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Consumption, Saving, Investment, and Unemployment. SVAR Tests of the Effects of Changes in the Consumption-Saving Pattern

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Abstract

In this paper we aim to provide information about the transmission mechanism at work between investment and unemployment by looking at the consumption-saving pattern as a determinant of investment behaviour. Our starting hypothesis is that permanent shifts in the consumption-saving pattern will have permanent effects on investment, with subsequent consequences for the unemployment rate. To test this hypothesis we build an SVAR model for the Spanish economy seeking information about the response of the four relevant macroeconomic variables (consumption, saving, investment and unemployment) to simulated shocks imposed on the system.

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1.- Introduction

The Great Recession has devastated the western economies in recent, and in the Spanish case it put an to end a very strong and positive business cycle, based on a strong consumption and investment boom, (especially housing related). This boost allowed, through the standard aggregate demand channels, for a huge and unprecedented increase in employment, such that even an immigration wave of more than 4 million workers was absorbed without much social tension.

The dark side of this process was that consumption and investment growth caused a very high level of private debt (both for families and firms) which in turn implied a greater exposition to risk if fundamental macroeconomic conditions changed. Indeed, they changed dramatically. In the first two years after the begining of the recession the unemployment rate reached levels of more that 20%, which, joined by a large government deficit (more than 6% of GDP) and a lack of confidence of international investors in the Spanish economy,[2] is leading to a severe downturn with no clear perspective of a recovery.

Macroeconomic theory shows that adverse shocks may lead to falls in the components of the aggregate demand that, if not corrected by timely measures of fiscal policy, may lead to a slowdown of economic activity and an increase in the unemployment rate. This is not the focus of this paper, but rather the second round effects that a strong recession may have on the consumption and saving patterns of the families, and the ultimate effects on the labour market through investment.

New Keynesian Macroeconomics (NKM) assumes that medium-run changes in saving and consumption patterns or in investment rates do not cause significant effects on the labour market medium-run equilibrium. The reason is that this equilibrium is characterized by the compatibility of wage claims by workers in the bargaining, and the real wages that firms are willing to pay, given their labour costs and the degree of imperfections in the product market. Therefore the equilibrium unemployment rate (dubbed as the Natural Rate of Unemployment, NRU, or the Non Accelerating Inflation Rate of Unemployment, NAIRU) determines the medium-run equilibrium of the economy, since it acts as an attractor for the actual rate. Layard *et al.* (1991) show that under standard assumptions the equilibrium unemployment rate

[2] During the boom of the 2000's Spain experienced very low private saving rates (see below), and international investors feed the unlimited capital requirements of private banks, in order to finance de ongoing housing bubble. See Matesanz, *et al.* (2011) for an analysis of the effect of the incoming capital flows on the growth process during these years.

is determined by supply side variables, such as labour market institutions or the degree of competition in the product market, but it is not affected by changes in aggregate demand. Following the tradition of the Neoclassical Synthesis, aggregate demand determines the medium-run inflation rate.

The NKM model emphasizes in particular that variables such as capital stock or productivity cannot affect the equilibrium unemployment rate. The reason is that capital stock, for instance, is a trended variable, whereas the unemployment rate is not. In spite of the popularity of this model, in recent years a great diversity of evidence has emerged pointing towards a negative relationship between investment (capital stock growth) and unemployment, even in the medium-run. Arestis and Mariscal (1998, 2000), Blanchard (2000), Malley and Moutos (2001), Miaouli (2001), Sawyer (2002), Herbertson and Zoega (2002), Smith and Zoega (2005), Kapadia (2005), Arestis, *et al.* (2007), Karanassou, *et al.* (2008) or Bande and Karanassou (2009, 2010) are examples of papers that, through very different analytical approaches, reach a similar conclusion, i.e. an inverse relationship between aggregate investment and the unemployment rate. Moreover, this evidence seems robust to the type of econometric modelling used or to the countries considered. Actually, this relationship was dubbed by Blanchard (2000) as the *Modigliani Puzzle*.

Some natural rate models based on investment find the source of this relationship in the work of Oi (1962). This author regards labour as a quasi-fixed asset in the firm, due to hiring and training costs. In this case it is natural to expect that changes in the level of employment at the firm level are coincident with changes in investment.

More recent general equilibrium models try to explain medium term changes in unemployment through this channel (see for instance Phelps, 1994 or Pissarides, 2001). Both authors model hiring decisions as intertemporal investments in the presence of real wage rigidity. This implies that the equilibrium unemployment rate (the natural rate) is a function of the determinants of investment demand. Thus, when the expected flow of profits from the investment in the hiring and training of new workers increase, the hiring rate also rises, and the equilibrium unemployment rate falls. Finally, the Real Business Cycle literature also allows predicting a positive relationship between employment (measured by worked hours) and investment, even though it is not able to explain involuntary unemployment.

To explain the relationship between investment and unemployment we must analyse the determinants of investment. The macroeconomic literature has identified the main driving forces behind investment growth: real interest rates (Phelps, 1994), expected profits and the real value of the firm's equity (Tobin, 1969, Zoega, 2010). Another important determinant is

the amount of savings, both private and public. Given the current very high levels of private indebtedtness, joined by increasing public deficits due to expansionary fiscal policies designed to initially fight against the recession, it is very likely that in the forthcoming future the consumption and saving patterns will be modified, and therefore potential effects on the investment-unemployment relationship may arise. This is precisely the aim of this paper, to asses the impact of changing consumption-saving patterns on investment and unemployment.

We will take as a starting point of our analysis the life-cycle consumption models of Modigliani and Brumberg (1954), Modigliani (1963) and Modigliani (2000). In these models individuals take their intertemporal decisions on consumption and savings not only as a function of current income, but they also take into account the expected stream of income (from labour) and their expected financial wealth. Following this line, we must expect that when individuals increase their savings due to life-cycle reasons, there is an increasing amount of disposable resources for investment, which would reduce the equilibrium unemployment rate. On the contrary, if we observe a fall in aggregate savings due to life-cycle reasons, we should observe falls in investment, and therefore an increase in equilibrium unemployment. Moreover, the short-run dynamics of this process may be a two-way causation: a fall in savings due to a higher short-run unemployment rate may provoke a fall in investment, which would feed back the medium term effects on equilibrium unemployment.

Hertberson and Zoega (2002) tested this hypothesis through the analysis of the correlation between age structure and investment, and age structure and unemployment, for a sample of OECD countries. Their results are striking, since they confirm the hypothesis: a higher share of workers in the central age groups (those more engaged in savings) is correlated to a higher investment rate and a lower unemployment rate. On the other hand, a higher proportion of young workers is correlated to lower investment rates and higher unemployment.

In this context, the current recession may modify the consumption and saving patterns in Spain. The high indebtedness rates of families, together with the worsening of employment perspectives may permanently modify the short- and medium-run saving rates, and therefore affect permanently the unemployment rate. On the other hand, changes in the population structure may compromise, through this Modigliani effect, the economic recovery and the long-run growth rate. The demographic projections of the Spanish Statistics Institute (INE, 2000) show a marked ageing of the Spanish population, which may lead to a fall in the investment rate (due to the unsaving of this group), with corresponding higher unemployment rates, precisely in a moment in which most of the available productive resources should be

used, since the dependent rate of the economy (inactives/actives) is expected to exceed 80% in the forthcoming future.

The paper is organised as follows. Section 2 sketchs the theoretical model of consumption, investment and unemployment, while Section 3 provides some evidence regarding the recent behaviour of saving rates, investment and unemployment in the Spanish economy. Section 4 describes the econometric approach, the estimation of a Structural Vector Autoregression (SVAR) in consumption, investment and unemployment, and summarises the main results. Finally Section 5 concludes.

2.- Theoretical underpinnings

The purpose of the following sketch of a theoretical model is just to impose a minimal economic structure on what otherwise would be an unstructured VAR model to obtain an SVAR model. The choice of the elements in this framework, and their level of detail, is determined mainly by their fitness for the purpose mentioned above. Our framework consists of three equations. The first is a consumption function consistent with the life-cycle hypothesis. The second is an investment equation roughly representing the theory of investment based on Tobin's q ratio. Finally, the third equation is a highly stylized relationship linking unemployment with aggregate demand variables in a way that can be interpreted as an equilibrium condition between aggregate demandad and aggregate supply, as implying the assumption that output is demand determined in a standard Keynesian fashion. The SVAR we estimate is not obtained directly from this minimalist AS/AD macro model. The order just outline the structure underlying our restrictions.

The consumption equation in our framework should be consistent with the life-cycle hypothesis of Modigliani and Brumberg (1954). The most rigorous way of deriving such a consumption function is through an overlapping generations (OLG) model. For the sake of simplicity we opt for a simpler formulation, based on the well-known linear quadratic consumption model first presented by Hall (1978). Assuming a quadratic instantaneous utility function *u(.)*, the intertemporal expected utility maximization problem of a representative individual can be written as the maximization of

$$U = \sum_{t=0}^{\infty} \frac{1}{(1+r)^t} u_t, \qquad (1)$$

where r is the real interest rate, here taken as given for simplicity. The individual is subject to an intertemporal budgdet constraint that in the simplest case of a closed private-sector economy is written as

$$E_t\left\{\sum_{t=0}^{\infty}\frac{1}{(1+r)^t}(C_t+I_t)\right\}=E_t\left\{(1+r)A_0+\sum_{t=0}^{\infty}\frac{1}{(1+r)^t}Y_t\right\}, \qquad (2)$$

where $E_t\{\cdot\}$ is a mathematical conditional expectation, C_t is consumption, I_t is investment, and Y_t is income, all of them referred to period t. A_0 is the wealth (or debt, if negative) the individual holds in the present period $t=0$.

Resolution of this problem gives the famous result that consumption follows a random walk, but it also allows us to obtain an expression that relates present consumption with other present and future variables, that is

$$C_t=\frac{r}{1+r}\left[(1+r)A_0+\sum_{t=0}^{\infty}\frac{1}{(1+r)^t}E_t(Y_t-I_t)\right]. \qquad (3)$$

Taking a particular set of expectations as given, and linking income to the labour market in a straightforward fashion through Okun's law, this equation can be expressed as a simple linear relationship of the form:

$$C_t=a_1+a_2I_t+a_3u_t+\varepsilon_{1t}, \qquad (4)$$

where $a_1\geq 0$ is a constant made up of the coefficients representing the impact of the expectations set and of initial wealth, $a_2,a_3\leq 0$, and ε_{1t} is a random disturbance on consumption. This equation relates the level of consumption to investment and to unemployment rates, plus a random error term.

The investment equation is based on the model of investment with adjustment costs developed by Abel (1982) and Hayashi (1982). A representative firm maximizes the present value of its profits, Π, that are proportional to its capital stock, κ, and decreasing in the industrywide capital stock, K: $\pi(K_t)\kappa_t$, where $\pi'(\cdot)<0$. The key assumption is that adjustment of the firm's capital stock is costly. Specifically, adjustment costs are assumed as a convex function of the rate of investment, $C(I_t)$, with $C'(\cdot)>0, C''(\cdot)<0$.

The firm maximizes

$$\Pi=\sum_{t=0}^{\infty}\frac{1}{(1+r)^t}\left[\pi(K_t)\kappa_t-I_t-C(I_t)\right], \qquad (5)$$

Subject to the constraint that $\kappa_{t+1}=\kappa_t+I_t$ (we ignore depreciation for simplicity).

The first-order condition for the firm's investment in t can be written as $1+C'(I_t)=q_t$, where $q_t=(1+r)^t \lambda_t$, is a value usually interpreted as equivalent to the ratio of the market value to the replacement cost of capital, named "q" by Tobin (1969) [3].

This equation can be expressed as a simple linear relationship of the form:

$$I_t = b + \varepsilon_{2t} \qquad (6)$$

where $b \geq 0$ is a constant and ε_{2t} is a random disturbance on investment.

The model is closed with a third equation adjusting the output market to aggregate demand conditions. This equation can be expressed as a simple linear relationship between unemployment, consumption and investment by making use again of Okun's law:

$$u_t = c_0 + c_1 C_t + c_2 I_t + \varepsilon_{3t} \qquad (7)$$

where $c_0 > 0$ is a constant made up of the coefficients related to full-employment conditions in Okun's law, c_2, $c_3 < 0$, and ε_{3t} is a random disturbance on unemployment.

Therefore, the theoretical model which will help us in identifying the SVAR empirical model is formed by equation (4), (6) and (7). These theoretical relationships will serve as a guide to impose the necessary identification conditions on the unstructured VAR model formed by the consumption, investment and unemployment variables.

3.- Saving, investment and unemployment in Spain

In this section we provide some information concerning recent trends in the three variables involved in our model, namely consumption-savings, investment and unemployment, especially as compared with other European countries. This will allow for a better understanding and interpretation of the empirical results of the next section.[4]

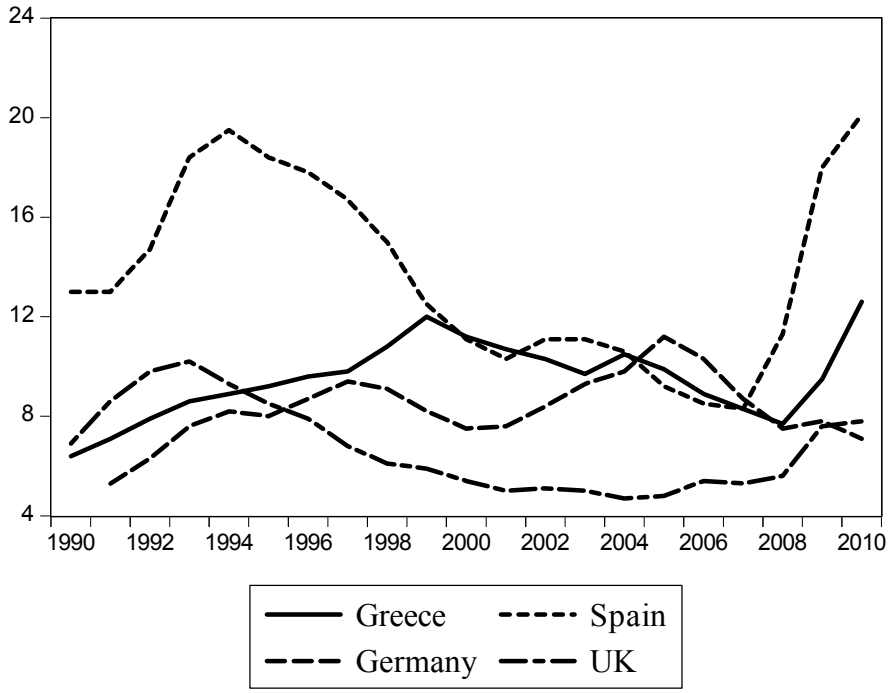
Traditionally Spain has stood as one of the European countries with highest unemployment rates. In spite of the economic boom between 1994 and 2007, which allowed for the creation of more than 7 million jobs, the unemployment rate has never been below 7%. This is due, in part, to the massive immigration during the 2000s (it is estimated that half a million immigrants entered annually in the Spanish labour market during this decade), but also reflects deeper trends in the labour market behaviour of the Spanish population, with increasing participation rates of youngsters. Nevertheless, by 2004 the Spanish unemployment rate was at similar levels than Germany or France (see Figure 1). However, with the start of

[3] λ_t is the Lagrange multiplier associated with the investment definition constraint corresponding to *t*.

[4] All the data for this section have been gathered from the AMECO dataset, European Commission, available at http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm

the Great Recession, while other European unemployment rates rose, the Spanish one exploded, from 8.3% in 2007 to 20.1% in 2010, an increase not comparable to other European countries.[5].

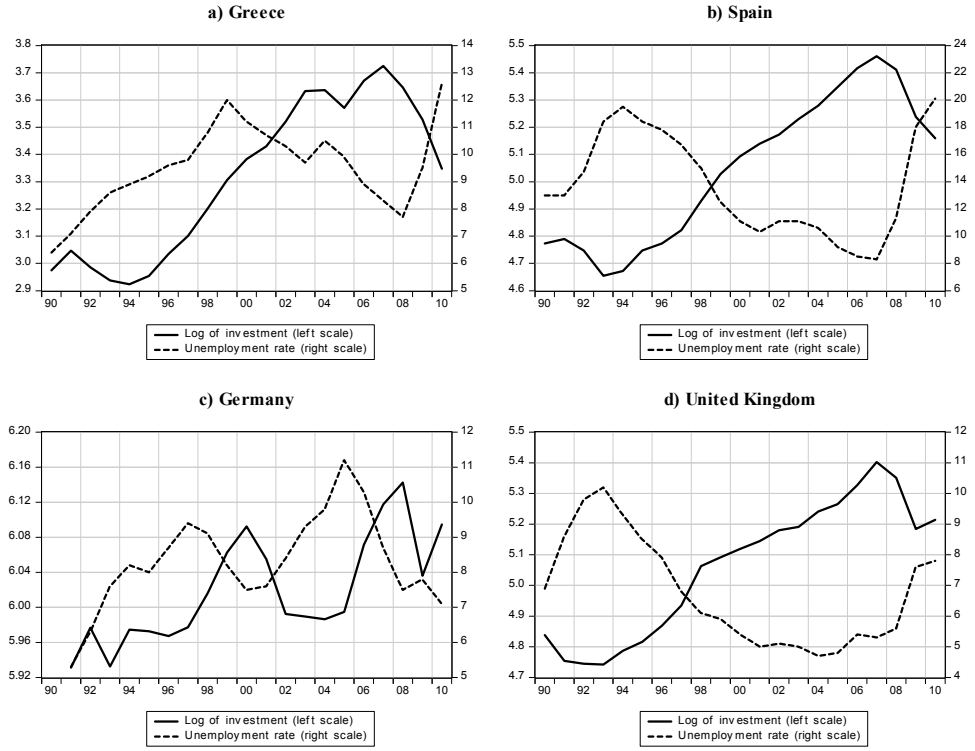
Figure 1. Unemployment Rates (in %). Selected countries



These unemployment dynamics seem to be correlated to those of investment, as discussed in the Introduction. In most European countries a negative relationship between investment and unemployment was present during the last two decades (see Figure 2). In the Spanish case (panel b of Figure 2), investment reached a minimum in 1993 while the unemployment rate peaked to 19.5% a year later. Then investment started to increase steadily while unemployment fell, until 2007, when investment changed its trend, coincident with a huge increase in the unemployment rate. These dynamics were also present in other European countries, as Germany, Greece or the UK, which indicates that investment can be an important determinant of unemployment changes.

[5] Part of this huge increase in the unemployment rate is related to the productive specialization pattern followed by the Spanish economy since 1994, based on construction and labour intensive services. These activities exhibited high rates of temporary workers, who were massively dismissed when the recession began, given the low (or null) firing costs associated to these contracts.

Figure 2. Investment (in logs) and unemployment rate (in %). Selected countries



Saving rates have been apparently rather high during the last two decades, especially as compared to other European countries (see Figure 3). This rate (total savings/GDP) increased from 5.3% in 1994 to 10.1% in 2003, and then decreased again to 2.8% in 2009, and peaked to 7.7% in 2010 with the Great Recession. Moreover, the rate has been much higher than that of Germany or the UK. However, this general description may be missleading, since this definition of total savings includes both private and public savings. This is important, since during the 2000s the Spanish economy underwent a housing bubble (due to the coincidence of favourable monetary conditions imposed by the European Central Bank, increased competition in the banking sector, especially due to the expansion of savings banks, and a favourable legislation to develop construction activities). This real estate boom increased indebtedness of the private sector by a large amount. For instance, the Bank of Spain (2011) estimates that private debt in 2010 was about 210% of that year's GDP. Therefore we should analyse separately public and private debt to disentangle the initial picture.

Figure 3. Total saving rates (in %). Selected countries

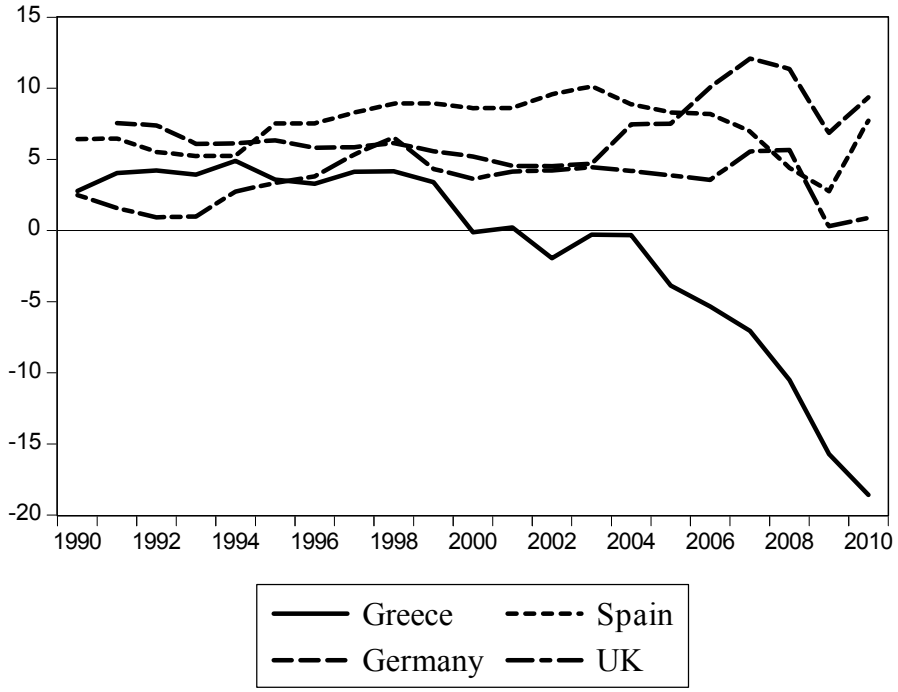
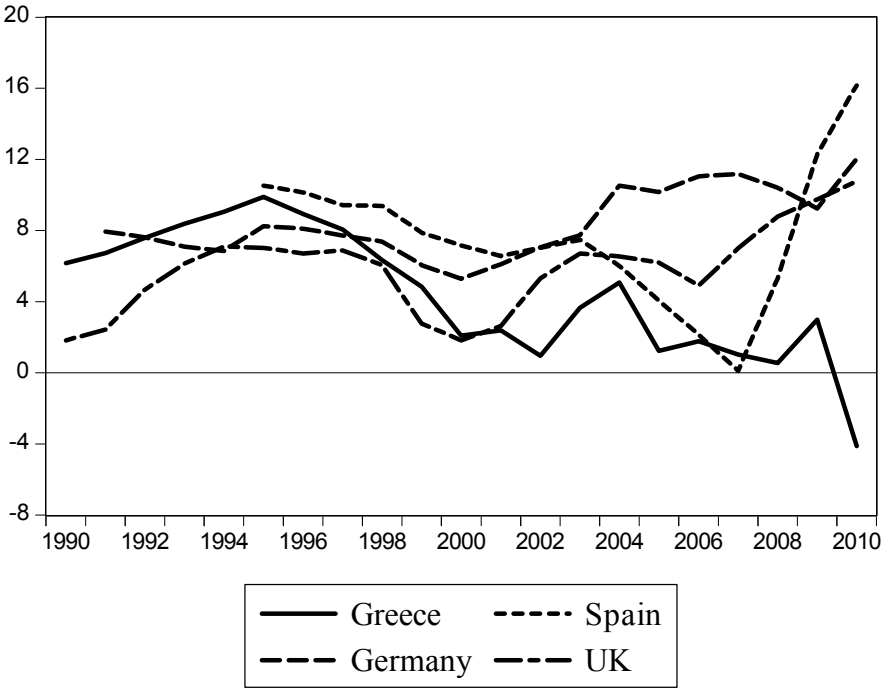


Figure 4 exhibits private saving rates for the same countries, and provides a much clearer image. While until the beginning of the 2000s the Spanish rate was higher than in other European countries, it exhibited a clear downward path. Actually, since 2003 it remained below the German or the UK rate, reaching a minimum of 0.1% in 2007. The increase since then is remarkable, and reflects both a precautionary saving pattern due to high unemployment and the need to increase savings to face the financial commitments related to mortgage payments.

Figure 4. Private saving rates (in %). Selected countries



The difference between the behaviour of private and total savings must be explained by government savings, which are summarised in Figure 5. While Spain used to run large public deficits during the 90's, its engagement with the European Monetary Union led to severe stabilization plans to accomplish with the convergence criteria. This involved a marked restructuring of public expenditures and revenues, and led to large budget surpluses, with a peak of 6.9% of GDP in 2007. Moreover, these surpluses were much larger than those of other European countries with supposedly greater fiscal discipline, like Germany. The Great Recession changed this image dramatically, and the Spanish government had to run large deficits, due to large fiscal stimulus packages and the usual automatic stabilisers (e.g., unemployment benefits, income tax revenues, etc.). This is imposing large costs on the Spanish public debt, since after the bailout of Greece and Portugal, fears of a default on Spanish debt are increasing the risk premia on Spanish sovereign debt. However, in principle this is unjustified, since Spain, despite of the large public deficits, still stands as one of the core European countries with lowest Debt/GDP ratios. It seems, therefore, that financial markets fear of a large private default and that the Spanish government will have to bailut the involved institutions, most probably large saving banks.

At the same time, the expansion of consumption and investment during the 2000s cannot be understood without taking into account the massive entry of foreign capital into the Spanish

economy (Figure 6). The extraordinary expansion of aggregate demand during these years was mainly financed by these capital entries. The Great Recession has put to an end this process, and given the uncertainty in financial markets, capital is not fleeing to Spain anymore. This implies that in the forthcoming future, boosts in investment must be financed by domestic capital.

Figure 5. Public deficits (in % of GDP). Selected countries

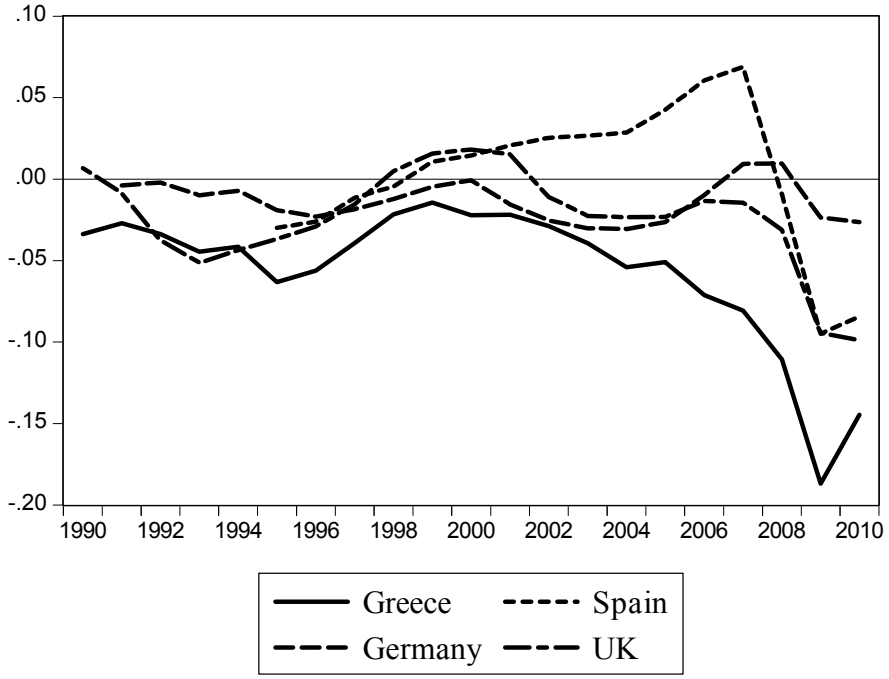
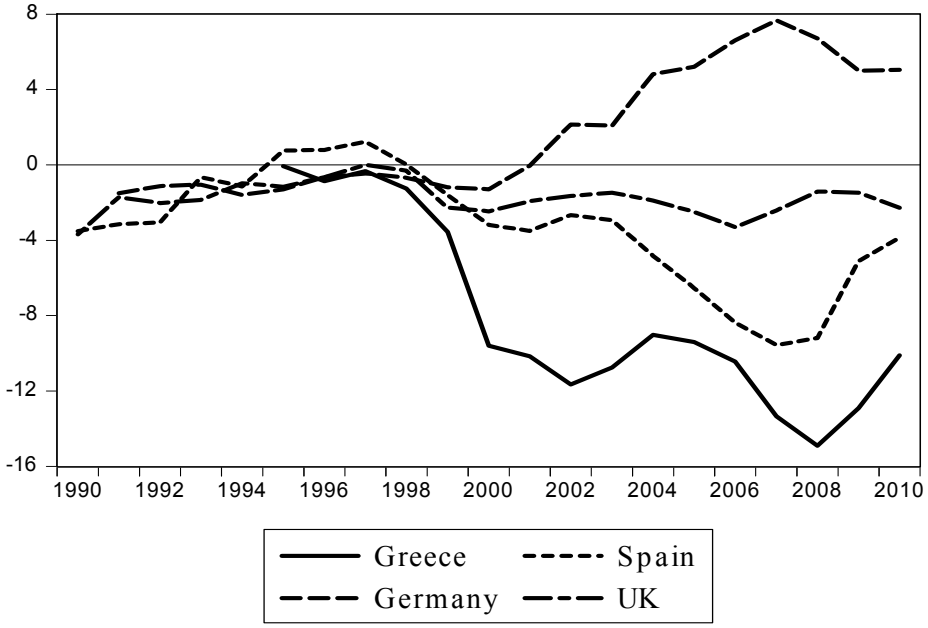


Figure 6. Net Lending (as a % of GDP). Selected countries



In sum, the recent evolution of macroeconomic aggregates suggests that in Spain (as in other European countries) there exists a clear relationship between investment and unemployment, and that important changes in the private saving rates have taken place recently. The huge amount of private debt suggests that in the presence of a 21% unemployment rate large amounts of savings will be directed towards the financial commitments of the firms and families. However, the main point is that it is not likely that this increased saving will feed to investment due to the very high indebtedness of families and firms. In principle an increase in the savings rate should cause an increase in the unemployment rate (due to the fall in consumption), but the second round effects through investment could allow for a reduction of unemployment in the medium term. However, in the present context these second round effects will not likely take place. The reason is that increased savings are precautionary (therefore consumption will permanently fall) and, at the same time, the restructuring of the banking sector, which has emerged as a necessary consequence of the Great Recession, has cut credit to the private sector. [6]Therefore is highly likely that an important change in the consumption-saving pattern will take place, which can curtail investment growth, and therefore have a direct impact on unemployment. In the next section we aim to analyse econometrically these relationships through the estimation of a SVAR model.

4.- A structural VAR (SVAR) approach

In this section we outline the empirical modelling strategy and present the main empirical results. We make use of the so-called Structural VAR's, which have been extensively used in the empirical literature to disentangle the effects of endogenous shocks within a system.

Consider the following structural vector error correction model (VECM):

$$A\Delta y_t = \Pi^* y_{t-1} + \Gamma_1^* \Delta y_{t-1} + ... + \Gamma^*_{p-1}\Delta y_{t-p+1} + v_t \qquad (8)$$

where $y_t=(y_{1t},...,y_{Kt})'$ is a $(K\times 1)$ vector of endogenous variables. The Π^*, Γ_j^* $(j=1,..,p-1)$ are structural form parameter matrices, and finally v_t is a $(K\times 1)$ structural form error that has zero mean and a time-invariant covariance matrix Σ_v. The matrix A allows modelling instantaneous relations among the variables in y.

[6] In other words, should this increase in the savings rate had taken place in 2004, for instance, the macroeconomic consequences should have been very positive, despite the initial fall in consumption. Savings would feed investment, and thus the unemployment rate would be reduced. In this strong recession with high indebtedness, consumption falls, savings increase but investment does not peak, and therefore unemployment will remain high due to this effect.

Structural shocks are the key element in this approach. These shocks are non-observable, and are the input of a linear dynamic system generating the *K*-dimensional time vector y_t. Thus, they are related to the residuals in (8). However, given that the shocks are not observable some assumptions are needed to identify them. The first standard assumption is that structural shocks are orthogonal (mutually uncorrelated). Further, structural shocks (ε_t) are assumed to be related to the model residuals (v_t) by linear relationships of the type

$$v_t = B\varepsilon_t \qquad (9)$$

where *B* is a *(K×K)* matrix.

Substituting (9) into (8) we obtain:

$$A\Delta y_t = \Pi^* y_{t-1} + \Gamma_1^* \Delta y_{t-1} + \ldots + \Gamma^*_{p-1}\Delta y_{t-p+1} + B\varepsilon_t \qquad (10)$$

with $\varepsilon_t \sim (0, I_K)$. This equation has an equivalent vector autoregression representation for the level variables of the form

$$Ay_t = A_1^* y_{t-1} + \ldots + A_p^* y_{t-p} + B\varepsilon_t \qquad (11)$$

The reduced forms corresponding to the structural forms (9) and (10) are obtained by premultiplying by A^{-1}:

$$\Delta y_t = \Pi y_{t-1} + \Gamma_1 \Delta y_{t-1} + \ldots + \Gamma_{p-1}\Delta y_{t-p+1} + u_t \qquad (12)$$

and

$$y_t = A_1 y_{t-1} + \ldots + A_p y_{t-p} + u_t \qquad (13)$$

where $\Pi = A^{-1}\Pi^*$, $\Gamma_j = A^{-1}\Gamma_j^*$ *(j=1,...,p-1)* and $A_j = A^{-1}A_j^*$ *(j=1,...,p)*. Finally, note that

$$u_t = A^{-1}B\varepsilon_t \qquad (14)$$

In order to identify the structural form parameters we must impose restrictions on the parameter matrices. These identification restrictions will be described shortly. In this first approach we apply the maximum likelihood estimation procedure to a levels VAR model. Thus, we ignore any cointegration relationship between the variables, given the early stage of our analysis. Moreover, ignoring cointegration avoids imposing too many restrictions to the model. In any case, standard Johansen cointegration tests rejected the null of a cointegrating relationship between the involved variables in the VAR.[7]

The structure of the model is the following:

[7] Results are available upon request

$$
\begin{aligned}
u_t^C &= a_{12}u_t^I + a_{13}u_t^U + b_{11}\varepsilon_t^C \\
u_t^I &= a_{21}u_t^C + a_{23}u_t^U + b_{22}\varepsilon_t^I \\
u_t^U &= a_{31}u_t^C + a_{32}u_t^I + b_{33}\varepsilon_t^U
\end{aligned}
\qquad (15)
$$

where C, I and U are consumption, investment and unemployment respectively, and all of the a_{ij} and b_{ij} are positive parameters to be estimated. This basic structure can be interpreted along the lines of the theoretical model discussed in Section 2. The first relationship can be thought as a dynamic consumption function under life-cycle hypothesis. Consumption, in this context, is negatively affected by unemployment. The second one, the investment function, can be thought of as a Tobin's q relationship. Finally, the third line stablishes the relationship between labour market status (measured through the unemployment rate) and shocks to consumption and investment. Thus, this third relationship can be thought of as the locus of aggregate demand-aggregate supply equilibria.

Note that the system (15) may be written in matrix form as

$$u_t = A^{-1}B\varepsilon_t$$

Given that we have three endogenous variables in the model we need to impose $2K^2-K(K+1)/2=12$ restrictions on the A and B matrices (see Breitung *et al*.,2004). First we impose the orthogonality condition, which implies that the B matrix is diagonal. This accounts for 6 restrictions. Further we impose that the diagonal elements of the A matrix are equal to one. This leaves us with three further restrictions. We make use of economic intuition to impose the three remaining assumptions.

The first two restrictions are obtained assuming that shocks to consumption and to unemployment do not affect contemporaneously to investment, that is, $a_{21}=a_{23}=0$. Finally, we assume that shocks to consumption do not affect contemporaneously to unemployment, but investment shocks do.This implies imposing $a_{31}=0$. Therefore, our final specification of the structural form parameter matrices is respectively

$$A = \begin{bmatrix} 1 & a_{12} & a_{13} \\ 0 & 1 & 0 \\ 0 & a_{32} & 1 \end{bmatrix}$$

and

$$B = \begin{bmatrix} b_{11} & 0 & 0 \\ 0 & b_{22} & 0 \\ 0 & 0 & b_{33} \end{bmatrix}$$

We next provide the results of the estimation of our SVAR model by maximum likelihood techniques and the corresponding structural analysis.

4.1. Data

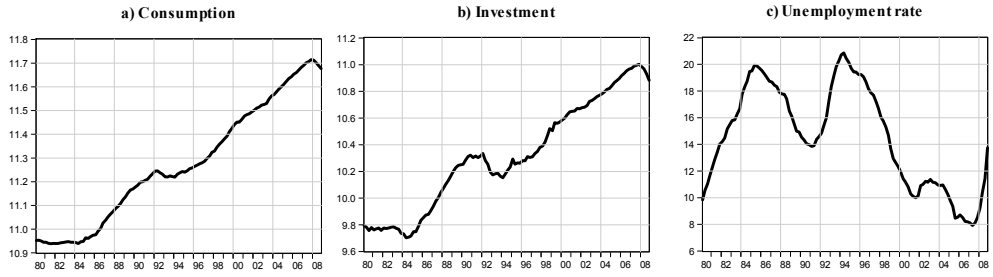
Data for consumption, investment and unemployment has been gathered from the BD-REMS database. This database is a collection of quarterly variables, provided by the Spanish Ministry of Economy and Finance, which was originally designed for the estimation of a a rational expectations model for simulation and policy evaluation of the Spanish economy (see Boscá et al, 2007, for details). It is publicly accessible through Internet.[8]

Consumption and investment are measured in real terms, using the GDP deflator as the price index. Consumption is measured as final expenditures in consumption by families and non-profit organizations (ISFSH), while investment is measured by gross fixed capital formation.

The unemployment rate is computed by its standard definition, i.e., the ratio of unemployed to total labour force. All variables are quarterly, and our sample is 1980:Q1 to 2008:Q4 (116 observations). The variables were seasonally adjusted and transformed in logs (except the unemployment rate).

Figure 7 shows the time series properties of the variables.

Figure 7. Consumption, Investment and Unemployment rate. Spain, 1980-2010



4.2 Estimation

The initial analysis of the VAR procedure includes the lag selection of the VAR model. The optimal endogenous lag selection from the information criteria led us to choose a lag length of 3, following the values of the usual information criteria, AIC and SBC.

[8] There are other datasets available, as the BD-MACRO, also from the Spanish Ministry of Economy and Finance. However, BD-REMS provides an homogenous dataset for the three variables included in our analysis.

Next we impose the just-identifying restrictions discussed above and estimate the structural parameters by means of the Maximum Likelihood estimator, described in Breitung *et al*. (2004). The resulting structural parameter estimates of the matrices *A* and *B* are:

$$\widetilde{A} = \begin{bmatrix} 1 & \underset{(0.02)}{-0.07} & \underset{(0.001)}{0.005} \\ 0 & 1 & 0 \\ 0 & \underset{(1.31)}{5.71} & 1 \end{bmatrix}$$

and

$$\widetilde{B} = \begin{bmatrix} \underset{(0.0003)}{0.004} & 0 & 0 \\ 0 & \underset{(0.001)}{0.017} & 0 \\ 0 & 0 & \underset{(0.016)}{0.241} \end{bmatrix}$$

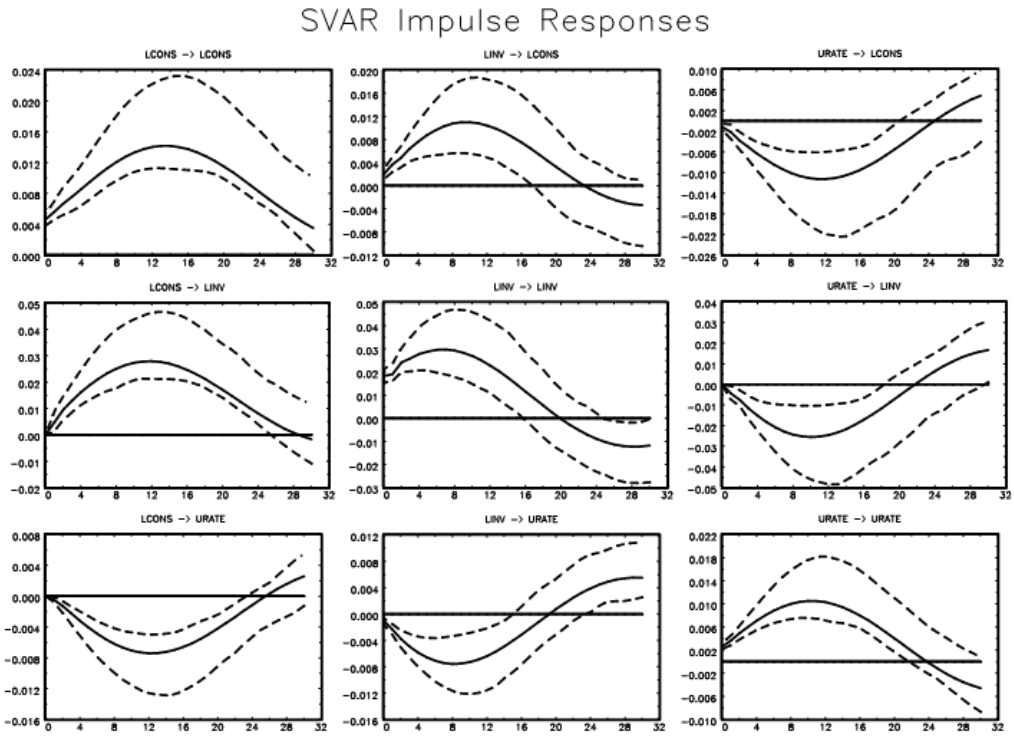
where asymptotic standard errors are reported in parentheses. Our findings suggest that the coefficient $a_{1,2}$ is negative, while $a_{1,3}$ and $a_{3,2}$ are positive, being all of them statistically significant.

The effects of the structural shocks can be investigated through the standard impulse-response analysis. Thus, we first estimate the contemporaneous impact matrix, which can be obtained from the maximum likelihood estimates of the structural parameters:

$$\widetilde{A}^{-1}\widetilde{B} = \begin{Bmatrix} 0.46 & 0.20 & -0.12 \\ 0.00 & 1.81 & 0.00 \\ 0.00 & -0.10 & 0.27 \end{Bmatrix} \times 10^{-2}$$

Next, we provide the impulse-response figures. We consider the response of the variables in the system to one standard deviation shock, computing also the 95% Hall bootstrap confidence intervals, based on 2000 bootstrap replications. Figure 8 shows our findings.

Figure 8. Impulse-Response functions



From this graph we observe that the unemployment rate is affected to a greater extent by shocks to consumption than shocks to investment. Shocks to consumption find their maximum effect on the unemployment rate 14 quarters after the shock, while shocks to investment manifest themselves completely 9 quarters after the shock has taken place

Furthermore, the effect of investment on unemployment is somewhat larger than consumption shocks, even though the difference between the two is rather low.

On the other hand, we observe that a shock to consumption leads to long lasting effects on investment and unemployment. Therefore, our empirical model gives credit to the view that large consumption drops after the current crisis may have dampening effects on investment and a consequent effect on the labour market outcome.

5.- Conclusions

In recent years, evidence on the existence of a negative relationship between investment and unemployment has been relentlessly growing. This relationship, sometimes dubbed the *Modigliani puzzle*, goes against the conclusions of current standard NKM models, but it is not ruled out by other diverse analytical approaches.

In this paper we tested the hypothesis that permanent shifts in the consumption-saving pattern have permanent effects on investment with subsequent impacts on the unemployment rate. We built a SVAR model for the Spanish economy where we identified the structural form parameters by imposing restrictions on the parameter matrices that are consistent with a simple, aggregate-demand led, Keynesian model, where the behaviour of consumption and investment is based on intertemporal optimization.

We estimated the model with quarterly data gathered from the BD-REMS database provided by the Spanish Ministry of Economy and Finance for the period 1980-2008. Our results suggests that shocks to consumption have both direct effects on unemployment and indirect effects that work through investment, consistently with the long series of results finding an inverse relationship between investment and unemployment. Therefore our empirical model gives credit to the view that the large consumption drops observed after the 2008 financial crisis may have a dampening effect on investment with negative consequences for the labour market.

These results, even if still of a preliminary nature, point to important implications for Spanish economic policy. The permanent nature of the effects on unemployment of a permanent drop in consumption provides new information about the measures that, in the middle of the current recession, aim to sustain consumption levels of the population. Our results suggest strongly that the focus should be on measures directed to address the sustainability of consumption patterns instead of temporary measures addressed to mitigate the negative short-term impact of the recession. The former will yield employment gains that will not be present with the latter.

References

1. Abel, A.B. (1982): Dynamic effects of permanent and temporary tax policies in a q model of investment. *Journal of Monetary Economics*, 9(3), pp. 353-373.
2. Arestis, P. Baddeley. M. an M. Sawyer (2007): The relationship between capital stock, unemployment and wages in nine EMU countries. *Bulletin of Economic Research*, 59(2), pp. 125-148.
3. Arestis, P., and Biefang-Frisancho Mariscal, I. (1998): Capital Shortages and Asymmetries in UK unemployment. *Structural Change and Economic Dynamics*, 9, 189-204

4. Arestis, P., and Biefang-Frisancho Mariscal, I. (2000): Capital Stock, Unemployment and Wages in the UK and Germany. *Scottish Journal of Political Economy*, vol. 47, nº 5, 487-503.

5. Banco de España (2010). *Informe Anual*. Banco de España, Servicio de Publicaciones, Madrid.

6. Bande, R. and M. Karanassou (2009): Labour Market Flexibility and Regional Unemployment Rate Dynamics: Spain 1980-1995. *Papers in Regional Science*, 88(1), pp.181-207.

7. Blanchard, O.J. (2000). *The Economics of Unemployment: Shocks, Institution and Interactions*. Lionel Robbins Lectures.

8. Breitung. J, Brüggemann, R. and H. Lütkephol (2004): Structural Vector Autoregressive Modeling, in Lütkepohl, H. and M. Krätzig (Eds.). *Applied Time Series Econometrics*. Cambridge University Press, Cambridge. pp. 159-196.

9. Hall, R.E. (1978): Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence *Journal of Political Economy*, 86(6), pp. 971-987.

10. Hayashi, F. (1982): Tobin's marginal q and average q: A neoclassical interpretation. *Econometrica*, 50(1), pp. 213-224.

11. Hertbertson, T. and G. Zoega (2002):The Modigliani Puzzle. *Economics Letters*, vol. 76(3), pp. 437-442.

12. Kapadia, S. (2005): The Capital stock and equilibrium unemployment: a new theoretical perspective. *Balliol College, University of Oxford*. Department of Economics, Discussion Paper 181.

13. Karanassou M., Sala H., and P. F. Salvador (2008): Capital Accumulation and Unemployment: New Insights on the Nordic Experience, *Cambridge Journal of Economics*, 32, 977-1001.

14. Layard, R., Nickell, S. and R. Jackman (1991). *Unemployment: Macroeconomic Performance and the Labour Market*. Oxford University Press, Oxford.

15. Malley, J. and T. Moutos (2001): Capital Accummulation and Unemployment: A Tale of two Continents: *Scandinavian Journal of Economics*, 103(1), pp. 79-99.

16. Matesanz, D., Fugarolas, G. and R. Bande (2011): La Restricción de la Balanza de Pagos en la España del Euro. Un Enfoque Comparativo. *FUNCAS*, Documentos de Trabajo, nº 618.

17. Miaouli, N. (2001): Employment and Capital Accumulation in Unionised Labour Markets: evidence from five south-European countries. *International Review of Applied Economics*, vol 15(1), pp. 5-29.

18. Modigliani, F. and R. Brumberg (1954): Utility Analysis and the consumption function: an interpretation of cross-section data. In Kurihara, K.K. (Ed.), *Post-Keynesian Economics*. Rutgers University Press, New Brunswick, pp. 388-436

19. Modigliani, F. (2000): Europe's Economic Problems. Prepared for *Testimony before the Monetary Committee of the European Central Bank*. Mimeo

20. Oi, W. (1962): Labour as a quasi-fixed factor. *Journal of Political Economy*, 70, 538-555.

21. Phelps, E. (1994). *Structural Slumps: The modern equilibrium theory of unemployment, interest and assets*. Harvard University Press, Cambridge, MA.

22. Pissarides, C. (2001). *Equilibrium Unemployment Theory*. 2nd edition. Blackwell, Oxford.

23. Sawyer (2002): The NAIRU, Aggregate Demand and Investment. *Metroeconomica*, 53(1), pp. 66-94.

24. Smith, R. and G. Zoega (2005): Unemployment, Investment and Global Expected Returns: A panel FAVAR approach. *Birkbeck College, School of Economics, Mathematics and Statistics*. Working Paper BWPEF 0524.

25. Tobin, J. (1969): A general equilibrium approach to monetary policy. *Journal of Money, Credit and Banking*.

26. Zoega, G (2010): Employment and Asset prices. *Birkbeck College, School of Economics, Mathematics and Statistics*. Working Paper BWPEF 0917

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