(a) Consumption

(b) Investment

(c) Unemployment

LETTER

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Consumption, investment and unemployment: SVAR tests of the effects of changes in the consumption-saving pattern

Roberto Bande-Ramudo[1], Manuel Fernandez-Grela[1*] and Dolores Riveiro-Garcia[1]

Abstract: In this paper, we provide evidence supporting the hypothesis that permanent shifts in the consumption-saving pattern will have permanent effects on investment, with subsequent consequences for the unemployment rate, by estimating a structural vector autoregression model for the Spanish economy. Our results suggest a significant impact of consumption shocks on unemployment through changes in investment.

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1. Introduction

New Keynesian Macroeconomics 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, which is characterised by the equilibrium unemployment rate. This approach emphasises in particular that variables such as capital stock or productivity cannot affect the equilibrium unemployment rate. In spite of the popularity of this approach, in recent years, a great diversity of robust evidence has emerged pointing towards a negative relationship between investment and unemployment, even in the medium run.[1] Actually, Blanchard (2000) dubbed this relationship as the *Modigliani Puzzle.*

RESEARCH GROUP OVERVIEW

One of the main research interests of the GAME group has been focused on labour market issues, like wage setting and regional disparities in unemployment. The current financial crisis and its effects on the real economy, especially relevant in the Spanish case, shifted our interest towards the analysis of the interrelation between the aggregate demand components and labour market outcomes, especially unemployment. To address these topics, we have developed the research project 10SEC242003PR *Cambios nos patróns de consumo e aforro despois dunha crise: efectos sobre o mercado de traballo* (Changes in the consumption-savings patterns after a crisis: effects on the labour market) funded by the regional Galician government, *Xunta de Galicia*. This paper shows some of the findings of that more extensive research.

PUBLIC INTEREST STATEMENT

This paper provides information about how the negative investment–unemployment relationship works by analysing data for the Spanish economy since 1980. Given that one of the most important determinants of investment growth is the amount of savings, the consumption-saving pattern will be an important determinant of investment behaviour and, therefore, of the unemployment rate.

The results show that shocks to consumption have a strong impact on unemployment through both direct and indirect effects, working through the investment channel. So, according to our empirical model, the current Spanish recession, with high indebtedness rates of families in a context of worsening of employment perspectives, may permanently modify the short- and medium-run saving rates, and therefore permanently affect the unemployment rate, pointing to important implications for economic policy; 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 macroeconomic literature has identified the main driving forces behind investment growth, as real interest rates (Phelps, 1994), expected profits and the real value of the firm's equity (Tobin, 1969; Zoega, 2010), etc. Another important determinant is the amount of savings, both private and public. We will take as a reference for our analysis of savings the life-cycle consumption models based on the hypothesis developed by Modigliani and Brumberg (1954).[2]

Given the very high levels of private indebtedness, 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 assess the impact of changing consumption-saving patterns on investment and unemployment, considering the Spanish economy as a benchmark.
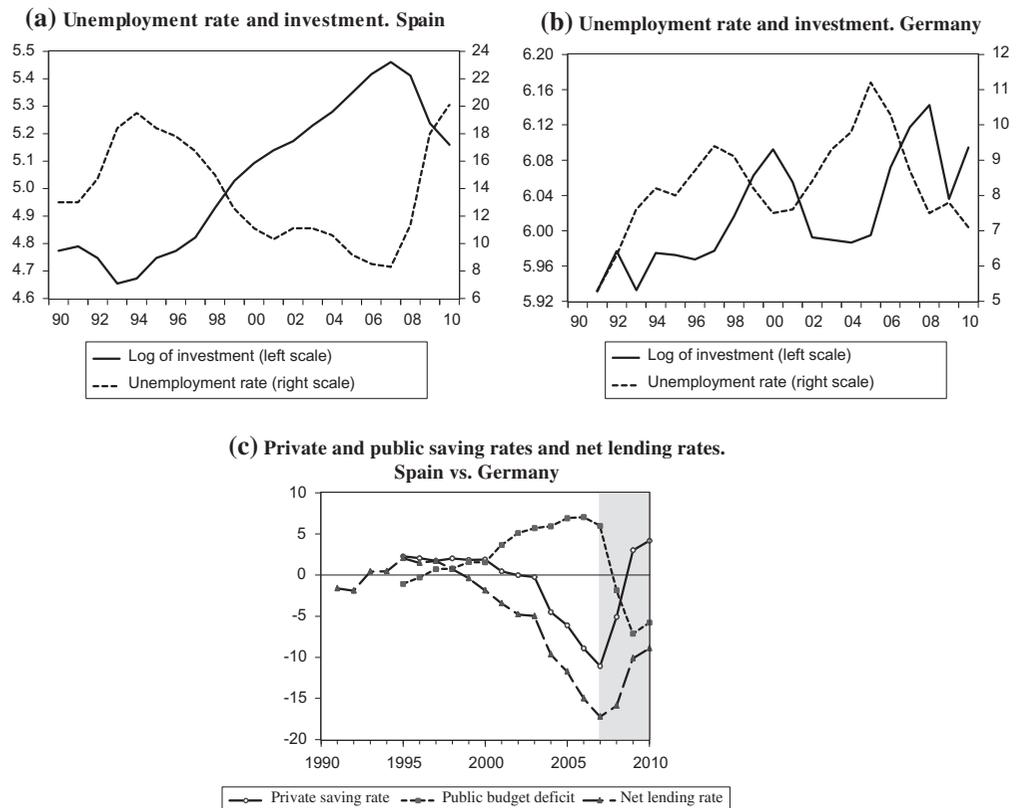
The paper is organised as follows. Section 2 provides some evidence regarding the recent behaviour of saving rates, investment and unemployment in the Spanish economy. Section 3 describes the econometric approach, the estimation of a structural vector autoregression (SVAR) in consumption, investment and unemployment, and summarises the main results. Finally, Section 4 concludes.

2. Saving, investment and unemployment in Spain

Traditionally, Spain has stood as one of the European countries with highest unemployment rates. Nevertheless, by 2004, the Spanish unemployment rate was at similar levels than Germany (see Figure 1(a) and (b)).[3] However, with the onset of the Great Recession the Spanish rate exploded, from 8.3% in 2007 to 20.1% in 2010, an increase not comparable to other European countries.

These unemployment dynamics seem to be correlated to those of investment. A negative relationship between investment and unemployment is present during the last two decades (Figure 1(a)

Figure 1. Unemployment, investment, and savings in Spain and Germany.

(a) Unemployment rate and investment. Spain

(b) Unemployment rate and investment. Germany

(c) Private and public saving rates and net lending rates. Spain vs. Germany

and (b)) in both countries, indicating that investment can be an important determinant of unemployment changes.

The private saving rate was higher than the German one (see Figure 1(a) and (b)) during the 90s but, due to the housing bubble, it fell dramatically during the 2000s. With the onset of the Great Recession, it increased again, remaining 5 pp above the German figure.

As regards public savings, Spain used to run large public deficits during the 1990s, but its engagement with the European Monetary Union led to severe stabilisation plans, which resulted in large budget surpluses. 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.

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 1(c)). 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.

In sum, the recent evolution of macroeconomic aggregates suggests that in Spain there exists a clear relationship between investment and unemployment, and also that important changes in the private saving rates have taken place recently. 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 of very high indebtedness of families and firms, 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 has cut credit to the private sector. Therefore, likely falls in consumption are expected. In the next section, we aim to analyse, econometrically, these relationships through the estimation of a SVAR model.

3. A SVAR approach

Consider the following structural Vector Error Correction Model:

$$A \, \Delta y_t = \Pi^* \, y_{t-1} + \Gamma_1^* \, \Delta y_{t-1} + \cdots + \Gamma_{p-1}^* \, \Delta y_{t-p+1} + v_t \tag{1}$$

where $y_t = (y_{1t}, \ldots, y_{Kt})'$ is a ($K \times 1$) vector of endogenous variables. The Π^*, Γ_j^* ($j = 1, \ldots, p-1$) are structural form parameter matrices, and 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.

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 Equation 1. 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. Further, we assume structural shocks (ε_t) are related to the model residuals (v_t) by linear relationships of the type

$$v_t = B\varepsilon_t \tag{2}$$

where B is a ($K \times K$) matrix.

We apply the maximum likelihood estimation procedure to a levels vector autoregression (VAR) model, ignoring any co-integration relationship between the variables. This avoids imposing too many restrictions to the model. The structure of the model is the following:

$$u_t^C = a_{12}u_t^I + a_{13}u_t^U + b_{11}\varepsilon_t^C$$
$$u_t^I = a_{21}u_t^C + a_{23}u_t^U + b_{22}\varepsilon_t^I$$
$$u_t^U = a_{31}u_t^C + a_{32}u_t^I + b_{33}\varepsilon_t^U$$

(3)

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. The first relationship can be thought as a dynamic consumption function under life-cycle hypothesis. The second one, the investment function, can be thought of as a Tobin's q relationship.[4] Finally, the third line establishes 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 Equation 3 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, Brüggemann, & Lütkepohl, 2004). First we impose the orthogonality condition, which implies that B matrix is diagonal. This accounts for six restrictions. Further, we impose that the diagonal elements of the A matrix are equal to one. We make use of economic intuition to impose the three remaining assumptions. First, we assume that shocks to consumption and to unemployment do not affect contemporaneously to investment ($a_{21} = a_{23} = 0$). Secondly, we assume that shocks to consumption do not affect contemporaneously to unemployment, but investment shocks do, ($a_{31} = 0$).

Data has been gathered from the BD-REMS database, a collection of quarterly variables, publicly provided by the Spanish Ministry of Economy and Finance (see Boscá et al., 2007) and accessible through the internet. Consumption is measured as final expenditure in consumption made by families and non-profit organisations, while investment is measured by gross fixed capital formation (both in real terms, using the Gross Domestic Product, deflator as the price index). The unemployment rate is computed as the ratio of unemployed to total labour force. All variables are quarterly; our sample is 1980:Q1 to 2008:Q4 (116 observations). The variables were seasonally adjusted and transformed in logs (except the unemployment rate, which is in levels).

3.1. Estimation
The optimal endogenous lag selection for the underlying VAR was chosen following the values of the information criteria, Akaike Information Criterion and Schwartz Bayesian Criterion, with an optimal lag length of three. Next, we impose the just-identifying restrictions discussed above and estimate the structural parameters by means of the Maximum Likelihood estimator suggested by Breitung et al. (2004). The effects of the structural shocks can be investigated through the standard impulse-response analysis. We consider the response of the variables in the system to a one standard deviation shock to consumption, computing also the 95% Hall bootstrap confidence intervals, based on 2000 bootstrap replications. Figure 2 shows our findings.[5]

From this graph, we observe that the unemployment rate is affected to a large extent by shocks to consumption, working their way through falls in investment. Shocks to consumption find their maximum effect on the unemployment rate 14 quarters after the shock, while shocks to investment manifest themselves completely nine quarters after the shock has taken place (results not reported).

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 in investment and a consequent effect on the labour market outcome.

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Figure 2. Impulse response functions to a consumption shock.

Notes: Impluse response functions to a one standard deviation shock on consumption. Dotted lines are % Hall bootstrap confidence intervals, based on 2000 bootstrap replications. Time units are quarters.
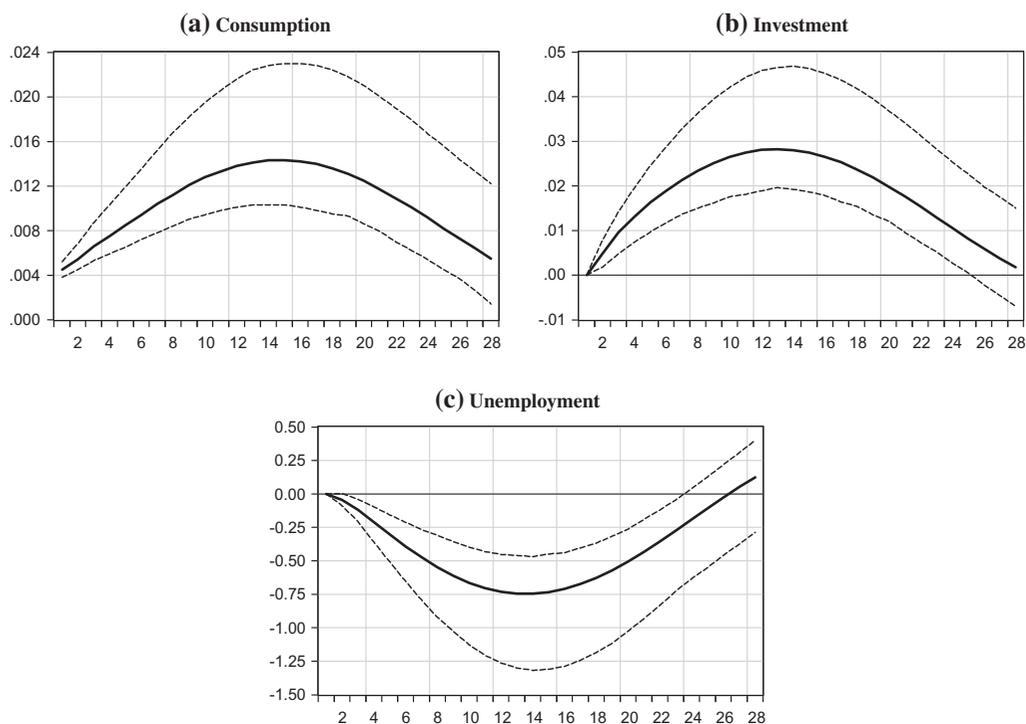
4. Discussion

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 and estimated a SVAR model for the Spanish economy, and 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 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

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Notes
1. Malley and Moutos (2001), Miaouli (2001), Sawyer (2002), Herbertsson and Zoega (2002), Arestis, Baddeley, and Sawyer (2007), or Karanassou, Sala, and Salvador (2008) are examples of papers that, through very different analytical approaches, reach this conclusion.
2. Following this line 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. Herbertsson and Zoega (2002) find strong support for this hypothesis for a sample of OECD countries.

3. All the data for this section has been gathered from the AMECO data-set, European Commission.

4. Interest rates are not included in the investment function to keep the SVAR simple. Bande and Riveiro (2013) found a negative impact of real interest rates on investment (as expected), but with changes in consumption still being the main determinant of investment.

5. For brevity, we only report the Impulse Response Functions to a consumption shocks. IRF for other shocks are available upon request from the authors.

References

Arestis, P., Baddeley, M., & Sawyer, M. (2007). The relationship between capital stock, unemployment and wages in nine EMU countries. *Bulletin of Economic Research, 59*, 125–148. http://dx.doi.org/10.1111/boer.2007.59.issue-2

Bande, R., & Riveiro, D. (2013). The consumption–investment–unemployment relationship in Spain: An analysis with regional data? *Theoretical and Practical Research in Economic Fields, IV*, 5–24.

Blanchard, O. J. (2000). *The economics of unemployment: Shocks, institution and interactions*. Cambridge, MA: Lionel Robbins Lectures.

Boscá, J. E., Bustos, A., Díaz, A., Doménech, R., Ferri, J., Pérez, E., & Puch, L. (2007). *The REMSDB macroeconomic database of the Spanish economy*. Working Paper WP0704. Instituto de Economía Internacional.

Breitung, J., Brüggemann, R., & Lütkepohl, H. (2004). Structural vector autoregressive modeling. In H. Lütkepohl & M. Krätzig (Eds.), *Applied time series econometrics* (pp. 159–196). Cambridge: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511606885

Herbertsson, T., & Zoega, G. (2002). The Modigliani "puzzle". *Economics Letters, 76*, 437–442. http://dx.doi.org/10.1016/S0165-1765(02)00089-7

Karanassou, M., Sala, H., & Salvador, P. F. (2008). Capital accumulation and unemployment: New insights on the Nordic experience. *Cambridge Journal of Economics, 32*, 977–1001. http://dx.doi.org/10.1093/cje/ben022

Malley, J., & Moutos, T. (2001). Capital accumulation and unemployment: A tale of two continents. *Scandinavian Journal of Economics, 103*, 79–99. http://dx.doi.org/10.1111/sjoe.2001.103.issue-1

Miaouli, N. (2001). Employment and capital accumulation in unionised labour markets: Evidence from five South-European countries. *International Review of Applied Economics, 15*, 5–29. http://dx.doi.org/10.1080/02692170120013321

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

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

Sawyer, M. (2002). The NAIRU, aggregate demand and investment. *Metroeconomica, 53*, 66–94. http://dx.doi.org/10.1111/meca.2002.53.issue-1

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking, 1*, 15–29. http://dx.doi.org/10.2307/1991374

Zoega, G. (2010). *Employment and asset prices*. Working Papers, BWPEF 0917. Birkbeck College, School of Economics, Mathematics and Statistics.

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