and solving for l_d, we get the following labor demand function:

$$l_d = (1 - \mu)^{-1} l^* \quad (11)$$

Now, substituting (11) in (9), we get the corresponding product supply function:

$$q_s = f(\mu(1 - \mu)l^*) \quad (12)$$

Since (9) is homogeneous of degree and defines the set of all possible firm's equilibria for all $l^* \geq 0$, (12) becomes an strictly concave and continuous function.

Both functions (11 and 12) show some fundamental results. On the one hand, we have that labor demand is independent of w and p, and exclusively dependent on the size of market through l^*. Independently of the characteristics that labor supply could have respecting w, the labor market will not be performed in the system, unlike the neoclassical framework takes place. This market does not exist in the competitive structure of our model. Firms will not employ higher levels of labor if wages decrease, like the neoclassical theory commonly predicts. They will only increase employment if l^*rises, and it will only happen if the number of contracts grows. Since firms do not follow the signal of wages to take their decisions, they will decide the employment level that maximizes their profit rate according to the number of contracts they are supposed to accomplish. It means that labor demand will increase (decrease) if market expands (reduces) its size. The inverse relation between wages and employment, fundamental in the traditional hypothesis frame, does not exist here.

[3] Such a point would not exist in a function with $l^*=0$, that belongs to the general case of neoclassical models. It means that it would not be possible to find a theoretically significant solution.

On the other hand, we have the product supply function, which is independent on w and p as well. This one becomes positive regarding l^* (like the labor demand), even though its slope decreases as long as l^* grows. That is, the rational behavior of firms is related with the size of sales, once w and p assure economic viability of production. In other terms: whenever in the system the real wage satisfies this condition: $\frac{q_s}{l_d} \geq \frac{w}{p} > 0$, the profit rate will be positive and the financial viability of the firm will be assured. If the real wage is equal to the average product, then π will be cero but the system will keep its financial feasibility. In change, if real wage comes to be cero, the complete system collapses. It can be easily verified in the following equation which derives from (6):

$$q_s = (1+\pi)\frac{w}{p}l_d \qquad (13)$$

Labor demand and product supply functions imply that firms will maximize their profit rate if and only if real wages ensure profits for the firm. Given w and p, if firms sell less than what market demands, they would be missing possible profits, as well as if they produce more than what market requires. Then, the firms will always follow market demand as the signal to maximize.

Finally, it is important to point out that it can be shown that in equations (6) to (12) there is more than one pair (w, p) that would fit each one (l_d, q_s) couple. The usual one-to-one relation between prices and quantities has been abandoned by results, and the possibilities to explain direct or inverse relations between employment level and real wages are completely opened.

2.2 Consumer

This agent maximizes a strictly concave utility function defined on two independent variables: leisure S, and consumption q_d. Leisure is defined as the difference between labor time supplied by the individual l_s, and total time biologically available τ, given to each consumer as a natural endowment. Then:

$$S = (\tau - l_s) \qquad (14)$$

Hence, the maximizing behavior of the consumer will be given by:

$$max\ U = u(l_s, S) \qquad (15)$$

$$s.t. (1+\pi)wl_s = pq_d \qquad (16)$$

The first order conditions are given by:

$$-\left(\frac{\partial u}{\partial l_s} \Big/ \frac{\partial u}{\partial q_d}\right) = (1+\pi)\frac{w}{p} \qquad (17)$$

$$(1+\pi)wl_s = pq_d \qquad (18)$$

The budget constraint corresponds to a regime of property where each consumer only owns its right and capacity to work. The property rights on firms will be distributed among the consumers by the economy, through the work contracts. These rights are not previously assigned, as the traditional hypothesis usually states. So representative consumer will receive a part of his income from its labor supply (wages), and another part from its property rights on firms, represented in (16) and (18) by the term $\pi w l_s$. If an agent is not employed at all, its income will be zero.

A main feature of the model is that the income-expenses equation of the firm, derived from (6), along with the budget constraint of consumer, lead to the Walras's law expression that assures the accountable consistency of the system:

$$0 = p(q_d - q_s)(1+\pi)w(l_d - l_s) \qquad (19)$$

By definition, we can write the marginal rate of substitution at the equilibrium point, equation (17), as a fixed proportion:

$$\psi \frac{q_d}{\tau - l_s} = (1+\pi)\frac{w}{p} \qquad (18')$$

The parameter ψ is a real positive number which comes from the parametric structure of preferences. Replacing (18') in (17) and solving the equation system, we get the two following results:

$$q_d = (1+\psi)^{-1}(1+\pi)\frac{w}{p}\tau \qquad (20)$$

$$l_s = (1+\psi)^{-1}\tau \qquad (21)$$

Equation (20) belongs to product demand function, and equation (21), to labor supply function. We can see that both have a standard shape; while product demand function is directly related to income and inversely to p, labor supply is inelastic to wages, due to the flexibility of the mechanism of property rights assignment that we have assumed. Even though we have already reached the result of nonexistence of labor market and (21) reinforces it, inelastic labor supply should not represent by itself any problem for labor market's performance if it existed, since it is frequently used in neoclassical framework as a standard assumption to analyze employment and wages. However, being it now linked to labor demand (11) in the economy here analyzed, the result is clearly the nonexistence of something like a "labor market". Doubtless, there is a labor sector, suitable for analysis of employment phenomena, but it cannot be considered a market. Thus $\frac{w}{p}$ is not defined neither by labor supply nor by demand, as usually stated. It becomes now a distributive variable which must be determined exogeneously to the market system, by means of wage bargain.

2.3 General Equilibrium

General equilibrium conditions for the model are given by the following excess demand functions:

$$q_d - q_s = 0 \qquad (22)$$

$$(l_d - l_s) \leq 0 \qquad (23)$$

The equilibrium conditions system completes with Walras's law, equation (19). So, on the one hand, equation (21) is equal to zero since we assume that w and p are strictly positive. On the other hand, (22) is defined with an inequality to consider the possibility of existence of unemployment. Making the following algebra, we will show that unemployment exists although p and w are positive, and still if they change under perfect price and wage flexibility conditions: we substitute (12) and (20) into (21), and replace (11) and (21) into (23). Thus, we get the following functions:

$$(1+\psi)^{-1}(1+\pi)\frac{w}{p}\tau - f(\mu(1-\mu)^{-1}l^*) = 0 \qquad (24)$$

$$(1-\mu)^{-1}l^* - (1+\psi)^{-1}\tau \leq 0 \qquad (25)$$

Solving for l^* we obtain the equilibrium average product given by the term $(1+\pi)\frac{w}{p}$. Solving for a full employment situation, by equalizing to zero (25), we get:

$$l^* = (1-\mu)(1+\psi)^{-1}\tau\,, \qquad (26)$$

and substituting (26) into (24), finally we arrive to:

$$(1+\pi)\frac{w}{p} = (1+\psi)\tau^{-1} \cdot f(\mu(1+\psi)^{-1}\tau) \qquad (27)$$

This equation will stand for any positive magnitude of l^*. It means that l^* could even be inferior to its magnitude of full employment and still determine an equilibrium solution for product market.

2.4 Wage-Employment Features

To introduce money, let M^s be the nominal supply of nominal means of payment, so that the monetary sector comes to be performed by:

$$M^s = \bar{M} \qquad (28)$$

$$M_d = pq_d \qquad (29)$$

$$M^s \equiv M_d \qquad (30)$$

Since every level of product demand will be a feasible and an equilibrium production level for firms supply, (29) will always be defined for product market equilibrium. Indeed, product market will have a perpetual equilibrium situation for whatever employment level.

Let us suppose for a moment that nominal supply of money increases by an exogenous decision, in such a wage-bargain environment that firms increase wages in an inferior proportion to price increase, given by ϑ, $1>\vartheta>0$. Then, real wage will decrease and cause a reduction in product demand. The latest will diminish firm's sales and adjust employment level to a lower. However, being this or any other the cause of a market reduction, it is possible to show that equilibrium in product market is consistent with unemployment. For it, let ε, $1>\varepsilon>0$, be such as to define the following magnitude in (26):

$$\breve{l}^{*} = (1-\mu)(1+\psi)^{-1}\varepsilon\tau \qquad (31)$$

Replacing (31) in (27), we arrive to the following expression:

$$(1+\breve{\pi})\frac{\breve{w}}{\vartheta p} = (1+\psi)\varepsilon\tau^{-1}\cdot f(\mu(1+\psi)^{-1}\varepsilon\tau) \qquad (32)$$

It shows that average product increases while total product, given by $f(\mu(1+\psi)-1\varepsilon\tau)$, decreases. Employment level is lower and profit rate becomes higher. If demand reduction is caused by means far different from those considered before, real wage could be lower than its full employment magnitude or could remain unchanged, since any w such as $w \geq \breve{w}$, will be consistent with the system structure.

Up to this point, we shall raise a question: What are the causal relations to explain production and employment levels? The answer is that product demand determines employment level. From equation (24) we arrive to:

$$l^{*} = (1-\mu)\mu^{-1}\cdot f^{-1}\left((1+\psi)^{-1}(1+\pi)\frac{w}{p}\tau\right) \qquad (33)$$

Here, labor demand, which is given by $(1-\mu)^{-1}l^{*}$, according to (11), and the employment level, become positive functions of product demand for whatever p and w. From the previous result, the size of market is defined according to (33).

Since nominal wage and money supply are determined exogenously, the employment, production and distribution are simultaneously settled. We can already generalize the following conclusions: market equilibrium is perpetual, independently of employment level, and there is not a one-to-one relation between real wage and employment level.[4]

3. AN OPEN ECONOMY MODEL

Some basic features of underdeveloped economies, taken by the model, are the following: They are considered to be small and price takers due to their production size regarding to the rest of the world. Their production is irrelevant in the formation of international prices. The highest percentage of its imports corresponds to inputs and capital goods, which are necessary to their production.[5]

[4] In this case, market will concern exclusively to the only existing product. However, it is easy to show that with more than one product, the system will admit as many markets as products exist. Nevertheless, labor sector will not be one of these markets.

[5] That is a tacit revelation of their technological weakness and dependence on industrialized countries. The need of their internal economic activity for inputs and capital goods produced by the rest of the world, make their production highly inelastic to exchange rate fluctuations. In change, its imports of consumption goods are highly elastic.

This economy holds on its own the possibilities of administration of three exogenous variables: the monetary wage, the nominal exchange rate and the monetary supply. A specific aim of the model will be to explain the paper that carries out the exchange rate in the determination of production, employment and prices levels, as well as distribution and poverty phenomena. The specific analytic environment corresponds to an export oriented economy.

In order to search for an alternative explanation of observed results, the model analyzed herein is based on the following assumptions:

1. The labor mobility between the local economy and the rest of the world is null.[6]
2. The local economy is composed by two representative agents: a consumer and a producer; by two non durable products: the internal one and the imported from the rest of the world, and by the necessity of two production factors: its own labor capability and the imported product.
3. The consumer requires as well the national product as the one imported from the rest of the world to solve her needs. The same consumer is labor supplier for the internal productive apparatus. There is positive gross substitutability between the national and imported product for consumption in the utility function.
4. The producer demands the imported product as the only physical input, which the producer transforms into the final internal product. This agent also demands the labor supplied by the consumers, in order to organize the production process and to accomplish production itself. The producer supplies the final internal product, not only for internal consumption, but also to export it to the rest of the world.
5. The producer does not use its own product as an input.
6. There is total absence of durable products in the world economy, so that the internal economic processes as well as the external take place in only one period.

3.1 Accounting features

Let the local economy consumer's behavior be given by:

$$\max U = f(q_c, q_m, S) \tag{1}$$

$$\text{s.t.}\ \Pi + wl_s = pq_c + \varphi\, p_m q_m \tag{2}$$

The preferences correspond to a well behaved utility function $f(\cdot)$, and q_m refers to the product imported from the rest of the world for internal consumption; p_m to the

[6] It is a fact that migration from poor to rich countries is much more significant.

price of the imported product, and ϕ to the nominal exchange rate expressed in terms of a number of internal monetary units by each monetary unit of the rest of the world. The other variables are: q_c the local consumption of internal product; S, S=(τ-l_s), the demanded time for leisure; p the price of internal product; w the nominal wage; l_s the supplied time for labor, and Π the profits perceived by the consumer for her property rights on the firms.

As in the previous model, the firm's economic behavior is defined by the maximization of its profit rate, subject to a strictly concave production function (diminishing returns to scale) respecting $(l_d - l^*)$, so that:

$$\max(1+\pi) = \frac{pq_o}{(wl_d + \varphi\, p_m q_{\min t})} \tag{3}$$

$$\text{s.t } q_o = g[(l_d - l^*), q_{\min t}] \;;\quad g' > 0,\; g'' < 0 \tag{4}$$

In (3) and (4) we denote with $q_{\min t}$ the quantity of external product internally used as an input for production. The term $l*$ belongs to the quantity of labor employed by the firm in order to organize all its processes, as it was stated for the previous model. The bigger the number of contracts established by the firm in order to employ labor and to sell product, the higher $l*$ will be.

Once defined $q_x = q_s - q_c$, being q_x the exported quantity of internal product, and q_c the internal product consumed locally, the balance of the internal economy is given by:

$$w(l_d - l_s) = pq_x\text{-}\varphi p_m[q_m + q_{\min t}] \;, \tag{5}$$

Equation (5) shows that trade deficit will always be equal to unemployment (left side), in terms of value. The rest of the world will have then surplus and positive excess of labor demand. If there were some degree of mobility for the labor force between the two economies, the economy with surplus would generate immigration, and the one with deficit, emigration. However, following assumption 1, the deficit in (5) would not be solved by labor mobility. We may wonder then if a small and open economy would solve its unemployment problem just by allowing the free fluctuation in its exchange rate until balancing its international trade. Besides an existing demonstration of unemployment in a closed economy (world economy), advancing a bit of the analysis, the answer is negative. As it will be shown, the free flotation of exchange rate would only achieve the balance in a transitory way, that is to say, in a short period of time, likewise the full employment, because the deficit condition is a problem of structural transformation of its productive apparatus. The trade deficit is only the countable expression of the technological weakness of the local economy regarding the rest of the world. It is a problem that cannot be solved by the exchange rate itself.

Since the economy that is analyzed does not correspond to a general equilibrium system, there is p_m that comes from the rest of the world as a given data. The right member of (5) it is not a demand surplus in the sense of a walrasian function, which would derive from a difference between the demand and supply of a same product or service; it is the difference in value between exports and imports. The equality in (5) will depend on the magnitude of φ. As it will be seen, the internal economy will consist in a market of internal product, a labor sector, a demand for foreign product, and a monetary sector. So it will be possible to determine production, employment, distribution and prices, once that nominal wage w, nominal exchange rate φ and monetary supply are predetermined by exogenous criteria. Thus, w and φ correspond to the internal economy's degrees of freedom once the monetary supply $M°$ is set.

3.2 Supply and Demand Functions

Since the consumer's behavior consists on achieving through the maximization, the optimum partition of its income between the available goods, in order to simplify some well known procedures, we will only needed to know the fractions of the income that this agent assigns to each one of the two existing products. So let γ and ξ be two positive parameters representing the consumer's preferences, such that $1>(\gamma+\xi)>0$. So the optimum fractions of the income that the consumer assigns to q_c, q_m and S, respectively, considering that $S=(\tau-l_s)$, is given by:

$$(\Pi+w\tau) = \gamma(\Pi+w\tau) + \xi(\Pi+w\tau) + (1-\gamma-\xi)(\Pi+w\tau) \qquad (6)$$

So we arrive to the following functions, which are exactly the same as those that would result from an explicit maximization exercise, excepting the specificities of the parameters, now irrelevant for our analysis:

- Domestic demand for internal product:

$$q_c = \gamma\left(\frac{\Pi + w\tau}{p}\right) \qquad (7)$$

$$q_{cm} = \xi\left(\frac{\Pi + w\tau}{\varphi\, p_m}\right) \qquad (8)$$

- Domestic demand for external product for consumption:

- Leisure demand:

$$S = (1-\gamma-\xi)\left(\frac{\Pi + w\tau}{w}\right) \qquad (9)$$

- Clearing l_s in (9), we get the labor supply:

$$l_s = (\gamma+\xi)\tau - (1-\gamma-\xi)\left(\frac{\Pi}{w}\right) \qquad (10)$$

The firm's maximization problem is defined as follows:

$$\max(1+\pi) = \frac{pq_o}{(wl_d + \varphi\, p_m q_{\min t})} \qquad (3)$$

$$\text{s.t. } q_s = (l_d - l^*)^{\alpha}\, q_{\min t}^{\beta}\ ; \quad 1 > \alpha + \beta > 0\ ; \quad \alpha;\ \in \Re^{+} \qquad (11)$$

defined for every $(l_d - l^*) \geq 0$.

The first order conditions are: the marginal relationship of technical substitution (12), and the sum of factors elasticities equal to one (13), besides the production function (14):

$$\frac{\alpha q_{\text{mint}}}{\beta(l_d - l^*)} = \frac{w}{\varphi\, p_m} \qquad (12)$$

$$\alpha \frac{l_d}{(l_d - l^*)} + \beta = 1 \qquad (13)$$

$$q_s = (l_d - l^*)^{\alpha} q_{\text{mint}}^{\beta} \qquad (14)$$

The solution of this system are:

- Labor demand:

$$l_d = \left(\frac{1-\beta}{1-\alpha-\beta}\right) l^* \qquad (15)$$

- Internal demand for external product that will be used as input:

$$q_{\text{mint}} = \left(\frac{\beta}{1-\alpha-\beta}\right)\left(\frac{w}{\varphi\, p_m}\right) l^* \qquad (16)$$

- Internal product supply:

$$q_s = \frac{\alpha^{\alpha}\beta^{\beta}}{(1-\alpha-\beta)^{\alpha+\beta}}\left(\frac{w}{\varphi\, p_m}\right)^{\beta} (l^*)^{\alpha+\beta} \qquad (17)$$

As it is shown in (15), the demand for labor by the firm is independent of the real wage and of any price. So we show that firms do not demand labor as a function of real wages but as a result of the size of the market that buys the product supplied by the firm. The size of the market is denoted by l^*, magnitude that will be solved in the macroeconomic solution of the model. It is also apparent that demand for imported input, as well as the product supply of internal product, depends on prices. We already have that in the case of (16), although there is an inverse relationship with its price, before an increase of the price or the rise of the exchange rate it will not necessarily fall the bought quantity of the good; it can be the case where the growth of the market of internal product (reflected in l^*), impulse the buys of the imported input in spite of the rise in the price of it.

In (17), the quantity produced by the firm has a positive relationship with the real wage. The growth of real wages will cause the expansion of the product supplied. This result is substantially different to those of neoclassical theory. According to neoclassical results, when there is a decrease in the real wage, the firm increases its production. It means that whenever the market experiences a demand contraction, the firms are called to produce more goods.

In spite of the fact that labor supply (according to 14) depends on w, in (15) it is shown that labor demand is independent of this variable. This implies again that the labor sector is not a "market", as it is presented in the traditional theory, therefore, w (or *caeteris paribus*, w/p) does not regulate the employment level, neither it is determined by the relationship between supply and demand of labor. The nominal wage w, comes to be a distributive variable that is exogenously determined through the negotiation. Therefore, the "labor market" it does not exist, neither it can be part of the analytic structure to explain the operation of a capitalist economy without causing serious conceptual errors with its inclusion as such a market.

3.3 Monetary Sector

In this economy exists the local money and the foreign currency that belongs to the rest of the world. Those are introduced through two channels: First, the monetary supply generated by the Central Bank with the purpose of covering the internal transactions on national product. Second, the foreign currencies enter to the economy through the firm for its exports. The Central Bank gives to the firms M^s as a unique credit; the firm pays to consumers, not only with the local money, but also with the foreign currency, the wages and profits, and also pays to the rest of the world for the inputs. Although the internal transactions can be made with local currency and foreign currencies, the rest of the world only accepts foreign currency. There are not intermediation earnings in the monetary exchange transactions.

The balance in the monetary sector is perpetual and instantaneous, represented by the following equation:

$$M_d = M^s \qquad (18)$$

The monetary supply is identical to the value of the domestic transactions on internal product:

$$M^s = pq_c \qquad (19)$$

The countable equation of the monetary system exhibits on the left member the availability of domestic currency (M^s) and of foreign currency (D_{iv}), on the right side the uses of these resources:

$$M^s + D_{iv} = pq_c + \varphi\, p_m(q_{cm} + q_{\text{mint}}) \qquad (20)$$

$$M^s + pq_x = pq_s \quad , \qquad (21)$$

By this way, the exports are the only channel to get foreign currency:

3.4 Domestic Market of Internal Product

Now it corresponds to exhibit the reduced form of the functions whose determination depends on the interactions between the consumer and the firm, starting from its optimum plans and the conditions of the rest of the world economy.

This market is constituted by the internal and external demand of internal product, and its supply. The demand surplus of this market is given by:

$$(q_c + q_x) - q_s = 0 \qquad (22)$$

Being the external demand for internal product (exports function), represented by the following expression:

$$q_x = \psi\left(\frac{\varphi y^*}{p}\right) \qquad (23)$$

The term Y^* in (23) represents the level of nominal income of the rest of the world economy; the price p and the exchange rate are the same as in previous functions. The parameter, ψ, $1>\psi>0$, is assumed to represent the preferences of the consumers of the rest of the world, and it allows to specify the fraction of the income of that economy that their consumers dedicate to the demand of the internal product.

Replacing (7), (16), (17), (21), and (23) in (22), and solving for l^*, we arrive to:

$$l^* = (1-\alpha-\beta)\left[\tau + \frac{\psi y^* \varphi}{w} - \left(\frac{1-\gamma}{\gamma}\right)\frac{M^s}{w}\right] \qquad (24)$$

This expression shows that l^* is fully flexible and its magnitude is directly related to the domestic and external effective demand for internal product. This guarantees the perpetual equilibrium in the product market. When there is more effective demand of internal product, l^* will be much higher. The function (24) will always satisfy the function (22). This means that the firm will not produce more, neither less, than the market demands. If they produced more than what is demanded, they would lose possible earnings, it would happen the same in the opposite case. Therefore, the perpetual equilibrium in the market of internal product puts in evidence a natural result of firm's behavior. It must be said now that perpetual equilibrium in that market does not mean full employment. As a matter of fact, the model allows to show positive unemployment simultaneously to perpetual equilibrium in the sense exposed before.

3.5 Price Level and Non-Inflationary Wages

Equation (24) is fundamental to solve all endogenous variables of the system in terms of the structural parameters (preferences, technology and the endowment τ), in function of the exogenous variables w and φ, and of the predetermined M^s. Replacing (24) in (7) and the result in (19), it is obtained the following expression for the internal price level:

$$p = \frac{w^{\alpha}(M^{s} + \psi y^{*}\varphi)(\varphi\, p_{m})^{\beta}}{\left(\alpha^{\alpha}\beta^{\beta}\right)\left[w\tau + \psi y^{*}\varphi - \left(\frac{1-\gamma}{\gamma}\right)M^{s}\right]^{\alpha+\beta}} \qquad (25)$$

This function corresponds to the reduced form of p. It shows that while the demand for internal product is higher regarding its supply, p will also be bigger. Concerning the relation between p and w, it is widespread belief, inspired by the traditional theory, that to increase the monetary wages causes inflation; therefore it is assumed automatically as a necessary resource to control inflation, to avoid the growth of the monetary wages or to locate it below the prospective inflation.[7] However, like it will be seen at once, the wages W is generally not inflationary. Only under very particular conditions their growth causes inflation, what locates to the neoclassical tradition in this aspect, inside a narrow fringe of validity.

The following inequalities will be the pillar of the principal argument of the analysis:

$$\text{a) } \frac{\psi y^{*}\varphi}{M^{s}} \leq \left(\frac{1-\gamma}{\gamma}\right) \quad \text{or well} \quad \text{b) } \frac{\psi y^{*}\varphi}{M^{s}} > \left(\frac{1-\gamma}{\gamma}\right) \qquad (26)$$

[7] In fact, differentiating the equality between marginal productivity of labor and real wage, and dividing the result then, side to side, among the original equation, is shown that wages inflation will be verified whenever the growth of the monetary wages exceeds the rate of growth of labor productivity. An important reference on the topic is found in BLANCHARD, O. and FISCHER, S. (1989), pp. 542-546.

The slope of (25) respenting w, φ or M^s, will depend on (26). The left member of (26), in anyone of the parentheses, refers to the proportion that the value of the external demand for internal product represents regarding the value of the internal demand (and that it can vary), and it is compared with the right member, defined by a constant proportion of the fraction of the consumer's income that doesn't wear out in internal product, regarding the fraction of the income that he/she wears out in it. If the case refers to the domain of domestic market regarding the exports or external market, we will be in the parenthesis a. On the other hand, if it is a situation of domain of external market on the domestic one, for destination of the internal product, it will be concerning to the parenthesis b. The equality, possible in the parenthesis a, will represent a trivial case, not durable and of scarce importance for the interests of the analysis.

The shape of (25) for an economy in which the domain of the domestic market on the product is observed, shows that, *caeteris paribus*, the growth of the wages will be generally deflationary; that is to say, whenever w increases keeping constant the nominal exchange rate and the monetary supply, p will diminish. As it is observed, in general, that shape –shown in figure 1- implies that if the growth of the wages is not financed with monetary supply but with a redistributive decision coming from the firm, *w* is not inflationary:

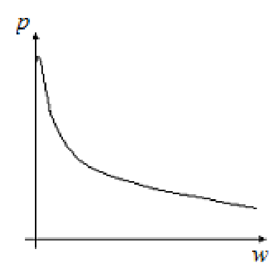

Figure 1

A decision of that kind on the part of the firm would alter the structure of the demand; the domestic market would strengthen and the employment level would grow. Even in spite of the decrease in the profit rate, the mass of benefits would also grow for the relative rise in the price of the imports for consumption and its substitution by internal product.

In a mistaken conception, neoclassical theory sustains that whenever the nominal wages grow to the same rate than the value of the marginal productivity of the labor, they won't cause inflation, but they surely would if they grew more than this.[8] In the

[8] The model of supply dynamics, proposed by Tobin (1972), and included in BLANCHARD, O. and FISCHER, S. (1989), pp. 542-546, clearly shows the neoclassical concept on this problem. There is no place in it for another sort of reasoning than the one that links wages with the marginal productivity of labor

first place, in the model TNLM it is demonstrated that the relationship among wages and productivity in the sense of neoclassical theory, doesn't have any appropriate analytic sustenance, since it derives from a behavior of the firms that doesn't represent its rational behavior in a correct way. In the second place, in the neoclassical domain w is considered a price, and so not a distributive variable. Therefore, if wages grow in a positive or negative proportion due to an exogenous impulse, the real conditions of the system are kept constant since the other monetary prices get adjusted in that same proportion. It means that after an inflationary process raised by w, the system won't modify its production and employment conditions in spite of the fact that the level of nominal prices will have increased.

However, as shown in figure 1, p reaches an absolute maximum in a very near point to the w's axis. Between zero and that maximum, there are extremely reduced values of w for which p grows; that is to say that the wage is inflationary inside of that range. Only inside that short range the neoclassical postulate of positive relationship is verified between wages and prices. Above the same one, that is to say, in the general case, the relationship between w and p is always negative.

It is possible to conclude then, that the relationship between the domestic price level and the nominal wages in an open economy with fixed exchange rate and unaffected monetary supply, dominated by the domestic market (that is to say, with domestic demand higher than external demand for internal product, according to the proportions specified in (26)), is generally inverse: to a higher nominal wages will follow a lower price level.

It corresponds now to analyze the case of an economy dominated by the exports of its own product supply; that is to say, a system represented by the parenthesis b in (26). The shape of p function for this case is shown in figure 2:

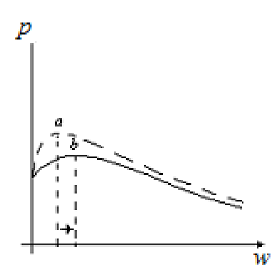

Figure 2

Geometrically, the function represented in this graph, contrary to that of figure 1, reaches its absolute maximum in values of w more and more elevated, the higher is the

under a positive relation. These and other facets of the problem are profusely discussed in JOSSA, B., and MUSELLA, M. (1998), *Inflation, Unemployment and Money. Interpretations of the Phillips Curve*, Great Britain, Edward Elgar, pp. 1-141.

dependence on exports. Two curves are presented, one dotted with its maximum signaled by *a*, and another one, continuous, with its maximum in the point *b*. The higher it is the dependence of the economy regarding exports, the direct relation between w and p will correspond to a wider range of w. In the dotted curve, if the wages are among zero and *a*, when growing towards *a* they will cause inflation, even not being financed with supplementary monetary supply. Only if w went bigger to the wage corresponding to *a*, its increments would have deflationary repercussions on p. As the dependence on the exports grows, the inflationary range of wages increases, like it is shown in figure 2 with the arrow that points out the displacement of the maximum.

This analytic conclusion is particularly important for those economies that have experienced exports growth rates very above of their internal product growth rates, under not very significant technological progress in terms of their capacity to knock down production costs regarding the rest of the world, during the last years. Since the underdeveloped world is generally marked with rather low wages, it is very possible that the inflationary character of *w* becomes more and more sharp, and with it the necessity to contain its growth to stabilize the internal level of prices and the exchange rate. That implies that the substitution of the domestic market for the external one, as the growing machine, will necessarily redound in an increasing tendency to punish wages to achieve inflation targets and exchange rate stability, except if a dynamic technological progress takes place in a quite a brief term.

3.6 Cyclicality Cases

The TNLM model has made apparent that the poor and inadequate concept of "labor market", characteristic of the neoclassical theory, has no space in the reasoning of the open economy. As a result of the reduced form of the model, the demand for labor depends on the effective internal product demand, and through it, positively on w. So then w doesn't act as a price, by no means it works as a mechanism able to regulate for itself the employment level, coordinating the plans of firms and consumers. The wage w plays the role of distributive variable, confirming the approach that the Classic economists and Marx had on this variable.

Labor demand comes out from the substitution of (24) in (15), and has the following expression:

$$l_d = (1-\beta)\left[\tau + \frac{\psi y^* \varphi}{w} - \left(\frac{1-\gamma}{\gamma}\right)\frac{M^s}{w}\right] \qquad (27)$$

This equation shows that the employment level depends on the effective demand of internal product, so much of the coming from the external market as of that that depends on the domestic consumers in the domestic market. From (27) we see that the weight of any one of the two markets will be decisive for the sort of influence that exogenous variables exercise on l_d. It is possible to verify also at first sight in (27), that the influence of the exchange rate on the employment level will be positive; negative that of the monetary supply, and not clearly defined yet that of w.

a) Employment level and wage

The inverse relation between w and π implies that when w diminishes, it necessarily polarizes the income in favor of the profits, and therefore of those that possess the property rights on firms. On the other hand, increments in w will give place to a more progressive distribution with an increase in the employment level.

For what has been said until this point, it is fundamental to answer to the following question: What sort of relation does w keep with l_d in each case, and under what circumstances this assures that the employment grows at the same time of consumption demand?

The following figure points out the possible cases to arrive to the answer:

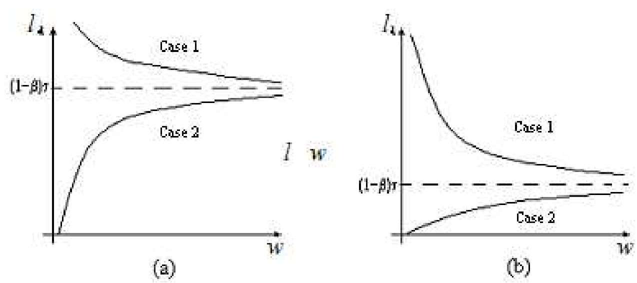

Figure 3

The difference between (a) and (b) it is determined by the magnitude of the parameter β, which determines the degree of dependence of local economy on imported input, same that is assumed to show the technological dependence in the model.

In (a) it is represented the case of an economy with small β, and in (b) the one with high β. Since the magnitude of this parameter reflects the grade of technological dependence regarding the rest of the world, (b) will correspond to a much more dependent economy that the one of (a). However, as well (a) as (b) shows the two possible cases that any underdeveloped and open economy can face, according to the proportion that internal market keeps regarding the external one in terms of demand of internal product.

- *Case 1: An economy highly dependent on its exports*

In each quadrant are two asymptotic curves respecting the magnitude $(1\text{-}\beta)\tau$, maximum employment level reachable for the system. The ones marked with "Case 1" exhibit the situation of an economy whose main activity impulse comes from its exports, in front of the reduced size of its domestic market, and the ones with the legend "Case 2" concern basically to an economy based on its domestic market.

Evidently, in an economy of the type (a) or (b)-case 1, the firms hire more labor the cheaper is the labor supply. It is the class of situation that neoclassical theory sustains. That is to say that whenever the small and open economy depends more on exports than on its domestic market, it will have to follow wage reduction policies in order to preserve or to expand its employment level and its short run competitive advantage. That is in fact the case of those economies that have been guided basically during the last thirty or forty years to the development of the assembly plants like props of their productive activity.[9] To maintain their competitiveness they operate systematically with reduced wages. Since the inputs this type of economies buy from other countries are quoted to international prices and that they try to maintain their profit rate at internationally attractive levels, they use the only available source in the domestic economy to knock down costs: the wages. These economies, instead of having reduced or even overcome their technological dependence, they have increased it (that is to say that β it has grown), having caused with it a more and more marked necessity to maintain low wages to preserve their employment levels and their international competitiveness.

- *Case 2: An economy highly dependent on its domestic market*

We analyze now the case of those economies that carry out the most significant part of their product thanks to the power of their own consumers' purchasing power, although they don't stop to require foreign currency to finance the purchase of their imported inputs. In this scenario the labor demand will be defined as positive function of the real wage, what means that to increase the employment level through the wage, *caeteris paribus*, will have to elevate w. This case gives place to a contrary situation regarding the one postulated by neoclassical theory. To higher w will correspond a higher employment levels. However, supposing that it existed oneself level of initial wage for two economies, a technologically less dependent one that the other one - as (a) regarding (b) -, the first one would have the possibility to increase more than the other one its employment level starting from an increase in w equal for both. This is due to technological dependence.

[9] For example, the economies of the southeast of Asia.

The size of domestic market in economies inherent to case 2, depends strongly on the power of their consumers' purchase, and it is so much bigger the smaller it is the part of the productive effort that is required to export to finance the imports. The positive relationship between wage and employment means that the increments in *w* will give place to progressive tendencies in the distribution of the monetary income among consumers. The growth in the employment level will go harnessed of progresses toward a more equal distribution.

It is shown that an underdeveloped economy that faces the challenge of depending basically on its exports to assure its activity level, is condemned to diminish its consumption levels and to concentrate the income in a growing way. On the contrary, the underdeveloped economies guided mainly towards their domestic markets, have effective possibilities to increase their well-being and to improve the income distribution.

b) Employment level and monetary supply

The growth of the monetary supply M^s, maintaining unaffected all the other exogenous variables, has a negative effect on labor demand. The magnitude of this effect, however, will depend on the magnitude of the parameter β and of w. The lower it is β, less marked it will be the slope of (27). The same as with β, while bigger it is w, less marked it will be the slope of the function and, therefore, the negative effects of increments in M^s on the employment will be less marked.

It becomes apparent that in the event of putting into practice an expansible monetary policy without the appropriate accompaniment of wage and exchange rate policy, the effect on the employment level will be negative. The transmission channel will be basically the level of p. However, this doesn't imply that the active monetary policy is generally recessive; the only thing that indicates is that if it acts by itself, it affects the occupation levels negatively.

c) Labor supply

The reduced form of the function of labor supply depends strictly on the internal conditions of the economy; that is, positively on w and negatively on monetary supply, as it is shown in the following expression:

$$l_s = \tau - \left(\frac{1-\gamma-\xi}{\gamma} \right) \frac{M^s}{w} \tag{28}$$

It is important to stress the absence of the exchange rate and of the level of income of the rest of the world in (28). This means that the added supply of labor in the domestic economy depends exclusively on internal conditions. The variations in the level of the total exports of the economy or in the exchange rate, they won't affect the labor supply, except for because the monetary authority decides to modify the levels of M^s and w to correspond to some derived impulse of the rest of the world. But while this doesn't happen, the labor supply will stay without change before alterations of the variables referred to the relationship of the local economy with the rest of the world.

d) Unemployment

The labor excess demand function defined to accept unemployment, is given by:

$$l_s - l_s \leq 0 \quad , \qquad (29)$$

Replacing (27) and (28) in it, we arrive to the following weak inequality:

$$\left(\frac{1-\beta}{\beta}\right)\psi y^{*}\varphi\, w^{-1} - \frac{\xi - \beta(1-\gamma)}{\beta\gamma} M^{s} w^{-1} \leq \tau \qquad (30)$$

Although under certain conditions it will also be able to admit on unemployment; that is to say, the inequality, no longer weak, but strict, of contrary sign. Given the wage, the left member shows that the employment level depends exclusively on the effective demand for internal product. Whenever the quotient of parameters that multiplies M^s is positive, the relation between M^s and the unemployment level will be inverse; that is to say that the more smaller it is the monetary supply that makes possible the transactions of the domestic consumption, the higher it will be the unemployment. However the sign of this quotient will be positive only while it is so allowed by the propensity to consume imported product ξ. If ξ<(1-β), the monetary supply will keep a positive relation with the employment level. If ξ>(1-β), the monetary supply will establish an inverse relationship with the employment level, and the wage w will positively determine it. In the latest, if w descends constantly, unemployment appears or increases its magnitude.

The organic link between w and the employment level can positive, negative or null. If the w grew in smaller proportion than the monetary supply and this last one increased more quickly than the exchange rate, the employment level would rise with invigoration of the domestic market and without regressive redistribution of the income. If on the other hand the exchange rate ascended, maintaining everything else constant, the occupation would also grow because of an invigoration of the external demand of internal product, weakening the domestic market.

Another possible scenario would be given by a growth of the exports and of M^s in the same proportion in what w grows, staying constant the exchange rate, in which case the employment level will stay constant, the income distribution will favor those that depend mainly on the salary revenues, and the import of inputs will grow more than proportionally regarding the total demand of internal product, with a substitution effect regarding labor.

This analysis makes clear that the relation between unemployment and the wage level and its flexibility is not subject to the narrow possibilities of the neoclassical theory; to every level of real wage can correspond multiple employment levels, and to every employment level can correspond countless levels of real wage. The degrees of freedom of (30) -three, without counting y^*- assure that independently of the adjustment rule assumed for w in a regime of full flexibility, the change in its magnitude won't assure by itself that full employment will be reached. On the contrary, it is apparent that starting from a hypothetical situation of equality in (30) (that is to say, full employment), a decrease in anyone of the components of the effective demand will contract the occupation level without any automatic mechanism of restoration of full employment. The involuntary unemployment then will appear, still when the relative prices in the system have not changed.

4. CONCLUSIVE REMARKS

Two main conclusions arise from this analysis: the first of those, that neoclassical theory, when compared with TNLM, seems not to provide the best analytical foundations for wage-employment phenomena; the second, that cyclicality reveals the main structural features of the economy, not only the specific employment-wages causal relations.

Upon the basis of a TNLM model it has been shown that in a worldwide closed economy observed through a long term model where all capital accumulation facts become reduced to consumption, the relation between real wage and employment level is positive, which means that there is no analytical argument to sustain any change of sign for it. However, once that the main structural features of an underdeveloped economy are taken into account, the cyclicality will be positive if the system depends overall on its domestic market, and negative if it depends on its exports.

For any case, it has been show that cyclicality analysis assumes a robust methodological profile when derived from the demonstration that wages are a distributive variable, not the price of labor, and indeed that labor sector is not a market and neither behaves as such.

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