

# Capacity and Employment in the Great Recession

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*Although it is difficult to compare the present events to those of the “Great Depression”, they re-propose two old questions: Does a fall in aggregate demand have a direct impact on the labour market? Does a rebound in production imply a recovery in employment? The paper stresses the role of aggregate demand and slack capacity. While spare capacity may stimulate quantity adjustment strengthening the relationship between aggregate demand and labour performance in recession, the rebound can imply other forces (technical and structural change). However, the peculiarity of the present recovery is better understood within the aftermath of a financial bubble.*

## INTRODUCTION

Although it is difficult to compare the present events to those characterizing the “Great Depression”, (see Alumnia *et alia*, 2009, for a discussion), they seem to put forward again two questions that were both on the agenda during those times: does a fall in aggregate demand have a direct impact on the labour market? Is the rebound in production capable of restoring the previous level of employment?

A debate is taking place within the so called “new synthesis paradigm” (or DSGE models) (see for instance Hall, 2011) which, according to some authors (see Woodford, 2009), is unifying macroeconomics. This synthesis seems to accommodate both productivity shocks as in the Real Business Cycles theories (RBC) and demand shocks. In particular, while demand shocks are used in order to explain the downturn, the supply aspects are invoked in order to explain the jobless recovery. Wage rigidity (see Shimer 2012), productivity-led recoveries (Gordon, 2003), sectorial adjustment processes (see Chen *et alia*, 2011) and credit contraction (see Calvo, Coricelli and Ottonello, 2012) are the most quoted explanations.

A thesis of the present paper is that the role of aggregate demand is strategic in both contraction and expansion. It serves three purposes. First of all, aggregate demand characterizes the present events with respect to other business cycle experiences. This gives us a benchmark in order to measure the performance of the labour market. In the second place, aggregate demand, through the vehicle of capital utilization can explain the fall in employment during the contraction. Finally, along with a process of interdependence with supply aspects, it helps explaining the aftermath of the “Great Recession” which can be better understood as the aftermath of a financial bubble.

The structure of the paper is the following. Section 2 presents the main stylized facts of the labour market performance. Section 3 discusses the jobless recovery and the necessity of a correct benchmark of

reference. Section 4 illustrates different transmission mechanisms for the downturn. Section 5 stresses the role of uncertainty, while Section 6 examines the role and the meaning of capacity at the extensive margin. Section 7 stresses the asymmetry that characterize the so called jobless recovery. Section 8 investigates the thesis of wage rigidity. Section 9 considers alternative explanations of the jobless recovery. Section 10 concludes.

## STYLIZED FACTS

The “Great Recession” seems to be more severe than the average of the past business cycle experiences that occurred after World War II. The interaction between financial and real aspects on a world scale has certainly contributed to this result. At the same time, the “Great Recession” has been less severe than the “Great Depression”.

Let us start from some of the stylized facts that characterize the Great Recession that are worth stressing. The emphasis is on the experience of the US.<sup>1</sup>

- a) In the recession of 2007-09 the rate of unemployment peaked at 10% and remained above 8% for 41 consecutive months. During the recession 1982-83, the maximum rate of unemployment was higher, but it decreased more rapidly.
- b) The pattern of the Employment/Population ratio is almost the mirror image of the rate of unemployment. According to Lazear and Spletzer (2012), the correlation between the two variables during the period 1972-2012 is negative and equal to -0.87. This implies that the dynamics of employment is fundamental to understand also that of unemployment, a variable that is at the core of policy reactions.
- c) The Employment/Population ratio presents two patterns that are worth stressing. First of all, the fall has been unprecedented: 4 percentage points, even though the maximum of the ratio was achieved before the 2001 recession. In the second place, after the end of the recession it has remained almost constant. In this sense, there is a problem of recovery. In particular, the number of workers employed is about 5 million down from its peak.
- d) Finally, Table 1 shows how manufacturing, constructions and the service sector have contributed with the same amount to cause the employment fall of the “Great Recession”. Employment at the end of 2011 has diminished by a couple of million in each sector.

**TABLE 1**  
**EMPLOYMENT CHANGES BY SECTOR SINCE 2007**  
**(TOTAL NON-AGRICULTURAL. THOUSANDS OF PERSONS)**

Years	Total	Private	Goods-producing	Construction	Manufacturing	Services
2007	137.598	115.380	22.233	7.630	13.879	93.147
2011	131.159	109.080	18.037	5.526	11.723	91.043
Diff.	-6.439	-6.300	-4.196	-2.104	-2.156	-2.104

Source: Economic Report of the President 2012, Table B-46

The impression is that the fall in employment, although concentrated in the building sector as the epicentre of the “Great Recession”, has been widespread.

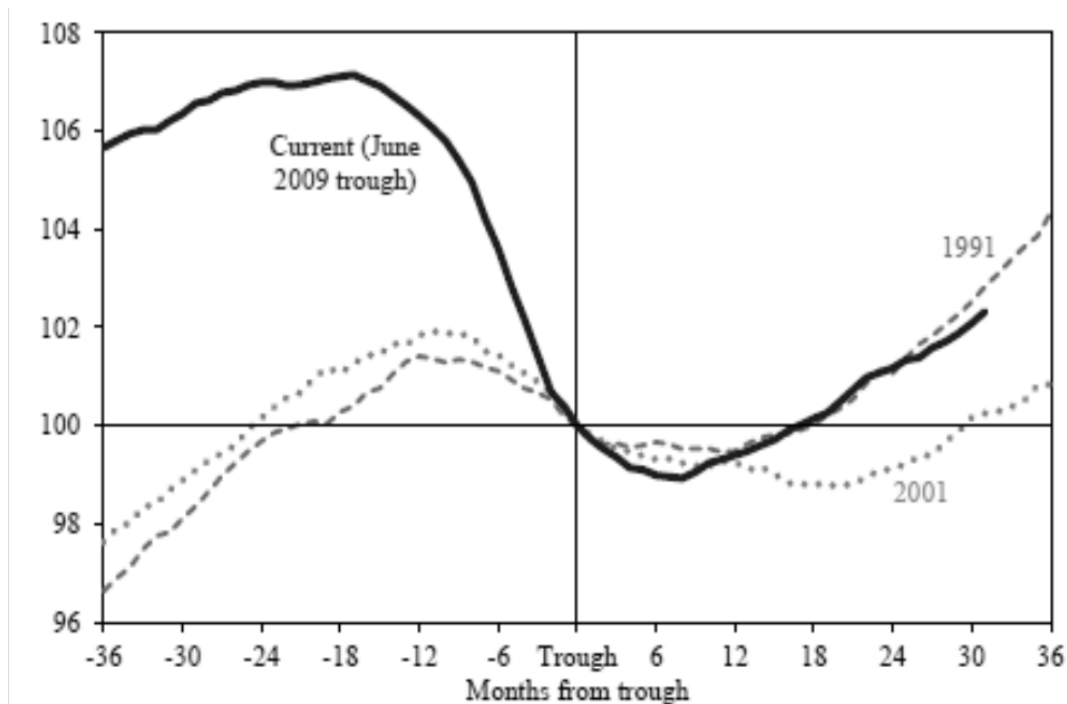
## THE JOBLESS RECOVERY AND THE BENCHMARK

These stylized facts have been interpreted as supporting the thesis of “jobless recovery”. However, in order to confirm this thesis an appropriate benchmark must be chosen. The problem is that the particular nature of the “Great Recession” makes this choice rather difficult. In fact, if one compares the present

situation with the previous business cycles experiences, as in Figure 1, one realizes that that the present employment recovery is in line with the 1991 business cycle experience and fares much better than the 2001 experience.

From this perspective, one cannot talk of a jobless recovery as a peculiarity of the present situation. On the contrary, the peculiarity is represented by the five million people missing from the peak reached before the crisis. However, also this benchmark is debatable because it refers to an unsustainable state of the economy.

**FIGURE 1**  
**PRIVATE NONFARM EMPLOYMENT DURING RECOVERIES**  
**(INDEXED TO 100 AT NBER-DEFINED TROUGH)**



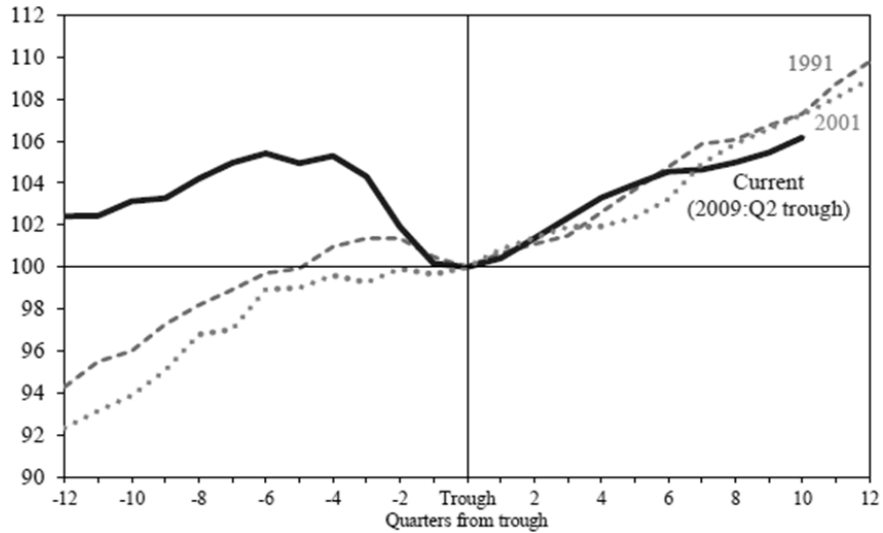
Source: US Economic Report of the President, 2012. Data from Bureau of Labor Statistics, Current Employment Statistics; NBER; CEA calculations

This aspect is strengthened if one consider also the performance of the product market. As appears from Figure 2, the peculiarity of the present situation lies more in aggregate demand. Furthermore, it is decisive to consider that during the Great Recession, the economy lost about twelve percentage points of output relative to trend. Both aspects can be better understood within a financial bubble framework (see Reinhart and Reinhart, 2010). In this perspective, one can understand why demand remains low with respect to previous business cycle experiences and why it cannot reach the previous maximum, when the credit cycle was at its peak.

### COMPETING EXPLANATIONS OF THE CONTRACTION

At this stage of the analysis, it is important to consider the main explanations put forward to understand both the contraction and the jobless recovery. As far as the former is concerned, one must find some forces that contributed to shift the demand for labour downward (see Figure 3).

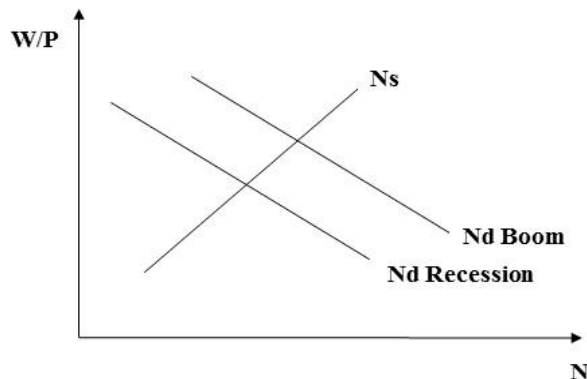
**FIGURE 2**  
**REAL GDP DURING RECOVERIES**  
**(INDEXED TO 100 AT NBER-DEFINED TROUGH)**



Source: Bureau of Economic Analysis, National Income and Product Accounts; NBER; CEA Calculations.

According to Real Business Cycle (RBC) theories productivity shocks should be at the root of the shift in the demand for labour. However, the difficulty in identifying what would be a technical regress has stimulated the so called DSGE models to look for other driving forces. In particular, demand shocks can add two further mechanisms of transmission: income distribution and capacity utilization, respectively. According to the first interpretation, which has been enriched by the supplementary hypotheses of imperfect competition (on this point, see Ferri and Variato, 2010) and price (nominal) rigidity, there is a countercyclical movement in the mark-up (a relative price) shifting down the labour demand (see Basu and Bundick, 2011 and Bils, Klenow and Malin, 2012). This shift might explain, at least partially, why the fall in employment in the Great Recession has been so substantial. However, a close look at Figure 4 shows that, at least for the more recent period, the mark-up has moved procyclically.

**FIGURE 3**  
**THE LABOUR MARKET IN THE CYCLE**



Another explanation stresses the role of a decrease in capital utilization that also may shift the demand for labour downwards. In effect, if one considers Figure 5, one realizes the big fall in capacity utilization during the “Great Recession”.

This is certainly a variable that deserves to be deepened, both to understand contraction and the problems of an unsatisfactory recovery.

In the literature (see Wen, 1998 and Eusepi and Preston, 2011), a particular definition of capital utilization has been adopted. It refers to a varying degree of intense utilization and implies incurring different depreciation costs. The theoretical framework is that based on the presence of adjustment costs that make it difficult to inputs to be always optimally employed. Adjustment costs are assumed to be convex and therefore they are compatible with the usual maximization conditions. It is this change in adjusting costs that shift the demand for labour.

**FIGURE 4**  
**PRICE MARK-UP OVER UNIT LABOUR COSTS**  
 (NONFARM BUSINESS, 1947-2011; RATIO OF PRICES TO UNIT LABOUR COSTS)



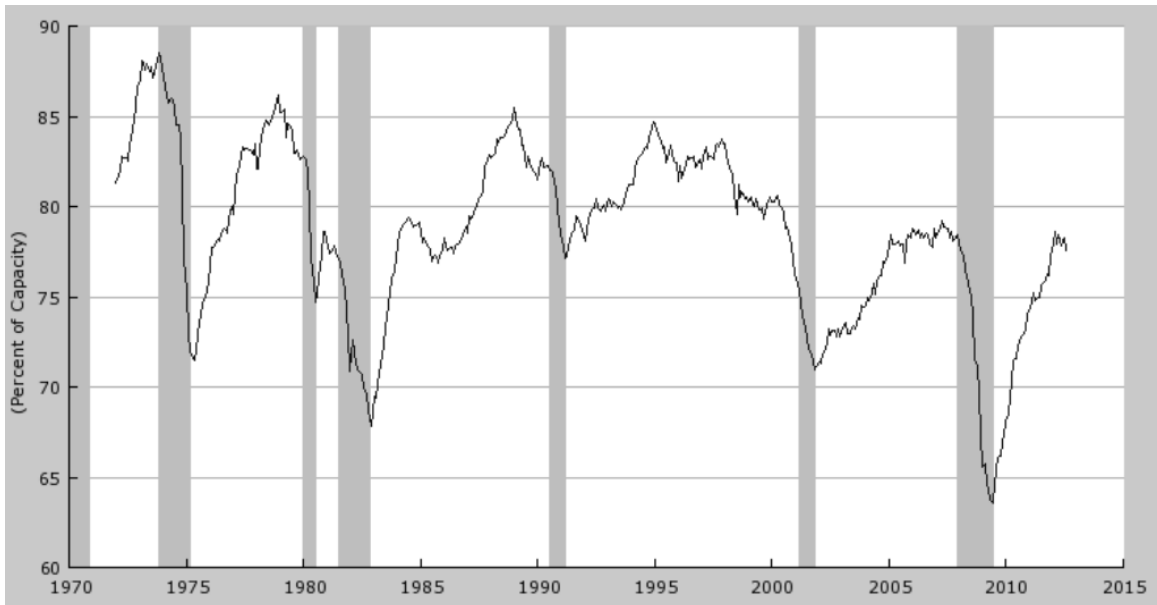
Source: US Economic Report of the President, 2012. Bureau of Economic Analysis, National Income and Product Accounts; Bureau of Labor Statistics, Productivity and Costs Current Employment Statistics; NBER; CEA calculations. Note: Shading denotes recession.

## UNCERTAINTY AND CAPACITY UTILIZATION

A rediscovery of the role of uncertainty as a prime driver of business cycle has taken place in recent times (see, for instance, Bloom and alia, 2009 and 2012). What we want to stress is its impact on the nature of adjusting costs, in particular, and that of capital, in general. In this context of uncertainty, also the concept of capacity utilization can undergo a change. More specifically, three relevant aspects seem to emerge. The first is that adjustment costs can become more complex than the usual convex costs and this allows the presence of more sophisticated patterns. For instance, inaction can become an optimal

strategy in the presence of uncertainty. In the second place, uncertainty favours the irreversible nature of capital (see Bloom, 2009) that must be considered within a putty-clay perspective.

**FIGURE 5**  
**CAPACITY UTILIZATION**  
**(MANUFACTURING NAICS MCUMFN)**



Source: Board of Governors of the Federal Reserve System. Note: Shading denotes recession.

In this context, and this is the final aspect to be stressed, changes in capital utilization does not necessarily mean variations in the intensity of the utilization, which is like supposing a different quantity of shifts on the same plant. On the contrary, capital utilization can vary along different routes, for instance the “extensive margin” (see Cooley *et alia*, 1995). In particular, it is not the intensity or the period of time with which a unit of capital is utilized that varies only, but more importantly it is the fraction of the capital stock used for production that changes at the extensive margin. Some plants are simply not working.

### **CAPACITY UTILIZATION AND THE EXTENSIVE MARGIN**

In order to better understand the role of the extensive margin, let us consider the technology of the firm in a more detailed way. To this purpose, let us suppose that ex-ante firms design production under some expectations of aggregate demand. There is flexibility, capital is putty and production is organized both within plants and between plants. Overall, there are constant returns to scale. In this context, the demand for labour can be expressed in the following way:

$$L_t = M_t^* f(A_t, k_t, w_t) \quad (1)$$

where  $M^*$  is the optimal number of plants, representing the extensive margin, while the remaining component represents the marginal productivity of labour, given the relative prices, capital ( $k$ ) and technical change ( $A$ ).

Ex-post the situation can be different. In fact, a fall in demand is faced by a putty-clay technology. Capital and labour can be substituted within each plant, but the number of plants is given. They can only be shut down. In this perspective, the demand for labour can be represented in the following way:

$$L_t = \kappa_t M_t^* f(A_t, k_t, w_t) \quad (2)$$

where

$$\kappa_t = \frac{M_t}{M_t^*} \quad (3)$$

represents the percentage of utilized plants. In other words, it measures capacity from an extensive point of view.

In this context, there is a strict link between changes in demand, and movements in capacity and employment.<sup>2</sup> The necessary conditions in order to obtain this result are the following: firms must be demand constrained and capital is of the putty-clay type. Both these conditions seem to be respected the more the contraction is stronger. It is for this reason that they can offer a good interpretation of the more acute phase of the “Great Recession”.

## AN ASYMMETRY

There are two differences with respect to the current literature that insists on the role of capacity utilization. First of all,  $\kappa$  is determined by aggregate demand and therefore its value depends on the nature of the model into which the above equations are inserted (for a dynamic version, see Cristini, Ferri and Variato, 2012). In the second place, it does not depend on relative price adjustment carried out through changes in the depreciation rate. It is simply a quantity adjustment that can create problems to a general equilibrium model only based upon relative price adjustments. In this case, the labour market is not self-contained because of the presence of  $\kappa$  in the demand for labour.

It follows that while the presence of capital utilization in the new synthesis literature (see, for instance, Rotemberg and Woodford, 1999, Jaimovich and Rebelo, 2009) emphasizes the possibility that firms can choose an optimal level by means of modifying depreciations costs in a convex cost structure, in the present case,  $\kappa$  refers to an extensive margin, where firms are in an inertia mood and aggregate demand determine its macro dimension.<sup>3</sup>

These results become more blurred when a different time horizon is considered. In fact, the number of plants (and the number of firms) can change and this implies that  $\kappa$  may increase without an increasing productive capacity. In this case  $\kappa$  and employment become less correlated.

This drives the discussion into the recovery phase. If one compares Figure 5 with the formula (2), one should expect an expansion in labour demand since  $\kappa_t$  has increased.

The problem is that the increase in  $\kappa_t$  has been produced by a fall in  $M^*$ , the optimal number of plants, and this has implied a contained employment expansion. If one tries to identify the forces behind this behaviour, one is compelled to face the various interpretations of the jobless recovery.

## A WAGE PROBLEM?

A recurrent issue is that insisting on the role of wage rigidity. That wage rigidity can cause an increase in unemployment within a neoclassical paradigm, both in a frictionless world and version with frictions, it is undoubtedly true. As shown by Shimer (2012) also within the neoclassical paradigm there are differences. In fact, within a frictionless world, the presence of wage rigidity generates a permanent loss in employment, once the capital process of an economy has been hit by a negative shock. On the contrary, if one refers to a model with frictions, such a search model, the same shock can only generate a persistent loss of employment.

What is at stake, however, is not so much a methodological problem concerning the adequacy of the neoclassical model, at least at this stage of the analysis. The problems, in fact, are different, the first one is empirical, while the second one is more analytical. Let us start from the empirical aspect. For instance, if one considers the decade 2000-10, one realizes that the real compensations (in the business sector) have not changed in a substantial way: 1.4 % per year. Can one conclude that real wages have been rigid? In a stationary world, the answer would be affirmative. But in a growing world, one must compare real wages ( $W/P$ ) with the dynamics of productivity ( $A$ ). In this perspective, they have been flexible. In fact, from the formula

$$\frac{W/P}{A} = \omega = \frac{WN}{PY} = \frac{1}{\mu} \quad (4)$$

one realizes that this ratio is just equal to the labour share ( $\omega$ ), which is just the inverse of the mark-up  $\mu$ , which is defined as the ratio between prices and unitary labour cost. However, as Figure 4 has shown, the mark-up has been pro-cyclical, while labour share has been countercyclical. It follows that there cannot be a macroeconomic problem concerning wages when their share is falling. This does not exclude the possibility of micro rigidities that are also very important in determining the allocation of labour.

Secondly, there is a theoretical problem. In our story, wages may have a short-run impact on labour substitution within the plant, but a rather indirect role on the number of plants, where it is just one component of medium-run profitability. In this perspective, aggregate demand and productivity are by far more important in order to understand medium-run dynamics.

## THE AFTERMATH OF A FINANCIAL CRISIS

In order to understand both contraction and recovery, it is important to consider the identity: (see also, Fazzari, Ferri, Greenberg and Variato (2013):

$$g_t \equiv l_t + a_t \quad (5)$$

where  $g$  is the rate of growth of output,  $l$  is the rate of growth of employment and  $a$  is the rate of growth of productivity.

If one looks at the data of the Great Recession, it turns out that the unsatisfactory behaviour of  $l$  is due to the unsatisfactory dynamics of  $g$ . Due to the presence of floors to nominal interest rate, presence of uncertainty and high debt ratio that prevented a stronger use of fiscal policy, the dynamics of  $g$  has been below the trend.<sup>4</sup> In this situation, the dynamics of productivity is anchored to the maximum previously reached and does not change a lot.

There are of course cyclical deviations. In fact, the increase in productivity quarters after the trough has been reached is a common feature of almost every post-war recovery. According to Gordon (2003), this behaviour is due to two tendencies: the “end-of-expansion effect” which implies firms’ tendency to over-hire, and the “early recovery productivity bubble”, which is the tendency to under-hire in the early stages of recoveries. However, since the economic downturn of 1990-91 a new era of productivity-led recoveries started where the length of the phase of high productivity growth and stalled growth in employment has increased in a substantial way. This implies that “productivity growth” cannot be “the deus ex-machina” of the explanation of employment in the “Great Recession”.

The present situation can be better understood as representing the aftermath of a speculative bubble (see also Reinhart and Rogoff, 2012) and therefore does not simply represents a normal recovery. This consideration is not only important to understand the behaviour of employment in construction, but also the overall pattern. Our thesis is that while it is not true that one can characterize the present economic situation as a case of jobless recovery, it is, on the contrary, true that one can talk about a jobless economy. The main explanation is due to the fact that aggregate demand, and therefore output, are still far



away from the previous trend. In this perspective, it is decisive to consider that during the Great Recession, the economy lost about twelve percentage points of output relative to trend. Aggregate demand has a pivotal role in order to understand both contraction and expansion. From the latter point of view, it is unlikely that it can reach the crisis levels when it was fuelled by a credit boom.

## CONCLUDING REMARKS

Even though present events differ from those of the “Great Depression”, they call into question the impact of aggregate demand on the labour market either during recession and recovery. The paper has referred to an economy with slack capacity. While normally, capacity utilization refers to an intensive use of factors of production, in the present papers it is grounded on an extensive concept, as the ratio of operating plants on the total. In this perspective, a fall in aggregate demand implies a fall in employment by means of a reduction of capacity utilized. For these reasons, the presence of spare capacity is accompanied by quantity adjustment and therefore strengthens the relationship between aggregate demand and the labour market.

In order to understand the unsatisfactory job creation during the aftermath of the “Great Recession”, one has mainly to choose an appropriate benchmark. In fact, the present situation is better defined as the aftermath of a financial bubble than as a typical recovery phase of a normal business cycle. In this perspective the unsatisfactory growth of aggregate demand, along with credit conditions, play a strategic role.

The analysis can be extended into different directions. The first would consist in considering other variables of the labor markets, both in terms of stocks and flows, in order to have a more complete picture of the situation. The second would imply to better characterize the present situation by considering the implications of financial distress (see Calvo *et alia*, 2012). Finally, one has to deepen the link between stagnating growth and sustained productivity.

## ENDNOTES

1. For a comparison with the Euro Area, see ECB (2012).
2. The putty-clay models can obtain the same relationship even though with a different causal order. See Gilchrist and Williams (2005).
3. It is also different from those approaches that stress the role of shocks on capital accumulation, see Gertler and Kiyotaki, 2011.
4. On the role of technical change in a fixed price model, see Basu and Kimball (2006) and also Bils *et alia* (2012).

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