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A New Macroeconomic Representation of the Labor Market based on the General Theory of the Firm

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Abstract

Based on the General Theory of the Firm, this paper has developed a new macroeconomic representation of labor market which allows to draw five main lessons. First, as an outcome of negotiations between employers and employees, the equilibrium of labor market is not characterized by equality between labor supply and labor demand, but rather by mutual "satisfaction" of both stakeholders. In fact, at the equilibrium, on the one hand, the respective desires to earn an extra penny on real gross profit and on real wage are equal and, on the other hand, the level of effort at work corresponds to the one agreed by each stakeholder in relation to the real wage. Secondly, labor demand is increasing with real gross profits. As a result, underemployment equilibrium is possible in an economy for two main reasons: (i) companies do not realize enough real profits to increase their labor demand, mainly because of the lack of profitable demand for goods and services and/or the strong job security in labor market; (ii) firms realize high real profits, but the labor flexibility is so strong that the economic dynamic is unfavorable for job creation and/or companies production capacities are relatively weak compared to labor supply. Thirdly, as a result, a judicious mix of flexibility and security in labor market, namely flexisecurity, is needed to ensure that economic growth generates both jobs and profits. Fourthly, the trade-off between unemployment and inflation is necessary in the short term, and the sacrifice rate of disinflation depends, among other things, on the degree of labor market flexibility. Lastly, even if a disinflation always has a cost in terms of the change in the unemployment rate in the short run, a decrease of the unemployment rate can be observed during a disinflation period.

Résumé : Une nouvelle représentation macroéconomique du marché du travail

Fondé sur la Théorie générale de la firme, ce papier a développé une nouvelle représentation du marché du travail qui permet de tirer cinq principaux enseignements. Premièrement, résultat de négociations entre les employeurs et les salariés, l'équilibre du marché du travail ne se caractérise pas par l'égalité entre l'offre et la demande de travail, mais plutôt par la « satisfaction » réciproque des deux parties. En effet, à l'équilibre, d'une part, les désirs respectifs de gagner un centime supplémentaire sur le profit brut réel et sur le salaire réel sont égaux et, d'autre part, le niveau d'effort au travail correspond au niveau accepté par chacune des parties, au regard du salaire réel versé. Deuxièmement, la demande de travail est croissante avec les profits bruts réels. De ce fait, l'équilibre de sous-emploi est bien possible dans une économie et, cela, pour deux principales raisons : (i) les entreprises ne réalisent pas assez de profits réels permettant d'accroitre leur demande de travail, à cause notamment d'une insuffisance de demande globale rentable et/ou d'une forte sécurité de l'emploi ; (ii) les entreprises réalisent des profits réels élevés, mais le marché du travail est trop flexible de sorte que la dynamique économique est très peu favorable à la création d'emplois et/ou les capacités de production des entreprises sont relativement limitées par rapport à l'offre de travail. Troisièmement, il résulte donc qu'un dosage judicieux de la flexibilité et de la sécurité du marché du travail, à savoir la flexisécurité, s'avère nécessaire afin que la croissance économique génère à la fois suffisamment d'emplois et de profits. Quatrièmement, l'arbitrage entre le chômage et l'inflation s'impose dans le court terme et le taux de sacrifice d'une désinflation dépend, entre autres, du degré de flexibilité du marché du travail. Cinquièmement, même si une désinflation a toujours un coût en termes de variation du taux de chômage dans le court terme, une baisse du taux de chômage peut bien être observée au cours d'un épisode de désinflation.

Summary

1. Introduction

The labor market is the subject of several controversies in macroeconomic analysis. According to Gregory Mankiw (1999), these controversies have often led to recommendations of contradictory economic policies proposed by economists to decision-makers.

The first category of controversy relates to the mechanisms of adjustment between labor supply and labor demand in the short term. For the neoclassical thinking, the real wage is flexible; thus, it adjusts to equalize the supply and demand for labor, so that all of the potential workforce willing to work at this level of wage is employed. Conversely, for the Keynesian thinking, nominal wages and prices are rigid in the short term; then, the labor market may be in a situation of underemployment equilibrium due to insufficient demand for goods and services.

The second category of controversy concerns inflation and unemployment relationship. For Keynesians, there is a negative relationship between inflation and unemployment. As a result, unemployment and inflation trade-off would be necessary in economic policies. For Friedman, the inflation and unemployment trade-off is only valid in the short term because economic agents adapt their expectations of wage increases according to inflation. For the new classics, there is neither short-term nor long-term trade-off between inflation and unemployment because the expectations of economic agents are rational.

In addition, many empirical facts and results seem to contradict these theoretical analyzes. On the one hand, unemployment has spread widely, especially in the past decade, contrary to neoclassical theories; while Keynesian economic recovery policies have proved ineffective in reducing it. Poverty persists in most developing countries.[2] On the other hand, at least two segments (formal and informal) with different wage levels coexist in the labor market of developing countries, thus calling into question the neoclassical thinking on labor market. On the other hand, empirical studies of disinflation episodes in several countries have shown that reducing inflation always has a cost which depends on labor market policies and institutions.[3]

Thus, despite the theoretical advances, the following three challenges relating to the macroeconomic representation of labor market remain posed: (i) understanding the mechanisms underlying the equilibrium of labor market which is most often characterized by situations contradicting neoclassic thinking (high wages, high unemployment, several segments), (ii) determining the effect of economic growth on employment because the facts have shown that it is not always synonymous with employment growth, (iii) identifying the determining factors of the inflation and unemployment trade-off.

Faced with these challenges, the main constraint is linked to the fact that most of the tools for analyzing the labor market derive from neoclassical approaches based on idealist assumptions about the labor market (perfect market), far removed from the realities of that market. So, this paper sets itself the objective of developing a new representation of the labor market, based on the General Theory of the Firm[4] which refutes the profit maximization hypothesis (black box) and adopts the postulate according to which companies operate on the basis of compromises between stakeholders. Thus, this research is structured in two sections, namely, (i) a literature review of labor market representations and (ii) the new representation of the labor market.

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[2] According to the African Economic Outlook 2017 (AfDB, OECD and UNDP 2017), despite a decade of economic progress, 54% of the population of 46 African countries are still trapped in a situation of multidimensional poverty and the claims relating to better job opportunities are the first trigger for civil protests.

[3] Blanchflower, D. et Oswald, A. 1995.

[4] Zerbo 2016 et 2018a.

2. Literature review of labor market representations

This literature review focuses on the two main theories, namely neoclassical theory and Keynesian theory, which have strongly influenced macroeconomic analysis of goods and services supply in general, and of the labor market representation in particular. Thus, this section first gives a brief overview of the analysis of each of the two thinking currents, then presents facts and empirical results that challenge their theoretical results.

1. *The neoclassical model of labor market*

Neoclassical analysis of labor market is based, on the one hand, on the function of labor supply which emanates from the tradeoff of individuals between consumption and leisure and, on the other hand, on the function of labor demand resulting from corporate profit maximization behavior.

a. *The neoclassical labor supply and demand functions*

According to neoclassical analysis, the choice of labor supply (L_S) is made by individuals in synchronization with their demand for consumer goods (C) and leisure (J). In other words, the labor supply results from a tradeoff between consumption and leisure through the maximization of the utility function (U) of individuals. This consumer maximization program is given by the relation (1) in which w denotes the nominal wage and p denotes the level of prices.

$$\begin{cases} Max \ U(C, J) \\ pC \leq wL_S \quad avec \ L_S = T - J \end{cases} \tag{1}$$

The first-order conditions of the maximization program give the relation (2) which indicates that the labor supply of individuals is linked to real wages.

$$\frac{\frac{\partial U}{\partial J}}{\frac{\partial U}{\partial C}}(L_S) = \frac{w}{p} \tag{2}$$

Under the assumptions of convexity and monotony of the consumer utility function, the labor supply function (relation 3) deduced from relation (2), is increasing with real wage (w/p). Thus, in neoclassical analysis, individuals adjust their labor supply according to real wage. When real wage increases, they increase their labor supply; more specifically, some people who did not previously want to work are now willing to work and those who are already working are willing to increase their working time.

$$L_S = L_S\left(\frac{w}{p}\right) \tag{3}$$

Regarding the demand for labor, it emanates, according to neoclassical analysis, from the behavior of corporate profit maximization behavior. It is assumed that companies produce goods and services according to a production technology which depends on labor (L) and capital (K), with a view to generating gross profits after having paid workers. Relations (4) and (5) respectively give the neoclassical production function and the corporate gross profit function.

$$Y = F(K, L) \tag{4}$$
$$\pi = pF(K, L) - wL \tag{5}$$

The first-order conditions of profit maximization give the relation (6) which indicates that gross profit is maximum when the marginal productivity of labor is equal to real wage. It is deduced the corporate labor demand function (relation 7).

$$\frac{\partial F}{\partial L}(L_D) = \frac{w}{p} \tag{6}$$

Under the assumption of concavity of the production technology, the labor demand function decreases with real wage. According to this analysis, when real wage decreases, employers are willing to hire more workers; while when the real wage increases, they reduce their demand for labor or the working time required.

$$L_D = L_D\left(\frac{w}{p}\right) \tag{7}$$

b. *The neoclassical equilibrium in the labor market*

In the neoclassical analysis, the labor market equilibrium is expressed by the equality between the labor supply (relation 3) and the labor demand (relation 7). Real wage (w/p) would be the adjustment variable for supply and demand in the labor market. It would adjust through the game of pure and perfect competition, and thereby achieve equality between labor supply and demand. So, the real wage (w/p)* at equilibrium corresponds to the wage level which ensures equality between labor supply and demand (relation 8 and graph 1).

$$L_D\left(\frac{w}{p}\right) = L_S\left(\frac{w}{p}\right) \tag{8}$$

For neoclassicals, any imbalance in the labor market stems from a difference between the observed real wage and the equilibrium real wage. In a situation of pure and perfect competition, such an imbalance cannot last because the wage will adjust to achieve equilibrium. In the graph 1, for instance, at the level of real wage $(w/p)_1$, the corresponding labor supply (L_1) is higher than the corresponding demand for labor (L_2). This imbalance will lead to a decrease in real wage because, on the one hand, there are individuals who are willing to work at a lower level of real wage and, on the other hand, there are employers who are willing to demand for additional labor at a lower level of real wage. The decrease in the real wage will lead to a decrease in the supply of labor and an increase in the demand for labor up to equilibrium point E, where labor supply equals labor demand.

Graph 1: Neoclassical equilibrium in labor market
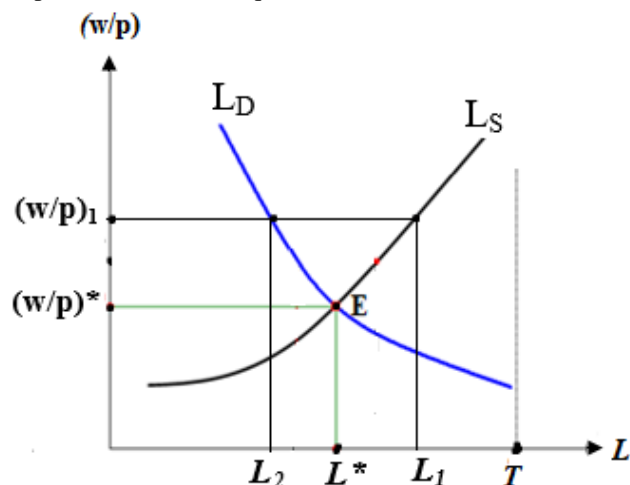
According to the neoclassicals, at equilibrium point (E), the economy is in a situation of full-employment, there is no unemployment because all the people willing to work at the real wage level (w/p)* are employed. Any situation of involuntary unemployment corresponds to a situation of disequilibrium in the labor market and, consequently, causes a decrease in real wage leading to an increase in demand for labor and a decrease in labor supply. Thus, involuntary unemployment

would be eliminated in the economy. Any persistence of involuntary unemployment would be linked to the existence of obstacles in the labor market which affect the flexibility of real wage. So, in neoclassical macroeconomic analysis, the solution to the unemployment (persistent involuntary unemployment) within an economy goes through the reduction or even the elimination of the obstacles which are sources of rigidities in the labor market (the labor market regulation, unions, labor administration, etc.).

However, the 1930s were characterized by unprecedented unemployment with dramatic social consequences. But neoclassical macroeconomic analysis was not equipped enough to answer them and suggest solutions. John Maynard Keynes therefore provides in his General Theory published in 1936 a new analysis of the economy and propose solutions to reduce unemployment.[5]

2. *The labor market in Keynesian macroeconomic analysis*

According to Keynes, the neoclassical model does not allow one to think about situations of involuntary unemployment equilibrium. It cannot therefore resolve such situations when they exist.

Graph 2: Keynesian underemployment equilibrium
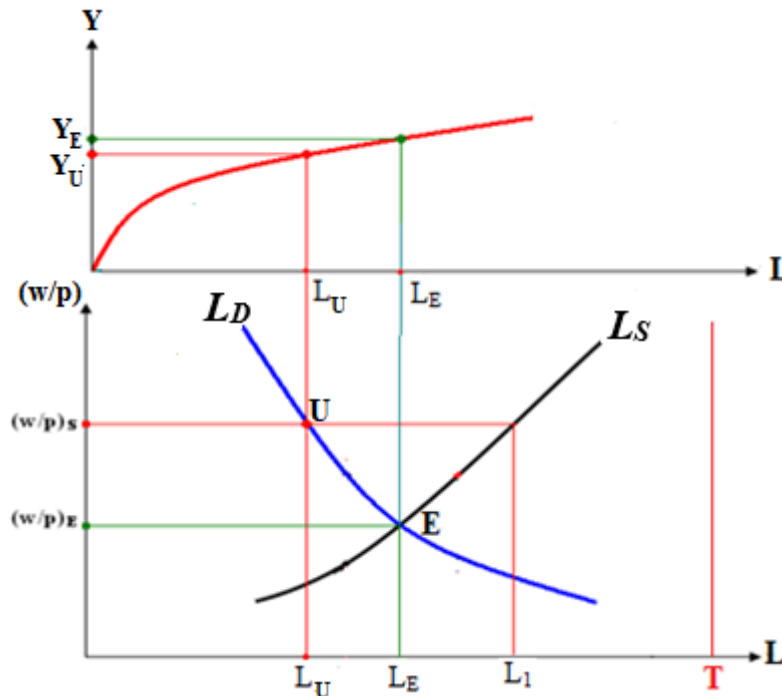
For Keynes, companies can face market constraints (insufficient aggregate demand). Then, the profit maximization behavior has to take into account the limitation of the supply of goods imposed by the market constraints.

When the effective demand for goods and services (Y_U) is lower than the level of full-production (Y_E) as illustrated in graph 2, companies labor demand (L_U) will be lower than the level of labor at equilibrium (L_E). So, in the labor market, the situation of economy would correspond to point (U) with a real wage $(w/p)_U$ higher than the real wage of full employment $(w/p)_E$ and an involuntary unemployment equal to $L_1 - L_U$. For Keynesians, wages are rigid, so they cannot decrease to restore equilibrium. Efficiency wage theories argue that wage rigidity is due to the fact that employers have an interest in paying high wages in order to keep labor productivity high. For these theories, employers pay high wages to encourage workers to make the required effort[6], to attract the best from workforce[7] and/or to limit labor

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[5] Keynes, J. M. 1936.
[6] Shapiro et Stiglitz 1984.
[7] Weiss 1980.

turnover costs[8], everything necessary for productivity. Also, according to collective bargaining theory[9], wages are the subject of negotiations between workers unions and employers organizations. Therefore, wages do not decrease with the labor supply and demand to reduce unemployment.

So, given the rigidity of wages, unemployment cannot be absorbed as long as there are market constraints (insufficient effective demand) because companies have no reason to hire more to produce more, in to the extent that they will not be able to sell the surplus of their production. Therefore, to reduce unemployment, Keynes proposes government intervention to boost the demand for goods through fiscal policies.

In the Keynesian model, insufficient aggregate demand generates unemployment; but when there is excess demand, unemployment is replaced by inflation. There would therefore be a negative relationship between unemployment and inflation in Keynesian economic analysis. In 1958, statistical work by A. W. Phillips confirmed the existence of such a relationship between wage change rate and unemployment rate in United Kingdom over the period 1861-1913 (graph 3). The intersection of the Phillips curve with the x-axis in the graph 3 is the NAWRU (the non-accelerating wages rate of unemployment), which is the unemployment rate that does not accelerate wages.

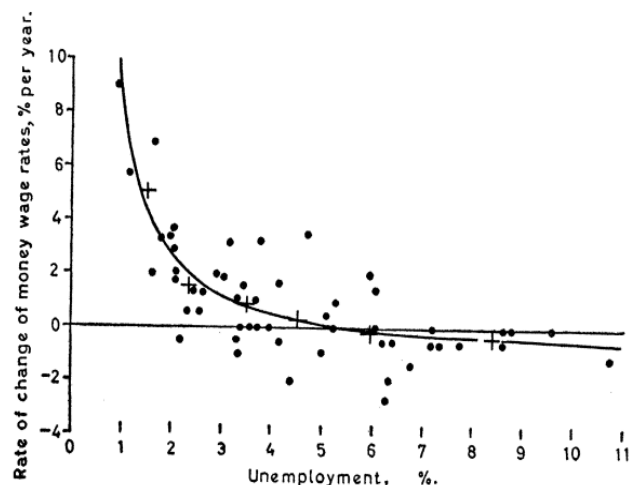Graph 3: The original curve of Phillips from 1861 to 1913.

Source: Phillips, A. W. 1958, p 285.

Assuming the indexation of wages to long-term prices, the Phillips curve has been transposed into the plan (unemployment, price) and has been interpreted as an economic policy instrument allowing to make trade-off between inflation and unemployment. In the plan (unemployment, inflation), the intersection of the Phillips curve with the x-axis is the NAIRU (non-accelerating inflation rate of unemployment), namely the unemployment rate which not accelerate inflation.[10]

The rise in both unemployment and inflation in the 1970s and 1980s, however, called into question the credibility of this economic policy instrument. One of the most well-known critics is that of Milton Friedman (1976) who maintains that inflation is a purely monetary phenomenon and that it is necessary to distinguish between short-term and long-term adjustments. He further argues that there is a natural unemployment rate in the labor market defined as unemployment that would exist in a neoclassical system if all the structural characteristics of the goods and labor markets (imperfections, information cost) is taken into account. This natural unemployment rate would correspond to NAIRU in the Phillips curve.

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[8] Stiglitz 1974.
[9] Nickell et Andrews 1983, Calmfors et Driffill 1988.
[10] See, for instance Artus P. et Muet P. A., 1995 for detail presentation.

So, if it is considered that the natural unemployment rate of the economy is equal to U_N, with inflation equal to A (graph 4) and that the government practices an expansionary monetary policy to reduce the unemployment rate to a lower level, for instance at U_L. For Friedman, there will initially be a stronger increase in the produced quantities than prices, because prices have greater inertia than production. Also, prices will increase faster than nominal wages. As a result, in the labor market, real wages decrease and corporate demand for labor increases. On the other hand, workers base their price expectations on the price level preceding the monetary action (adaptive expectations); so, they anticipate – because of the increase in nominal wages – an increase in real wages, which leads to an increase in the labor supply. Thus, employment increases and the unemployment rate decreases (point F in graph 4). But this situation is unstable because workers later realize the ex-post decline in the purchasing power of nominal wages. The labor supply decreases and leads to a disequilibrium in the labor market; real wages return to their original level and unemployment returns to its natural rate, with a higher inflation rate B (point G in graph 4).

So, according to Friedman, to restore the unemployment rate to a level lower than the natural rate, it is necessary to accelerate the increase in the money supply, because it is only at this price that we are again witnessing distortions of labor market expectations that stimulate employment. According to Friedman, there is therefore a decreasing relationship between inflation and the unemployment rate around the natural unemployment rate (graph 4).

Graph 4: Phillips short-run curves according to Milton Friedman
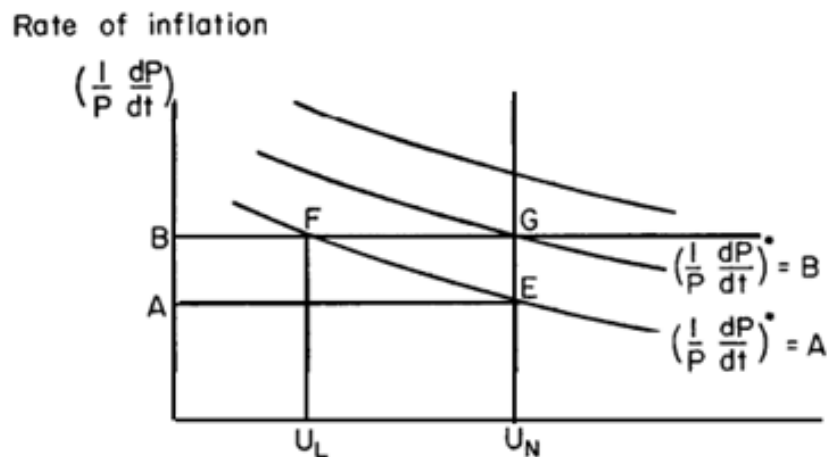
Source: Milton Friedman, 1976, p 272.

Each upper Phillips curve corresponds to a higher rate of increase in the money supply. So, according to Friedman, the relationship of the Phillips curve must take into account the workers' price expectations (p^a) (relation 9).

$$\frac{\Delta p}{p} = f(u) + p^a \qquad\qquad (9)$$

At the beginning of the 1970s, the idea of the sacrifice (in terms of unemployment) to be made to fight against inflation was criticized by the new classics in particular. New classics called into question adaptive expectation mechanisms. For them, economic agents rationally formulate their expectations and therefore, anticipate the effects of public policies. So, for the new classics, prices may be less inert as Friedman assumes. They also argue that both employers and employees anticipate the increase in prices and enter into agreements on this basis. Consequently, the short-term Phillips curve does not correctly represent the possible choices. Indeed, given that the agents are rational, a credible commitment to reduce inflation must lead economic players to quickly revise downward their price expectations and, thus, limit the increase in prices. So, for the new classics, a credible policy should

reduce the costs of reducing inflation far below the sacrifice level of monetarist analysis. In the extreme, you can reduce the inflation rate without any sacrifice. This painless disinflation, however, has two major requirements: (i) the inflation reduction program must be announced before workers and employers formulate their expectations; (ii) workers and employers must believe this announcement. According to the new classics, if these two conditions are met, the announcement immediately shifts the short-term trade-off between inflation and unemployment down, resulting in low inflation rate without increasing unemployment.

In addition to rejecting the hypothesis of adaptive expectations, the new classics challenge Friedman's thesis which presents natural unemployment as a fixed point to which the economy would spontaneously return under the effect of a series of restoring forces. For these new classics[11], the value of the natural unemployment rate depends on the unemployment rates observed in the past. Natural unemployment thus decreases during expansion and increases during recession mainly due to: (i) the tendency of actors to stiffen employment at a high level during expansion and at a low level during recession; (ii) the appreciation and depreciation of human capital according to the stock of unemployed.

3. *Evidences versus labor market representations*

The confrontation between the neoclassical thinking and the Keynesian thinking has enabled economics to make significant advances in terms of labor market analysis tools. However, these representations of the labor market have proven insufficient to explain essential facts of the labor market in both developed and developing countries.

First, unlike neoclassical analysis, real wages do not actually adjust to achieve the balance of labor supply and labor demand. Unemployment or underemployment is a reality in many countries. For instance, according to data from the African Economic Outlook 2017[12], the unemployment rate was 25.9% in South Africa, 25.3% in Swaziland, 24.4% in Mozambique and 14.8% in Tunisia. Over the 2011-2015 period, the average unemployment rate was 11.1% in the Euro area, including 23.8% for Spain and 14.1% for Portugal.[13] Furthermore, in the majority of developing countries where the unemployment rate is low, the underemployment rate – according to working hours – remains high. In Burkina Faso, for instance, the underemployment rate according to working time stood at 22.4% in 2007[14], that is to say that more than a fifth of people are willing to increase their working time, but they do not find opportunities. These high rates of underemployment are evidence of an imbalance between labor supply and labor demand, but wages do not adjust to achieve the equilibrium.

Can it be said that the disequilibrium in the labor market is due to the lack of flexibility? According to the results of the surveys carried out in the main cities of seven WAEMU countries over the 2001-2002 period[15], the informal economy has the highest rate of underemployment (15.5%) compared to the formal sector. This means that despite the fact that the informal economy escapes the labor market institutions (labor law and institutions, workers' union, minimum wage), 15.5% of people employed in this relatively free labor market are willing to increase their working time, but they do not find the opportunities to do so. Also, even in the most liberal economies in the world, for instance, United States and United Kingdom, unemployment rates remain relatively high at 7.2% and 7% for the period 2011-2015.[16]

In fact, labor demand and especially labor supply are weakly sensitive to changes in real wages as assumed in neoclassical analysis. Indeed, Artus Patrick (1987), based on econometric studies, found a relatively weak link between wages and employment, companies being very sensitive to other costs.

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[11] Phelps 1967 et 1970 ; Ball 2008
[12] BAD, OCDE et PNUD, 2017.
[13] World Bank 2017.
[14] INSD, 2007.
[15] Brilleau A. et ali. 2004.
[16] World bank 2017.

Similarly, Blanchflower and Oswald (1995)[17] found unemployment elasticities of real wages in the order of -0.1 for many countries including United States and United Kingdom. Thus, Cahuc Pierre (2000) [18] argues that "there is a simple fact that theoretical models should reproduce, namely that real wages are only slightly sensitive to changes in the unemployment rate and employment. It is important to note that this fact is in apparent contradiction with the predictions of the classical model. In fact, according to the classic model, wages are determined by the balance of labor demand and labor supply. However, all the empirical work shows that the labor supply varies little according to the wage".

The classical conception of the relationship of real wages and labor demand takes into account only the direct effect of the variation in real wages on corporate profit, namely the variation in the average cost of output. However, a change in real wages has two opposite effects on corporate profit: the effect on the cost of output and the effect on labor productivity. The first effect is direct and is explained by the fact that the decrease (respectively the increase) in real wages leads to a decrease (respectively an increase) in the average cost of output and, thus, an increase (respectively a decrease) in corporate profit. This positive effect is reduced by the second effect, which is explained by the fact that the decrease (respectively the increase) in real wages induces a decrease (respectively an increase) in the level of workers motivation and in work effort, as well as an increase (respectively a decrease) in the frequency of labor conflicts; all things that cause a decrease (respectively an increase) in labor productivity (efficiency wage theory) and, thus, a decrease (respectively an increase) in corporate profit. Thus, the higher effect of a change in real wage on labor productivity, the lower the real wage elasticity of labor demand.

Unlike neoclassical theories, Keynesians argue that insufficient effective demand is the main cause of unemployment. They therefore recommend boosting aggregate demand to reduce unemployment. However, if the Keynesian policies were successful during the glorious thirties, they were less effective in the 1980s. Indeed, the economies having become more open, the increase in demand may be focused on imported goods and, thus, deteriorate the external balance without having a significant effect on employment. In addition, the effect of increased demand for domestic goods is not a priori directed solely at employment; it can be divided between gross profit (gross operating surplus), employment, wages and taxes on goods and services, since the Gross Domestic Product (GDP) is equal to the sum gross operating surplus, payroll, taxes on products. Thus, according to the Theorem of Okun's Law[19], an economic stimulus policy can bring about vicious changes in Okun's relationship so that its effect in terms of reducing unemployment is quite small, if not negative.

Second, the success of the Danish model of labor market regulation has challenged classic theoretical results that only flexibility in the labor market can increase employment and reduce unemployment. Since the mid-1990s, it has been increasingly recognized that both flexibility and security are needed to revitalize labor markets, to create wealth and employment, and thereby to reduce unemployment. Flexisecurity, or the strategy aimed at jointly strengthening flexibility and security for the benefit of both parties in the employment relationship, has been recognized as one of the key objectives for European labor markets, within the framework of the European Strategy for Employment and the Lisbon Strategy. At the same time, the ILO continues to conceptualize and promote decent work, with in particular a research axis which aims to integrate the concept of flexisecurity into its Decent Work Agenda and its employment strategy and to study the scope of the concept, for the time being essentially European, in developing countries. Thus, the concept of flexisecurity is taking hold in employment policies in both developed and developing countries; however, macroeconomic analysis of the labor market has not yet managed to integrate it and prove the benefits attributed to it.

Third, empirical studies show that the sacrifice rate of inflation and unemployment trade-off is generally not equal to zero. Gregory Mankiw (1999) estimated the sacrifice rate due to disinflation in the first half of the 1980s in United States at 2.8. Inflation expectations linked to the resolute attitude of the President

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[17] Blanchflower, D. et Oswald A. 1995.
[18] Cahuc, P. 2000, p. 93 (our translation from french).
[19] Zerbo 2017, 2018b.

of the American central bank did not allow, contrary to the thesis of the new classics, painless disinflation. In 1982, unemployment in United States reached its highest level since the Great Depression. Furthermore, Laurence Ball (1994) has shown that in almost 65 episodes of disinflation in 19 countries, reducing inflation has a cost in terms of unemployment. However, the study shows that the sacrifice rate varies considerably and that, on the one hand, contrary to the adaptive anticipation thesis, rapid disinflations would cost less than progressive disinflations and, on the other hand, the more flexible collective bargaining process of wage, the lower the sacrifice rate. For this study, reducing inflation always has a cost, but that cost varies with respect to the labor market policies and institutions[20]. The recent episode (2015-2016) of the American economy, characterized by a low inflation rate (0.7%) associated to a low unemployment rate (5.1%) has reopened the debate on the factors that influence the sacrifice rate of the inflation-unemployment tradeoff.

The fierce controversies between the thinking currents, as well as the significant differences between the facts and the theoretical results of these currents, give a disparate and unconvincing representation of the labor market in macroeconomic analysis. This is due to the fact that theoretical representations of the labor market are based more on idealistic assumptions (how markets should work to reach the classical optimum), rather than realistic assumptions (how markets work in the real world). Therefore, theoretical analyzes cannot generally correspond to observed facts and empirical results which, themselves, result from the behavior of economic agents in the real world. From this point of view, a satisfactory representation of the labor market requires better consideration of the corporate behavior, which is far more complex than the behavior of profit maximization.

3. New representation of the labor market

According to the General Theory of the Firm, companies are entities, composed of employers, employees and possibly shareholders. They hold assets, enter into contracts and promote compromise between the stakeholders to produce goods and services in order to generate income which is distributed to said stakeholders.

Thus, according to the General Theory of the Firm, companies operate in the labor market on the basis of compromise between employers and employees, focusing mainly on (i) the average level of real wages (w/p), (ii) the level of employment (L) and (iii) real gross profit (π), under constraint of production possibilities. The nature of the compromise is determined, among other things, by the institutional environment (legislation and labor market institutions), the information environment (information imperfections and asymmetries), as well as by the social environment (community relationship between stakeholders). Thus, given the institutional, informational and social environment, the stakeholders seek to reach the optimal compromise, constrained by production possibilities.

Let U be the corporate compromise function given by relation (10) and F the corporate production function given by relation (11). Then, the corporate compromise program is given by relation (12).

$$U = U(\pi, L, w/p) \tag{10}$$

$$Y = F(K, L) \tag{11}$$

$$\begin{cases} Max\, U(\pi, L, w/p) \\ s/c \quad \pi + (w/p)L - F(K, L) \leq 0 \end{cases} \tag{12}$$

This corporate program determines, on the one hand, the wage negotiation process and, on the other hand, the corporate labor demand behavior. In fact, wage negotiations precede the demand for work by companies: employers and employees agree on the "price" of workforce before it is used. Thus,

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[20] Ball, L. 1994.

the corporate program can be distinguished in two stages. The first stage concerns wage negotiations, which determine the real wage level, and the second stage concerns the determination of the demand for labor.

1. *Fixing of wages*

Given the institutional, regulatory and informational environment of the labor market characterized by the compromise function U, as well as the quantity of labor necessary to produce an output unit (L/Y), wage negotiations relate to real wages (w/p) and the ratio of profit per output unit (π/Y), under the constraint of distribution of the wealth. Indeed, to determine the level of wages, the quantity of labor per output unit or, conversely, the labor productivity is considered by the stakeholders as a given, even if it is imperfectly known and is the subject of moral hazards. Employers want to pay low real wage for this labor productivity which guarantees them a high gross profit ratio (π/Y), while employees aim for a relatively high real wage level for this labor productivity level. The interests of the two parties being opposite and interdependent, they will proceed by negotiation to fix the real wage level.

Thus, from the corporate general program (relation 12), the program of wage negotiation process is deduced (relation 13).

$$\begin{cases} \underset{\pi/Y, \, w/p}{Max} \; U\left(\dfrac{\pi}{Y}, \dfrac{w}{p}, \dfrac{L}{Y}\right) \\ s/c \quad \dfrac{\pi}{Y} + (w/p)\dfrac{L}{Y} \le 1 \end{cases} \tag{13}$$

The first-order conditions give the system of equations (14) which indicates that the real compromise wage is such as the marginal rate of substitution of real wage for profit per output unit is equal to the quantity of labor per output unit, namely the slope of the constraint line. The compromise point C((w/p)*; (π/Y)*) is a solution of the system of equations (14). It is depending on the quantity of labor per output unit. The compromise point of wage negotiation process is such as the desire to earn an extra penny on real profit per output unit is equal to the desire of an employee to earn an extra penny on real wage.[21]

$$\begin{cases} MRS_{w\pi}\left(\dfrac{\pi}{Y}, \dfrac{w}{p}, \dfrac{L}{Y}\right) = \dfrac{L}{Y} \\ \dfrac{\pi}{Y} + (w/p)\dfrac{L}{Y} = 1 \end{cases} \tag{14}$$

Furthermore, the equations system (14) makes it possible to determine the compromise point of wage negotiation as the intersection of the conventional curve of wage negotiation (first equation) and the technical curve of wage negotiation (second relation) in the plane ((w/p); (π/Y)).[22] By taking the total differential of the first relation of the system (14), it appears that the conventional curve is increasing in the plane (w/p; π/Y). On this basis, the graphical determination of the compromise point of wage negotiation is illustrated by graph 5. Taking into account the institutional, regulatory, informational and economic environment, the compromise point corresponds to the point C of graph 5, where a level of real wage is equal to (w/p)* and the ratio of profit is equal to (π/Y)*.

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[21] See Zerbo (2016) for details of wage negotiation process.
[22] These curves can be also represented in the plane (w/p; π/L).

Graph 5: Determination of real wage in the labor market
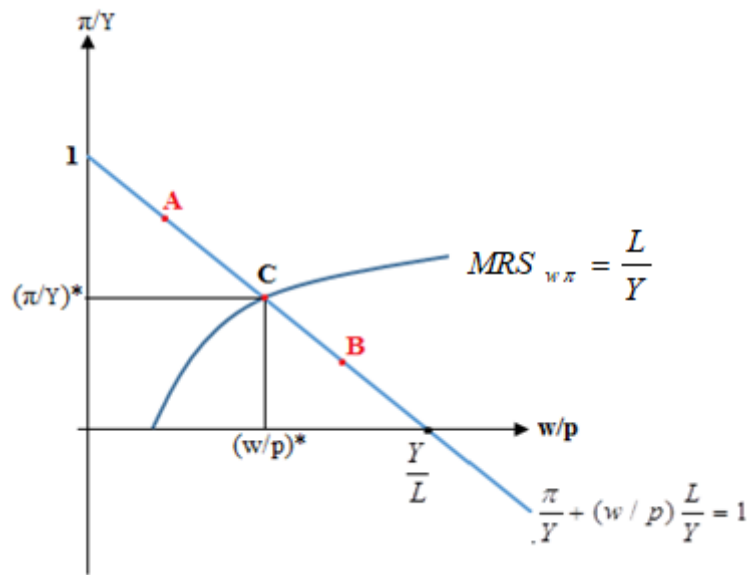
Source: This Paper

In the graph 5, the point C is effectively the compromise, namely the situation which satisfies all the stakeholders. Indeed, for any point located on the constraint line (technical curve) and above the point C, for instance, the point A, the distribution of the created wealth is more in favor of employers and the desire of employees to earn an extra penny on the real wage is higher than the desire of employers to earn an extra penny on real gross profit. As a result, employees will initiate collective actions addressed to their employers (wage claims, labor conflicts and/or negotiations) in order to obtain wage increases, as long as their desire to earn an extra penny on the real wage will be relatively higher. Faced with wage claim actions that could penalize labor productivity, employers would accept to negotiate with workers and grant them wage increases, as long as their desire to earn an extra penny on profit is relatively lower.

Conversely, for any point located on the constraint line (technical curve) and below the point C, for instance, the point B, the distribution of the created wealth is more in favor of employees and the desire of employers to earn an extra penny on profit is higher than the employees desire to earn an extra penny on real wage. So, employers will not accept to pay employees at the level of wage corresponding to the point B. They will negotiate with employees for lower labor costs, as long as their desire to earn an extra penny on profit is relatively higher. Faced with them, employees will accept the proposals for lower wages as long as their desire to earn an extra penny on wages is relatively lower.

$$(w/p)* = w_r\left(\frac{Y}{L}\right) \qquad (15)$$

Solving the first-order conditions given by system of equations (14) makes it possible to obtain the expression of the real wage as a function of the average labor productivity (Y/L). Solving the total differential of the system (14) shows that the real wage increases with the average labor productivity. Thus, we can write the relation (15) which expresses the real compromise wage as a function of labor productivity (Y/L).

As the compromise function is determined, among other things, by the institutional, legal and informational environment, the relationship between real wage and labor productivity depends in particular on the level of the minimum wage in force, the bargaining power of workers, the levels of information and asymmetric information of the stakeholders about labor productivity.

For instance, suppose that the asymmetric information about labor productivity has increased; that is to say, either labor productivity is more undervalued by employees or it is more overvalued by employers. If the employees underestimate labor productivity by α percent (α less than 1), then the real wage curve will shift downward (graph 6), so that real wage becomes lower for a given level of labor productivity. Conversely, if the employers overestimate labor productivity by β percent, then the real wage curve will shift upwards (graph 6), so that real wage becomes higher for a given level of labor productivity.

Graph 6: Effect of asymmetric information on wage negotiation

Source : This Paper
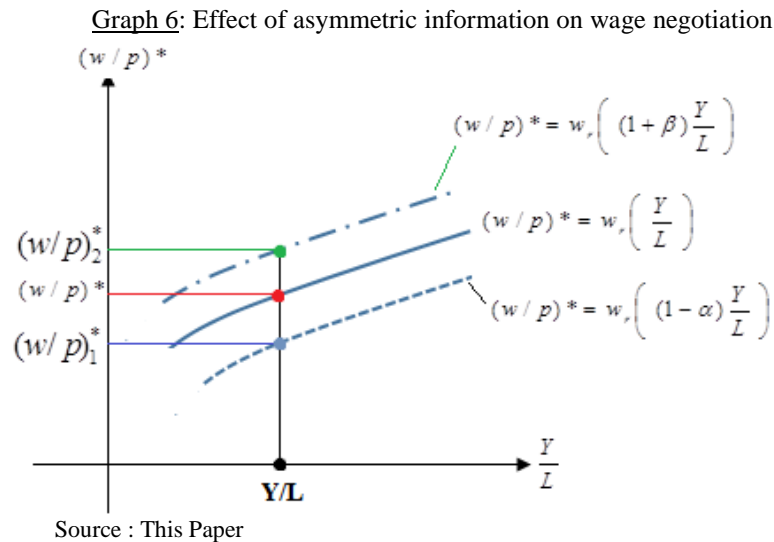
2. *Labor demand behavior of companies*

Once the real wage has been fixed through the salary negotiation process, companies maximize the compromise function with respect to the levels of labor demand and real profit, under the constraint of distributing the created wealth (program 16). Indeed, for a fixed real wage level (w/p), employers aim for a high level of real gross profit while minimizing, as much as possible, the cost of labor (the level of employment); while employees aim for a high level of employment which would in particular avoid layoffs and, at best, reduce the workload per person. As their interests being conflicting and interdependent, the stakeholders will enter into negotiations to determine, on the basis of the compromise, the level of employment and, thus, the real gross profit.

$$\begin{cases} \underset{\pi, L}{Max}\, U(\pi, L, w/p) \\ s/c \quad \pi + (w/p)L - F(K, L) \leq 0 \end{cases} \qquad (16)$$

Solving the maximization program (16) gives the results of the system of equations (17). [23] Thus, given the imperfection of information, asymmetric information, the respective bargaining powers of stakeholders, labor law, employment contracts within companies and social relations, the optimal compromise (π*, L*) is a solution of the system (17).

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[23] Note that the compromise function is concave and the inequality of constraints are convex. So, Kuhn-Tucker Theorem is applying.

$$\begin{cases} \dfrac{\partial F}{\partial L} + MRS_{L\pi} = w\,/\,p \\\\ \pi + (w\,/\,p)L = F(K, L) \end{cases}$$ (17)

The first equation of system (17) gives the conventional function of labor demand of companies, while the second equation expresses the technical constraint. Under the assumptions of convexity of the compromise function and concavity of the production function, the demand for labor increases with real gross profit. Furthermore, the econometric tests carried out by Zerbo (2018) confirm that the demand for labor is increasing with gross profit.

In the system of equation (17), the value of the marginal rate of substitution of labor for real gross profit ($MRS_{L\pi}$) at a point (L, π) represents, on the one hand, the marginal transaction cost due to imperfections in the labor market borne by employers at the level (π) of real gross profit and at the level (L) of employment. At any point on the conventional curve of labor demand (C1 in graph 7), the marginal transaction cost is equal to marginal loss (shortfall) due to imperfections, namely ($w/p - \partial F/\partial L$) and, thus, real gross profit is equal to effective gross profit. On the other hand, at any point above the conventional curve of labor demand, for instance the point B, the marginal transaction cost is higher than the marginal loss due to imperfections.[24] As a result, the additional financial cost due to imperfections that companies would have to bear to maintain themselves at the point B is higher than the shortfall (π_B-π_A) due to the fact of staying at point A.[25] Ultimately, the effective gross profit[26] at the point B is less than the real gross profit π_B minus the shortfall (π_B-πA), that is to say that the profit gross effective at the point B is less than the effective gross profit at point A, namely π_A.

Graph 7: Conventional curve of labor demand according to
flexibility degree of labor market
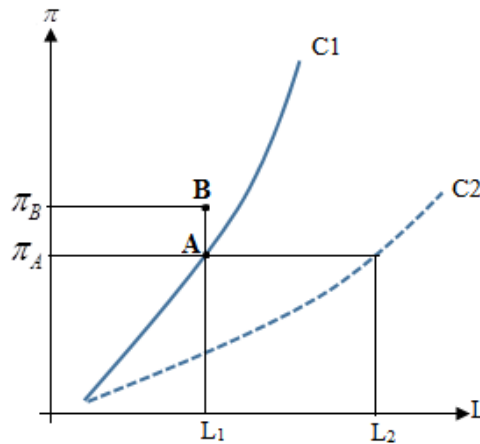
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On the other hand, the $MRS_{L\pi}$ reflects the flexibility of the labor market. The more flexible the labor market becomes, the more the $MRS_{L\pi}$ tends towards 0 and, thus, the system of equations (17) tends

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[24] As the $MRS_{L\pi}$ is increasing with π and it is decreasing with L, the value of the $MRS_{L\pi}$ at point B is higher than the value of the $MRS_{L\pi}$ at point A. As the level of employment is identical at the points A and B, namely L_1, the marginal losses are equal to ($w/p - \partial F/\partial L(L1)$). As the $MRS_{L\pi}$ at point A is equal to ($w/p - \partial F/\partial L(L1)$), then the $MRS_{L\pi}$ at point B is higher than ($w/p - \partial F/\partial L(L1)$), namely marginal loss at point B.

[25] At any point in segment $]AB]$ of graph 7, we have $MRS_{L\pi} > C_m$, where $C_m = w/p - \partial F/\partial L(L_1)$; so, it is deduced that :

$$\int_{\pi_A}^{\pi_B} MRS_{L\pi} d\pi > \int_{\pi_A}^{\pi_B} C_m d\pi$$

[26] The effective gross profit is equal to the total costs due to imperfections in the labor market (costs of labor conflict, of social relationship, of the information, etc.)

towards the neoclassic conditions (profit maximization) and the labor demand becomes less sensitive to variations in real gross profit. Conversely, the more rigid the labor market becomes, the $MRS_{L\pi}$ increases and, as a result, companies' demand for labor becomes more sensitive to changes in profit. Then, in the plane (L, π), the slope of the labor demand curve will be steep for a relatively more flexible labor market, as illustrated by curve C1 in graph 7; while it will be weak for a relatively less flexible labor market, as illustrated by curve C2.

Solving the system of equations (17) gives the level of compromise labor demand (L*). It is a function of real gross profit (π*) in the short-run, as shown in relation 18.[27]

$$L^* = L(\pi^*) \hspace{4cm} (18)$$

Thus, real gross profit is the determining factor of employment in the short term. Under the assumptions of convexity of the compromise function and concavity of production technology, it is shown that the labor demand increases with real gross profit. This result is consistent with the fact that in general, companies hire more when they make more and more profits; however, they layoff when they make losses. Besides the cost of labor, the level of gross profit depends on several factors, in particular the costs and yields of inputs such as fuel and other energies, the level of taxes on output, the market shares, as well as the efficiency of financial and technical management of the companies. As a result, gross corporate profits are more flexible than wages, which are generally adjusted after wage negotiations.

So, as the demand for labor is an increasing function of real gross profit, the lower the level of corporate profits, the lower the employment level of economy; the higher the level of corporate profits, the higher the employment level of economy. How does the equilibrium happen in the labor market and what is its nature?

3. *Labor market equilibrium in the short term*

To analyze the short-term labor market equilibrium, we distinguish two situations depending on the level of aggregate demand in relation to the production capacities of companies. In the first case, it is considered that aggregate demand is higher than the production capacities of companies and in the second case, it is considered that aggregate demand is lower than the production capacities of companies.

a. *Labor market equilibrium in full production capacity*

When the aggregate demand for goods and services is higher than the corporate production capacities, the level of production depends, in the short term, mainly on their production technology. Then, from relations (17) and (18), it is deduced that the labor market equilibrium is determined by the system of equations (19). The first equation characterizes the conventional curve of labor demand; the second equation is the technical curve of labor demand. The last equation indicates that the labor supply is invariable with real gross profit.

$$\begin{cases} L = L(\pi, w/p, K) \quad defined\,by \quad MRS_{L\pi} + \dfrac{\partial F}{\partial L} = w/p \\[2mm] \pi + (w/p)L = F(K, L) \\[2mm] L_S(\pi) = \overline{L}_S \end{cases} \hspace{2cm} (19)$$

For a given real wage, the equilibrium in the labor market corresponds to the intersection of the conventional curve of labor demand and the technical curve of labor demand, as illustrated in graph (8) by the point E with labor demand equal to L* and real gross profit equal to π*. The labor supply L_s may

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[27] The capital stock and the wages are not flexible in the short-run.

be higher than the demand for labor L*, in which case the economy would be in underemployment equilibrium and the quantity of unemployed would be equal to $(L_S - L^*)$.

At equilibrium point E, companies make the highest effective gross profit. Employers would have liked to be at another point of their technical curve upper than point E, where they would realize a theoretically higher gross profit. But, as explained in the previous sub-section, to reach such a point, companies will move away from the compromise situation established between the stakeholders and this, to the disadvantage of employees because of layoffs and an increase in work pressure would be required. This new situation would generate social tensions in the workplace which would lead to decrease in labor productivity and increase financial costs – due to labor conflicts – borne by employers to maintain themselves to such an extent. The further the companies' situation moves from point E upwards, the more social tensions and associated financial costs increase; then the losses recorded by the companies would become higher and higher compared to the gross profit surpluses which they would realize by moving away from point E. As a result, the companies' effective gross profit would decrease when they move away from the equilibrium point E. Then, the employers will return to point E which would guarantee them a higher effective gross profit.

Graph 8: Labor market equilibrium when economy is at full production capacity
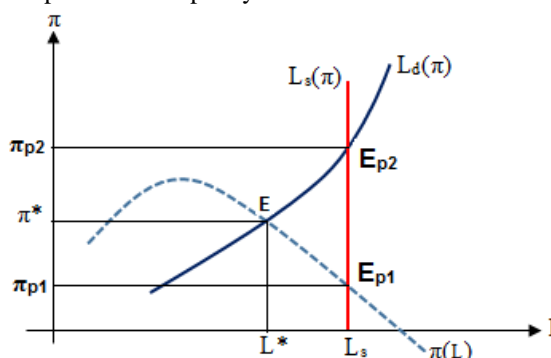
Source : This Paper

Conversely, at point E, employees benefit from working conditions corresponding, on the one hand, to the maximum level of work effort that they are willing to provide for the actual salary paid and, on the other hand, to the minimum level of work effort that employers are willing to accept for the actual wages they pay. In fact, employees would have liked to be at a lower point on the technical curve (below E), corresponding to a higher level of employment and, consequently, a lower workload per person. However, to reach such a point, companies would move away from the compromise situation established between the parties and this, to the detriment of employers who would see their gross profits fall due to the fall in labor productivity and increase in the wage bill. Thus, in such a situation, companies will return to the situation of compromise by reducing the number of workers in order to gain productivity and reduce labor costs. The compromise point E will be reached when the gross marginal profit due to the decrease in the number of workers is equal to the marginal financial cost generated by the redundancies; namely at point E where the effective gross profit of companies is the highest.

So, the point E_{p1} with abscissa L_s and ordinate π_{p1} cannot be reached because this point of full-employment moves companies away from the situation of compromise established between the stakeholders. As for the point E_{p2} with abscissa L_s and ordinate π_{p2}, which allows companies to make more gross profit and achieve full-employment, it cannot be achieved in the short term due to insufficient production capacities.

### b. *Labor market equilibrium in non-full production capacity*

When the aggregate demand for goods and services is lower than the productive capacity of companies, the level of companies' production is constrained by the level of aggregate demand ($\bar{Y}$) in the short run. Then, the equilibrium in the labor market is determined by the system of equations (20). The first equation characterizes the conventional curve of labor demand; the second equation gives the technical curve of labor demand (aggregate demand constraint curve); the last equation indicates that the labor supply is constant with respect to real gross profit.

$$\begin{cases} L = L(\pi, w/p, K) \\ \pi + (w/p)L = \overline{Y} \\ L_S(\pi) = \overline{L}_S \end{cases} \qquad (20)$$

For a given level of real wage, the equilibrium in the labor market corresponds to the intersection of the conventional curve of labor demand and the technical curve, as illustrated in graph (9) by the point E with abscissa L* and ordinate π*. The labor supply L_s is generally higher than the labor demand L*; in which case the economy would be in underemployment equilibrium (at point E). The unemployment would be equal to $(L_S - L^*)$.

Like the first case, companies make the highest effective gross profit, while the working conditions of employees at this point correspond, on the one hand, to the minimum level of work

Graph 9: Labor market equilibrium in a situation of insufficient aggregate demand

Source : This Paper

effort that employers expect from them for the actual salary paid and, on the other hand, the maximum level of work effort that employees are willing to provide for the actual salary paid. Also, the point E_{p2} corresponding to a situation of full employment of the workforce cannot be reached in the short term without a favorable shock in aggregate demand.
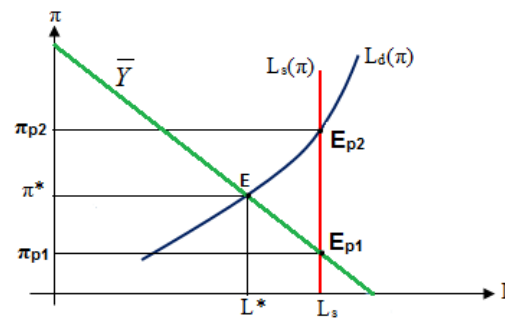
4. *The effect of an increase in aggregate demand on the labor market equilibrium*

Consider that the economy is in underemployment equilibrium; that is, unemployment $(L_s - L^*)$ is relatively high. In view of this situation, the government is taking measures to boost demand for goods and services in order to reduce unemployment. What effect will an increase in aggregate demand (dY) have on unemployment?

Two situations must be distinguished: (i) economy is at full production capacity; (ii) economy is at non-full production capacity.

When companies are at full production capacity, an increase in aggregate demand leads, in the short term, to inflationary pressures. Indeed, since companies are already in full use of their production capacity, they are no longer able to increase their production in the short term because this requires new investments with long lead times. As a result, the increase in aggregate demand creates an imbalance between the supply and demand for goods and services; which will cause increase in prices. So, analyzing the effect of an increase in aggregate demand on the labor market equilibrium in this case becomes to analyze the effect of inflation on the said equilibrium. This will be the subject of the next subsection.

In this subsection, the second case is considered: economy is at non-full production capacity (system of equations 20). To analyze the shift of the curves in the graph, the total differentiation of the relations of the system of equations (20) is made. The total differentials (relation 21) show that when the aggregate demand increases by (dY) at fixed real wage, the technical curve shifts outwards, while the conventional curve does not shift. The shifting of the curve is illustrated in graphs 10a and 10b.

$$\begin{cases} dL = \dfrac{\partial L}{\partial \pi} d\pi \\ d\pi + (w/p)dL = dY \end{cases} \qquad (21)$$

The effects of an increase in aggregate demand on real profit (π) and on employment (L) are given respectively by the relations (22) and (23) resulting from the solving of the system of equations (21).
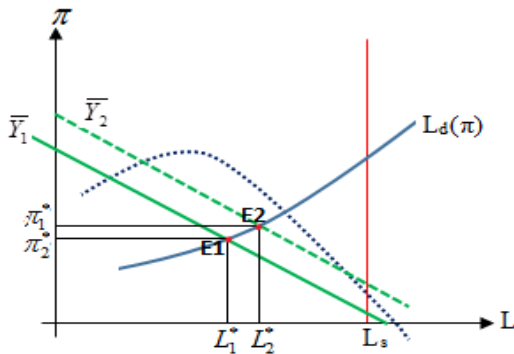
$$d\pi = \frac{1}{\left[1+(w/p)\dfrac{\partial L}{\partial \pi}\right]}dY \tag{22}$$

$$dL = \frac{\dfrac{\partial L}{\partial \pi}}{\left[1+(w/p)\dfrac{\partial L}{\partial \pi}\right]}dY \tag{23}$$

According to relation (22), the multiplier effect of an increase in aggregate demand on real profit decreases with marginal demand for labor with respect to real gross profit ($\partial L/\partial \pi$). Conversely, according to relation (23), the multiplier effect of an increase in aggregate demand on the level of employment increases with this marginal demand for labor. However, the more the labor market is imperfect, the higher the marginal demand for labor with respect to real profit; conversely, the more flexible the labor market, the lower the marginal demand for labor with respect to real profit. It is deduced that at a fixed real wage, the stronger the job security in labor market, the more the increase in aggregate demand has a high positive effect on employment, but a negligible effect on real profit (graph 10A). Conversely, the stronger the labor flexibility, the more the increase in aggregate demand has a high positive effect on real profit, but a negligible effect on employment (graph 10B).
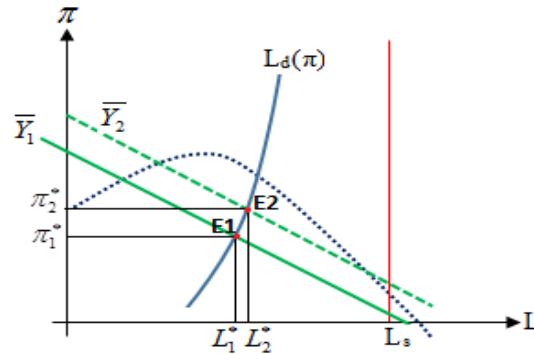
Graph 10: Effect of economic growth at non-full production capacity

*Graph 10a: Labor demand sensitive enough to changes in profit (fairly job security)*   *Graph 10b: Labor demand less sensitive to changes in profit (fairly labor flexibility)*
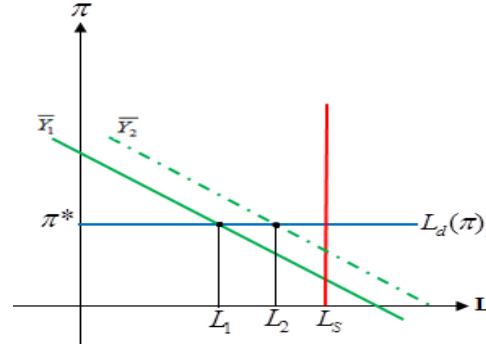

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To the extreme, if the labor market is perfectly flexible, the increase in aggregate demand has no effect on the level of employment (graph 11); in other words, in an economy with a perfect labor market (a neoclassical labor market), a policy of an aggregate demand increase has no effect on employment. However, the effect is greatest when employment is perfectly secure (graph 12), that is to say in a social and solidarity economy. This confirms the arguments in favor of flexisecurity in the labor market because the increase in both profit and employment is essential for economic and social dynamics in the medium and long term in a nation.

Graph 11: Effect of economic growth in a perfect market economy.
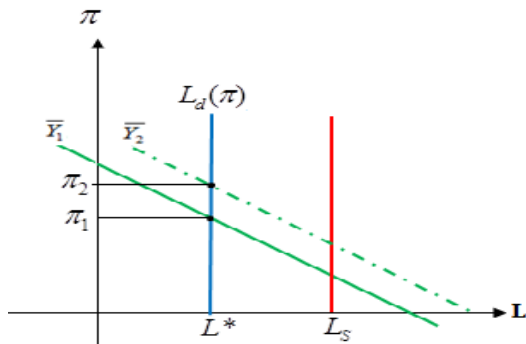
Graph 12 : Effect of economic growth in a perfect social and solidarity economy

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Source: This Paper

5. *Inflation and unemployment*

When the economy is at full production capacity, the margin that companies have to increase the supply of goods and services in the short term in response to an increase in aggregate demand is very limited or even non-existent. In such a context, an increase in aggregate demand leads to an increase in the prices. So this subsection aims to pinpoint the effect of inflation on the labor market equilibrium in the short term and, thus, on unemployment. To do this, the system of equations (19) relating to the labor market equilibrium at full production capacity is considered, in particular the two main equations which are recalled in the system of equations (24).

$$\begin{cases} L = L(\pi, w/p, K) \quad defined\,by \quad MRS_{L\pi} + \dfrac{\partial F}{\partial L} = w/p \\ \pi + (w/p)L = F(K,L) \end{cases} \qquad (24)$$

Considering that prices vary, the total differential of this system of equations makes it possible to obtain the system of equations (25). According to this system, when the level of prices (p) increases, the conventional curve of labor demand shifts downwards and the technical curve shifts upwards (graph 13).[28]

$$\begin{cases} dL = \dfrac{\partial L}{\partial \pi} d\pi - (w/p)\dfrac{\partial L}{\partial (w/p)}\dfrac{dp}{p} \\ (MRS_{L\pi})dL = (w/p)L\dfrac{dp}{p} - d\pi \end{cases} \qquad (25)$$

Solving the system of equations (25) gives the change in the labor demand (*dL*) due to the increase in the level of prices given by relation (26). The marginal demand for labor with respect to real wage being negative, the relation (26) indicates that employment increases with inflation (dp/p).

$$dL = \frac{(w/p)\left(L\dfrac{\partial L}{\partial \pi} - \dfrac{\partial L}{\partial (w/p)}\right)}{\left(1 + (MRS_{L\pi})\dfrac{\partial L}{\partial \pi}\right)}\frac{dp}{p} \qquad (26)$$

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[28] On reminder, $\partial L/\partial(w/p)$ is negative.

Graph 13: Effect of inflation when economy is at full
production capacity
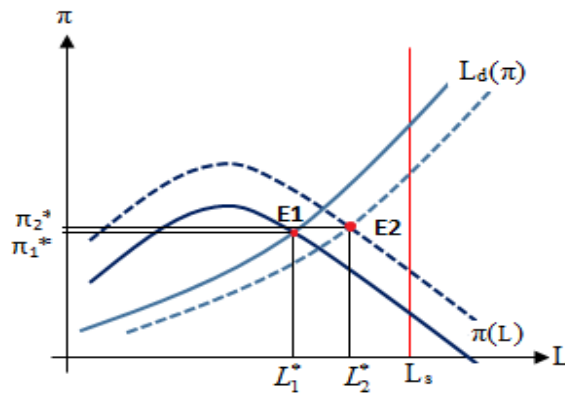

Knowing that the unemployment rate (u) is equal to the ratio of the unemployed labor force ($L_s - L$) compared to the total labor supply (L_s), the change in the unemployment rate in the short term (du) is equal to the opposite of the change in labor demand divided by labor supply, namely $- dL/L_s$. Then, the relation (27) which gives an expression of the Phillips curve in short term is deduced.

According to relation (27), for fixed level of real wage, labor demand, labor supply and labor productivity, the change in the unemployment rate (du) is negatively proportional to the inflation rate (dp/p).

$$du = - \frac{(w/p)\left(L\frac{\partial L}{\partial \pi} - \frac{\partial L}{\partial (w/p)} \right)}{\left(1 + (TMS_{\pi/L})\frac{\partial L}{\partial \pi} \right) L_S} \frac{dp}{p} \qquad (27)$$

Graph 14 represents this negative relationship between the change in the unemployment rate and inflation by noting δ_t the absolute value of the proportionality coefficient between date t and date t + 1. As illustrated in graph 14, inflation causes decrease in the unemployment rate in the short term (point B), while disinflation causes an increase in the unemployment rate (point A).

Graph 14: Inflation (dp/p) and change in unemployment rate (du) relationship in the short term
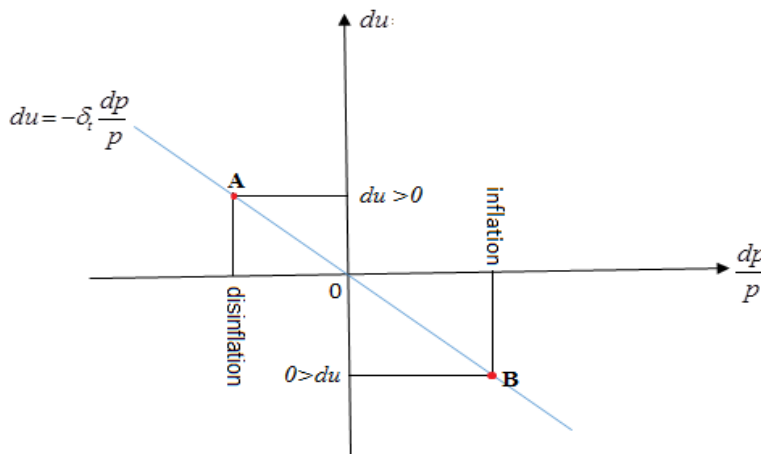
Source: This Paper

Defined as the ratio of the change in the unemployment rate (*du*) compared to the percentage change in price (inflation), the sacrifice rate of the inflation-unemployment tradeoff is equal to the coefficient of proportionality (in absolute value) between the change in unemployment rate and the inflation rate, given by the relation (28). This relation points out four lessons concerning the inflation-unemployment tradeoff.

$$\delta = \frac{(w/p)\left(L\dfrac{\partial L}{\partial \pi} - \dfrac{\partial L}{\partial(w/p)}\right)}{\left(1 + (MRS_{L\pi})\dfrac{\partial L}{\partial \pi}\right)L_S} \tag{28}$$

First, the relation (28) indicates that the sacrifice rate is not a simple scalar, but rather a function whose structure depends in particular on the triplet of functions ($\partial L/\partial\pi$, $\partial L/\partial(w/p)$, $MRS_{L\pi}$) which characterizes the level of labor and wage flexibilities in the labor market. For a given level of labor sensitivity with respect to real wage and for a given equilibrium (L, π, w/p, L_s), the sacrifice rate decreases with the degree of labor flexibility. This means that when security of employment increases, the sacrifice rate increases. Conversely, when the bargaining power of workers' organizations decreases and/or labor legislation becomes more flexible (more possibility of recruiting and renewing fixed-term contracts, flexible hiring and dismissal conditions), the sacrifice rate of the inflation-unemployment tradeoff is decreasing. Ultimately, when the labor market tends towards a situation of perfect flexibility, the sacrifice rate tends towards the absolute value of the real wage elasticity of labor demand multiplied by share of workforce employed (L/Ls) (relation 29).[29]

$$\delta_c = -\left(\frac{(w/p)}{L}\frac{\partial L}{\partial(w/p)}\right)\frac{L}{L_S} \tag{29}$$

Graph 15 illustrates the evolution of sacrifice according to the degree of labor flexibility for a given level of disinflation. In the plan (dp/p; du), when the labor becomes more flexible, the curve of inflation and change in unemployment rate relationship rotates anti-clockwise around the origin of the plan (graph 15) and the sacrifice in terms of change in the unemployment rate decreases from *(du)₁* to *(du)₂* for the given level of disinflation.

Graph 15: Sacrifice rate and labor market flexibility
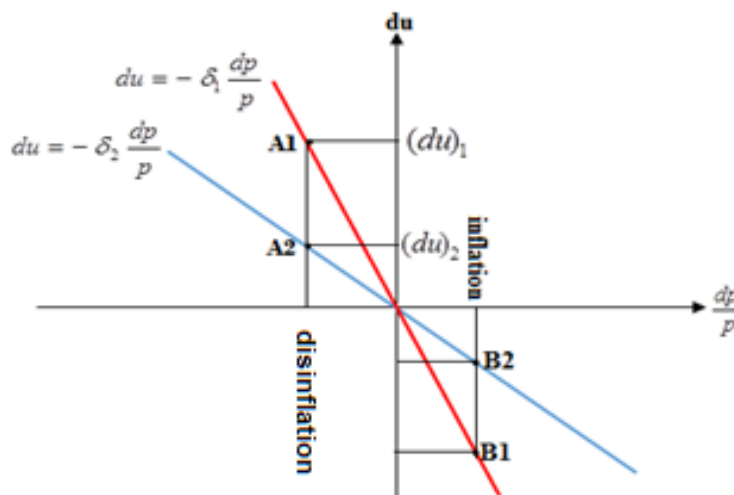
Source: This Paper

In summary, the sacrifice rate of tradeoff undergoes structural changes in the medium and long term according to the evolution of the labor flexibility and, thus, according to the policies and institutions of labor market, in accordance with the results of the empirical studies of Blanchflower and Oswald (1995).

Second, for a given level of labor flexibility, in other words for a given triplet ($\partial L/\partial \pi$, $\partial L/\partial (w/p)$, $MRS_{L\pi}$), the sacrifice rate of a disinflation during period t to t+1 depends on the equilibrium situation of the labor market at date t, characterized by the quantities (π_t, L_t, w_t/p_t, L_{st}), as indicated by the relation (30) which follows from relation (28). This means that the sacrifice rate is quite changeable from one period to another since the level of employment and the level of real gross profit are relatively volatile. This confirms that the relationship of inflation and change in the unemployment rate is only stable in the short term.

$$\delta_t = \delta(\pi_t ; L_t ; w_t / p_t ; L_{St}) \qquad (30)$$

Third, as it is the change in the unemployment rate that is linked to inflation (relation 28), it is quite possible to have low inflation associated with low unemployment or conversely high inflation associated with high unemployment. Indeed, in light of the previous results, when the labor flexibility is moderately high and the increase in production capacity is strong enough and/or in line with the dynamics of aggregate demand which, itself, is strong, then economic growth would create enough jobs, without accelerating the increase in prices. In a context of moderate or low population growth, the unemployment rate would be at a fairly low level. In such a case, we could have a low unemployment rate associated with low inflation or even disinflation, especially if the effect of economic growth on job creation is much greater than the negative effect of disinflation episodes. To demonstrate this, consider the total differentials of the system of equations (20), by varying Y, π, p and w. Knowing in the short term that the change in the unemployment rate (du) is equal to the ratio of the opposite of the change in the employment level compared to the total workforce, namely ($- dL/L_S$), solving the new system of equations gives the relation (31). Given that nominal wages are fairly rigid downward in the short term, this relation shows that disinflation will be accompanied by an increase in the unemployment rate that if the effect of economic growth on unemployment is relatively small.

$$du = -\frac{\frac{\partial L}{\partial \pi}}{\left(1 + (w/p)\frac{\partial L}{\partial \pi}\right)L_S} dY - \frac{\left(L\frac{\partial L}{\partial \pi} - \frac{\partial L}{\partial (w/p)}\right)(w/p)}{\left(1 + (w/p)\frac{\partial L}{\partial \pi}\right)L_S}\left[\frac{dp}{p} - \frac{dw}{w}\right] \qquad (31)$$

Let μ and φ be the respective shares of the wage bill and the gross profit in the total income (Y) and let $\varepsilon_{L/(w/p)}$ and $\varepsilon_{L/\pi}$ respectively the real wage elasticity and the gross profit elasticity of labor demand. From relation (31), it is shown that, in the short term, disinflation will be associated with a decrease in unemployment if the inequality given by relation (32) is verified[30]; if not, it will be associated with an increase in unemployment. Then, a decrease in the unemployment rate will be observed during a disinflation episode if the economic growth rate is greater than the difference between the growth rate of the average nominal wage and the inflation rate, multiplied by the sum the share of the wage bill in total income Y and the share of gross profit in total income Y weighted by the opposite of the ratio of real wage elasticity of labor demand compared to gross profit elasticity of labor demand (relation 32).

$$\frac{dY}{Y} > \left(\mu - \frac{\varepsilon_{L/(w/p)}}{\varepsilon_{L/\pi}}\varphi\right)\left(\frac{dw}{w} - \frac{dp}{p}\right) \qquad (32)$$

Similarly, it is shown that inflation (dp/p) will be associated with a decrease in unemployment if the inequality given by relation (32) is verified; if not, it will be associated with an increase in

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[30] To find the inequality of relation 32, pose du <0 from relation 31 and make the necessary arrangements.

unemployment. Then, an increase in the unemployment rate will be observed during an inflation episode if the economic growth rate is lower than the difference between the growth rate of the average nominal wage and the inflation rate, multiplied by the sum the share of the wage bill in total income Y and the share of gross profit in total income Y weighted by the opposite of the ratio of real wage elasticity of labor demand compared to real gross profit elasticity of labor demand (relation 32).

4.   Conclusion

Based on the General Theory of the Firm, this research has developed a new macroeconomic representation of the labor market to understand the mechanisms underlying its equilibrium. Equilibrium in the labor market is the result of two stages of negotiations between the stakeholders (employers and employees), constrained by the possibilities of production and distribution of the created wealth. Those are (i) the process of wage negotiation which allows wages to be fixed taking into account the (expected) productivity of labor and the share of profit per output unit, (ii) the process of determination of labor demand level and, thus, the level of real gross profit. Thus, this new macroeconomic representation of the labor market provides five main lessons.

First, the equilibrium of the labor market is determined by the matching of possibilities on the conventional level and of the possibilities on the technical level within economy. It is not characterized by equality between labor supply and labor demand, but rather by the "satisfaction" of each stakeholder in the production process (employees and employers). For a real wage level set by the wage negotiation process, the equilibrium on the labor market corresponds to the intersection of the companies' technical curve and their conventional curve of labor demand in the plan (L, π). At equilibrium, employers realize the highest effective gross profit; while the employees provide a level of work effort accepted by each of the two stakeholders for the real compromise wage. Thus, at equilibrium, on the one hand, the respective desires to earn an extra penny on real gross profit and on real wage are equal and, on the other hand, the level of work effort corresponds to the minimum that employers are willing to pay and the maximum level that employees are willing to provide at the real compromise wage.

Second, given that, in the short term, the demand for labor increases with the real gross profit of firms and that the supply of labor is invariable with the real gross profit, the supply of labor may be higher than the labor demand at equilibrium. Thus, underemployment equilibrium is quite possible, as is the case in many developing countries. Two reasons could explain the fact that an economy is in a situation of underemployment equilibrium: (i) companies do not realize high real profits making it possible to increase their demand for labor mainly because of the insufficiency profitable demand for goods and services and/or the job security is too strong in the labor market; (ii) companies make high real profits, but the labor flexibility is too high so that the economic dynamics are unfavorable for job creation and/or the companies' production capacities are relatively limited compared to the labor supply.

Third, in a situation of underemployment equilibrium, with under-productive capacities, a boosting aggregate demand policy would lead to an increase in employment and real profits, and thus, a decrease in unemployment. However, the more flexible the labor market, the weaker the effect of such a policy on employment, while the greater its effect on real profits. For a perfectly flexible labor market (perfectly market economy), the effect of economic recovery on employment becomes zero, while its effect on real gross profits becomes maximum. Conversely, the higher the job security in the labor market, the greater the effect of the economic recovery on job creation, while the weaker its effect on real profits. Ultimately, the effect of the economic recovery on employment is maximum for a total job security – within a social and solidarity economy – while its effect on real profits is zero. Given that any market economy needs, on the one hand, to make more profits to maintain its dynamics in the medium and long term and, on the other hand, to create more jobs to reduce unemployment and poverty, a judicious dosage of flexibility and security in the labor market is necessary in order to allows economic growth to generate both enough jobs and profits. Hence the importance of the concept of flexisecurity and policies promoting it.

Fourth, in a situation of full production capacity with an unemployment, an economic recovery measure would lead to a decrease in unemployment accompanied by inflation. In this case, the unemployment and inflation trade-off is necessary in the short term. The sacrifice rate of disinflation is influenced, on the one hand, by the state of the current equilibrium of the labor market and, on the other, by the labor flexibility or the labor market policies and institutions. The higher the labor flexibility, the lower the sacrifice rate of disinflation. Conversely, the higher the job security in labor market, the higher the sacrifice rate of disinflation.

Fifth, although disinflation always has a cost in terms of changing in unemployment rate in the short term, not every episode of disinflation is associated with an increase in the unemployment rate. A decrease in the unemployment rate will be observed during an episode of disinflation if the effect of disinflation is dominated by the effect of economic growth on job creation.

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