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Explaining the Dynamics of Spanish Unemployment

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Abstract

One of the most important problems of the Spanish economy is unemployment. One of the most important problems of Spanish economists is to explain Spanish unemployment. In this paper we provide an explanation for Spanish unemployment. We show that the Spanish economy is consistent with an insiders-outsiders model with full hysteresis and increasing labour supply in which output, unemployment and consumption are driven by a common monetary trend. We also show that, if we discount demographic factors and job destruction in agriculture, Spanish unemployment has followed closely, although with a lag of around two years, the evolution of Spanish monetary policy and it would have been in 1994 at the level of 1977. Finally, we provide some evidence supporting the hypothesis that the last recession was caused by the tight monetary policy of the eighties and early nineties.

Keywords: Shocks, Unemployment persistence

JEL Classification nos: E24, E52

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1 Introduction

One of the most important problems of the Spanish economy is unemployment. One of the most important problems of Spanish economists is explaining Spanish unemployment. On the one hand with unemployment rates of around 20 percent over the last 15 years, it is easy to understand the magnitude of the problem for the economy as a whole. On the other hand, Spanish unemployment has increased for many years, even though other standard indicators of the health of the economy were growing fast. For example, over the period 1977-1991 Spanish retail sales increased by around 55 percent and industrial production increased by around 30 percent; However, over the same period of time the number of unemployed people increased by 350 percent. Moreover, unemployment reached a peak in early 1988 when it was 6 times larger than in 1977.

It seems difficult to explain this striking performance with any standard economic theory. Some people have argued that the main problem behind Spanish unemployment is the extensive regulation of labour markets. The rigidities implied by this regulation would preclude the necessary adjustment in wages to the business cycle swings and therefore the labour market would be in disequilibrium. However, the partners of the European Union have similar regulations in their labour markets and present unemployment rates 10 percentage points below the Spanish one.

A related issue is the labour market system and institutions. Roughly speaking, the Spanish labour market is dominated by two trade unions which for long periods of time have been bargaining at aggregate levels rather than on a firm by firm basis with productivity grounds. In general, trade unions establish wage level floors in a centralized fashion and then move to more disaggregate negotiations at a sectoral and firm levels. Needless to say, the additional negotiations tend to push for additional wage increases. Moreover, wage negotiations are spread throughout the year and the first wage agreements of each year tend to mark the path for subsequent negotiations. Although we must recognise that average labour productivity growth has increased more than average unit labour costs, it is not less true that sectors with productivity below the average must have suffered from such strategy. However, again in this case the Spanish labour market does not seem to differ very much from the European partners.

All these particularities of Spanish unemployment have fostered a huge amount of research that has tried to understand the reasons of this differential behaviour. One of the most recent ones is Marimon and Zilibotti (1996), who argue that the problem of Spanish unemployment is that of the conditions of the Spanish economy in the 70s, where the agricultural sector represented around 30 % of the total employment against a current 10 %. They show that when one discounts the continuous job destruction process in the agricultural sector over the past 20 years (a loss of more than 2.5 million jobs which were not absorbed by other sectors) the performance of Spanish employment has not been different from that of other European countries. For example, had the structure of the Spanish agriculture been similar to that of France in the mid 70s, they estimate that the Spanish unemployment rate at the beginning of the 90s would have been around 8 percent (similar to that of 1978). The study by McKinsey (1994) adds that restrictions in product markets prevented the Spanish manufacturing and service sector from absorbing the huge flow of workers that had produced the modernization of the agricultural sector.

Dolado and Jimeno (1995) consider other factors relative to labour supply. Firstly, they consider demographic factors such as the stop in the flow of emigrants towards other European countries in the mid 70s which had kept unemployment rates down until that period. Other demographic factors include the huge increase in the female participation rate during the 80s (documented in, among others, Bover and Arellano (1995)) and the arrival of the baby boom generation which reached the working age over the late 70s and 80s. But labour demand issues seem to be important as well, and they consider the effects of unemployment protection and its tendency to increase unemployment duration, the limited role of active labour policies and in a related way the problem of mismatching of skills. They conclude that the current level of unemployment in Spain is the result of a series of adverse demand shocks amplified by a flawed system of labour market institutions and the sustained increase in the labour force.

But not only Spanish unemployment is high, it is also very persistent. Empirically, many authors have found european unemployment to be highly persistent (see, e.g., Alogokoufis and Manning (1989)) and, in the Spanish case, to be even I(1) persistent (Andrés (1993) and Dolado and López-Salido (1996)). From a theoretical point of view, Bentolila and Dolado (1994) argue that the persistence of Spanish unemployment can be well represented by an insider/outsider framework in which the interest of outsiders is basically disregarded in the wage bargaining process, giving rise to hysteretic effects (see also Blanchard, Jimeno et al. (1994)). Blanchard and Jimeno (1995) add that high unemployment protection and unemployment benefits have led to small effects of labour market conditions on wages and therefore amplifies the hysteretic effects. Following these results, Galí (1996) and Dolado and López-Salido (1996) introduce hysteresis in a VAR framework to consider highly persistent unemployment and argue that negative demand shocks, and in particular the strong deflationary policies that were implemented during the late eighties to meet the Maastrich criteria, might be responsible for the huge levels of unemployment in Spain.

This paper tries to reconcile all these facts and enters the debate of explaining the dynamics of Spanish unemployment. In Section 2 we present our theoretical framework intended to represent the Spanish economy, an insider-outsider model with full hysteresis, in which unions care only about affiliates in the wage-setting process, augmented to incorporate the differential characteristics of the Spanish case. We will allow labour supply to increase over time and introduce an agricultural sector which faces a strong technological progress and a fixed demand. and therefore there is an intense process of job destruction. Such a model predicts that the first difference of unemployment would be stationary around a deterministic component capturing the destruction of jobs in the agricultural sector and increases in labour supply, and that output, consumption and unemployment would be cointegrated and driven by a common monetary trend which has permanent long run effects on the variables.

In Section 3 we show that the Spanish data is consistent with this model. We find that, discounting factors such as job destruction in the agricultural sector and changes in labour supply, Spanish *virtual* unemployment, in Marimón and Zilibotti's terminology, would have been in 1994 very similar to that of 1977, and that its fluctuations have followed closely, although with a lag of around two years, the path of Spanish monetary policy over the last 15 years. We then estimate a trivariate VAR with monthly industrial production, *virtual* unemployment and retail sales and find that a single common stochastic trend, which can be identified with the Spanish money supply, can explain the performance of these three variables over the last 15 years. Finally, we estimate a structural model to analyze the cyclical effects of this common monetary trend. We show that it is very likely that the last recession was caused by the tight monetary policy of the eighties and that, if the correction of the disequilibria of the Spanish economy needs a continuation of these restrictive monetary policies, we can forecast a further increase in unemployment if these policies are not accompanied by deep reforms in the product and labour markets. Section 4 concludes.

2 The Model

In this section we introduce the basic insider-outsider model (see, i.e., Blanchard and Summers (1986)) aimed to represent the Spanish economy. There are N sectors in the economy, indexed by i. In each sector there is a monopolistic competitive representative firm i producing a differentiated good and facing a demand of the type

$$y_{ti}^{d} = -\alpha(p_{ti} - p_t) + (m_t - p_t) \tag{1}$$

where all the variables are in logs, p_t is the aggregate price level, p_{it} is the price level for the product of firm i. m_t is money supply, and it is assumed to follow the policy rule

$$\Delta m_t - \Delta p_t = \gamma(\Delta p_t - \Delta p_t^*) + e_t \tag{2}$$

where Δp_t^* is the government inflation target and the parameter γ measures the degree of accommodation of monetary policy. Dolado and Jimeno (1995) show evidence of $\gamma = 0$ for the Spanish case, and thus

$$\Delta m_t = \Delta p_t + e_t \tag{3}$$

Each firm produces the differentiated good using labour (l) according to the constant returns to scale production function

$$y_{ti}^s = l_{ti} + \theta_{1t} \tag{4}$$

where θ_{1t} represents the state of technology at time t common to all sectors, and in particular an exogenous labour augmenting Hicks neutral deterministic technological progress.

Profit maximization implies that firms choose constant markups of prices over wages and technology so that the real wage increases with technology. Therefore, each firm chooses $p_{ti} = w_{ti} - \theta_{1t}$, where w_i is the wage paid by firm i, so that at the aggregate level $p_t = w_t - \theta_{1t}$. The demand for labour by each firm i is then given by

$$l_{ti} = -\alpha(w_{ti} - w_t) + (m_t - w_t). \tag{5}$$

Labour depends on the relative wage and real money in wage units. There is a different labour market for each firm with l_i^* workers, in which the wage for each period is set in nominal terms by a trade union, with l_{ti}^u members.

The wage setting behaviour is characterized by

$$W_{ti} = W_{ti} : \{E_{t-1}l_{ti} = \lambda l_i^* + (1-\lambda)l_{ti}^u\} \tag{6}$$

where $0 \leq \lambda \leq 1$ governs the degree of hysteresis of the economy. Therefore, nominal wages are fixed one period in advance and are set so as to equate expected employment to a weighted average of labour supply and unionized workers. Dolado and Jimeno (1995) provide evidence for Spain supporting the hypothesis of *full hysteresis*, in which the union gives no weight to non-union members in the wage-setting process ($\lambda = 0$), and therefore

$$E_{t-1}(l_{ti}) = l_{ti}^u. \tag{7}$$

This equation implies that the unions do not take into account external constraints while bargaining and thus increases in labour supply do not affect wages. Membership to the union is equal to employment in the last period

$$E_{t-1}(l_{ti}) = l^u_{ti} = l_{t-1i} \tag{8}$$

and therefore expected employment is equal to employment in the last period. If we solve for a symmetric equilibrium in which all the unions choose the same wage, we obtain

$$w_t = E_{t-1}(m_t) - l_{t-1}. \tag{9}$$

Thus, the nominal wage depends positively on expected nominal money and negatively on last period employment. Substituting (9) into (5), the dynamics of employment are given by

$$l_t = l_{t-1} + (m_t - E_{t-1}(m_t)) \tag{10}$$

From (3) and (9) and taking into account that $p_t = w_t - \theta_{1t}$, a nominal money shock is given by

$$m_t - E_{t-1}(m_t) = e_t \tag{11}$$

and therefore

$$l_t = l_{t-1} + e_t. \tag{12}$$

If money is higher (lower) than expected, then employment will increase (decrease), and monetary shocks will have a permanent effect on the level of employment. Thus, nominal rigidities combined with full hysteresis imply persistent effects of aggregate demand shocks.

If the total numbers of workers, (the labour force) is denoted by l^*, assuming it to be initially constant, then

$$l^* - l_t = l^* - l_{t-1} - e_t \tag{13}$$

or denoting unemployment by u_t, then

$$u_t = u_{t-1} - e_t. \tag{14}$$

That is, unemployment will follow a random walk. Therefore, from equation (2) it follows that

$$y_t = y_{t-1} + e_t + \Delta\theta_{1t}. \tag{15}$$

Since there is no capital accumulation in the economy, consumption at time t (c_t) equals y_t, which implies

$$c_t = c_{t-1} + e_t + \Delta\theta_{1t}. \tag{16}$$

Therefore, in equilibrium we have $c_t = y_t = l_t + \theta_{1t} = l^* - u_t + \theta_{1t}$.

The theoretical results of the insider-outsider model have a natural implication in terms of cointegration. Let X_t be a vector containing the logs of income, unemployment and consumption. Each component is I(1), due to the common permanent monetary shocks. This implies that the three variables will comove in the long run and therefore income, unemployment and consumption will be cointegrated one to one: $y_t = c_t$ and $y_t = -u_t$. The common component, e_t, can be identified in this model with real money supply [1] (recall from (3) that $m_t - p_t = m_{t-1} - p_{t-1} + e_t$) and in general with aggregate demand.

However, we have seen in the Introduction the differential characteristics of the Spanish economy, and thus we extend the model to accommodate these particularities. The first feature of the Spanish economy we want to introduce into the model is the differential behaviour of the agricultural sector. The basic difference here is the assumption that the demand for agricultural products is constant over time. Given the rapid pace of technological change of the Spanish agriculture, due both to the very low starting point after the autarchy years and the fast process of european integration, we think that assuming a fixed demand facing

[1] This is a simple closed economy model. Given the recent developments in the Spanish economy, it would have been interesting to include an external sector into the model in order to account for the behaviour of the exchange rate. However, we think that it can be accounted for by the aggregated demand component, because the Spanish monetary policy has been largely conditioned by the exchange rate developments since the entrance in the EMS, and therefore we have preferred to keep the simple closed economy model.

a positive technological progress can be an adequate description of the Spanish agriculture.

Therefore if the production function for the representative agricultural firm is represented by

$$y^s_{at} = l_{at} + \theta_{2t} \tag{17}$$

market clearing implies $y^d_a = y^s_{at}$. Notice that a fixed demand implies that y^d_a does not depend on t, and therefore the technological progress implies a decrease in labour demand in this sector, which has to be absorbed by the industry and is equivalent to an increase in labour supply for the rest of the economy.

Consider then the effects of an increasing labour supply, coming from both job destruction in agriculture and exogenous elements (such as an increase in female participation and the arrival of baby boomers to the labour market), which for simplicity are assumed to be deterministic. To be more specific, consider that now the labour force l^* is not fixed but instead follows the following deterministic law of motion $\Delta l^*_t = g(t)$. We have seen that with full hysteresis trade unions do not take into account the excess of labour supply, and thus it is immediate that

$$l^*_t - l_t = l^*_{t-1} - l_{t-1} + g(t) - e_t. \tag{18}$$

Therefore

$$u_t = u_{t-1} + g(t) - e_t \tag{19}$$

or

$$\Delta u_t = g(t) - e_t. \tag{20}$$

This result imply that the first difference of unemployment would be stationary around the deterministic component $g(t)$. If $g(t) = \kappa$ the level of unemployment would contain a linear time trend. If $g(t) = \mu + \kappa t$ the level of unemployment would contain a quadratic time trend. If the increase in labour supply had been due only to job destruction in the agricultural sector, $g(t) = \Delta\theta_{2t}$. Notice as well that the cointegration implications of the model are not altered by these modifications.

3 Does the Data Fit the Model?

In this section we will check whether the Spanish data is consistent with the four conditions implied by the theoretical model, namely that: (i) aggregate demand shocks have persistent effects on economic variables, (ii) consumption, output and unemployment are cointegrated one to one, (iii) these three variables are driven by a common trend, which can be interpreted as a common monetary trend, and (iv) the first difference of unemployment is stationary around a deterministic component accounting for changes in labour supply. We will refer to these four conditions during the empirical analysis.

In order to do so we study the monthly series of Industrial Production (IP) and Retail Sales (RS), as monthly proxies for output and consumption respectively, and Total Registered Unemployment (U) from the *Instituto Nacional de Estadística*. The time period extends from 1977:6 to 1994:10 and they have been seasonally adjusted. There is a reason for using this sample period. Up to 1977, the unemployment rates in Spain and in the European Union were basically the same (around 5%). It is in 1977 when both series start to diverge. The final period has been motivated by data availability (in particular the retail sales series finishes in October 1994). All the series are indexes and the base (100) is the first observation.

Figure 1 contains the plots of the logs of the series. Inspection of Figure 1 reveals that while retail sales and industrial production have followed a similar trend over time, unemployment has grown at a much faster rate than the other two variables (350% compared to 55% and 30% respectively). In fact, the plots do not display the expected mirror image relationship of increasing economic activity and decreasing unemployment and viceversa.

In what follows we will study the econometric properties of these series, analyzing in turn each of the four conditions implied by the theoretical model. This implies analyzing the unit root and cointegration properties of the data, extracting their common trend (if there is any) and computing the dynamic responses of the variables to shocks to this common trend.

3.1 Unit Root Analysis

The first step towards analyzing these series is the evaluation of a potential unit root in them. Given the plot of the series, we have first considered as alternative hypothesis stationarity around a deterministic trend. Stationarity around a constant does not seem a sensible alternative given the tendency of the series to trend up over time. The first row of Table 1 reports the results of the Augmented Dickey Fuller test (t_τ) on the levels of the series. In parentheses are the number of lags used [2]. The critical value for this sample is -3.43.

Table 1: ADF tests.

VARIABLE	IP	U	RS	CV
Levels				
t_τ	-2.23 (10)	-3.29 (3)	-1.30 (7)	-3.43
First Differences				
t_μ	-3.86 (9)	-2.66 (5)	-3.96 (10)	-2.85
t_τ		-3.80 (6)		-3.43

We have next tested for one and only one unit root in the series. In this case we have computed the Augmented Dickey Fuller test where the alternative hypothesis is stationarity around a constant on the first differences of the series (t_μ). The critical value is now -2.85 and the results are reported in the second row of Table 1. Inspection of Table 1 suggests that there is little evidence against the presence of a unit root in both industrial production and retail sales. Unemployment, however,

[2]We have selected the number of lags in the autoregression following a general to specific approach. The sequential test chooses between a model with m lags and a model with $m+1$ lags using a standard t test at 10% significance level. Work by Ng and Perron (1995) reveals that the sequential tests to select the order of the autoregression have some advantages with respect to information criteria.

presents some problems. While there is little evidence against the unit root hypothesis on the levels of the series, we find that we cannot reject a unit root even in the first difference of the unemployment series. This result is also found by Dolado and Jimeno (1995) and clearly there is no economic theory to justify that unemployment can be I(2). Therefore it seems that further analysis is needed for this series. It is well known that if a series is stationary around a deterministic trend and one tests for the unit root hypothesis using as alternative stationarity around a constant, the results can be misleading. Figure 2 plots the first difference of unemployment, and in fact given that the series has a tendency to trend down, it seems that a more sensible alternative is stationarity around a time trend. When we test for this alternative on the first difference of unemployment, we obtain a t_τ statistic of -3.80 (using 6 lags) which rejects the null hypothesis of a unit root. Moreover, the t-statistic for the time trend (-2.23) is significant at standard levels. This satisfies condition (iv) of the theoretical model, according to which the first difference of unemployment should be stationary around a deterministic component, this being the result of a variable labour supply. Hence, we have performed the following exercise: we have transformed the unemployment series by first detrending the first difference of the log of unemployment and then integrating the detrended series using as a starting condition the first value of the original series. In doing so we extract from the series the component that may be due to the increasing labour supply (i.e. g(t) in (20)), and obtain a series of how would unemployment have been with a constant labour supply. This exercise is in the spirit of what Marimón and Zilibotti (1996) denote as *virtual* unemployment. Figure 3 shows the levels of *real* and *virtual* unemployment.

It seems from Figure 3 that until 1988 the increase in unemployment is due to the deterministic factors: had it not been for these deterministic factors, the level of unemployment would have even decreased over this period. Once we have discounted these factors, we observe that the transformed unemployment series displays a very different picture. In fact, unemployment increases sharply in the initial observations of the sample but then it remains basically constant up to the end of 1983.

Then it starts decreasing steadily up to the end of 1987 when sharply decreases to reach a minimum value in April 1991. After this date it starts increasing again. The evolution of *virtual* unemployment resembles the path of Spanish monetary policy with a 2-year lag. The Spanish monetary policy (see Ayuso and Escriva (1993) for a detailed description) was quite restrictive until 1983, bringing down the high inflation levels of the 70s to a 12% in 1983. However, this had led to a very high level of interest rates (25% intervention rate) and the Bank of Spain gradually relaxed the pressure over the economy (see Figure (5)): this loosening would have triggered the decrease in unemployment after 1985. This loose trend lasted until 1989 with one interruption: in 1986 Spain decides to join the EEC. and this is accompanied by an increase in interest rates, which is accentuated 1987 to control the huge flow of foreign capital that was arriving in Spain and that was pushing too high the monetary aggregates. This sudden interruption of the loose monetary policy implied, two years later, an end in the decreasing trend in unemployment, which remained stable until 1992. Finally, Spain joins the EMS in 1989 in order to import credibility from the system and bring down inflation. This implied again high interest rates in order to keep the peseta within the bands, situation that lasted until early 1992. Not surprisingly, unemployment started to increase in 1993! This evidence seems to suggest that monetary policy has an important effect on *virtual* unemployment, but with a lag of around two years. This confirms the implications of the model that *virtual* unemployment is driven by the common monetary trend of the economy and suggests the presence of strong rigidities in the Spanish labour market: this issue will be confirmed later by the Variance Decomposition analysis.

Finally, Figure 4 plots *virtual* unemployment together with industrial production and retail sales. We can see that *virtual* unemployment shows the desired mirror image with respect to production and consumer demand, an image that the *real* unemployment did not show (Figure 1).

3.2 Cointegration Analysis

At this point we begin the multivariate analysis by performing Johansen cointegration tests on the monthly VAR with the *virtual* unemployment (VUN) series. The number of lags of the specification of the VAR has been chosen so that it minimizes the multivariate version of the Hannan and Quinn (1979) criterion with a minimum of 1 lag and a maximum of 6. The selected specification on the basis of this criterion is a VAR(3). Table 2 contains the result of the Johansen cointegration tests for the system.

Table 2: Johansen Cointegration Tests

	λ_i	Trace	5% c.v.	10% c.v.	λ_{max}	5% c.v.	1 0 % c.v.
$r \leq 2$	0.01	.09	8.18	6.50	.09	8.18	6.50
$r \leq 1$	0.06	14.05	17.95	15.66	13.18	14.90	12.91
$r = 0$	0.12	41.04	31.52	28.71	26.98	21.09	18.90

The column headed by λ_i contains the value of the eigenvalues of the Johansen tests from which we can compute the Trace-test statistic and the λ_{max} statistic. We also report the five and ten percent critical values of the tests. Inspection of Table 2 suggests that both tests reject the null of less than one cointegrating vector at both the 5 % and 10 % significance levels. At the 5 % level they do not reject the hypothesis of only one cointegrating vector. However, at the 10 % significance level the λ_{max} test rejects even the hypothesis of one cointegrating vector in favour of the alternative two cointegrating vectors. In order to further explore the adequate number of cointegrating vectors, we have also computed Johansen tests for lags 2 to 6. With a VAR(2) specification we find that at the 5 % level we cannot reject the hypothesis of two cointegrating vectors. For the remaining specifications, the results are as in the VAR(3) case (we do reject less than two cointegrating vectors at the 10% level on the basis of the λ_{max} test). On these grounds we finally adopt the specification with 2 cointegrating vectors:

$$\begin{aligned} IP_t &= 0.42RS_t \\ VUN_t &= -0.58IP_t - 0.66RS_t \end{aligned} \tag{21}$$

which can be rewritten as

$$\begin{aligned} IP_t &= 0.42RS_t \\ VUN_t &= -2.15IP_t \end{aligned} \tag{22}$$

The parameters of the cointegrating vectors have the right sign, although they differ somehow from the implied solution of the model (recall that the condition (ii) implied that $y_t = c_t$ and $u_t = -y_t$). An explanation could be that industrial production represents only a fraction of GNP; in fact, the analysis of the quarterly series of industrial production and GNP suggests that we cannot reject the null of cointegration between them, with a cointegrating vector $IPI = 0.5GNP$. This allows us to rewrite the cointegrating vectors as

$$\begin{aligned} GNP &= 0.84RS \\ VUN &= -1.07GNP \end{aligned} \tag{23}$$

which satisfies condition (ii) of the theoretical model.

3.3 Extracting the Common Trend

The next step is extracting the common trend. The approach we follow is based on the following proposition by Johansen (1995). Given a vector X_t in R^n, if M is a closed subspace of R^n we can decompose X_t as the direct sum of its orthogonal projections onto M and its orthogonal complement $M_\perp$, and this decomposition is unique. Therefore, X_t can be decomposed as

$$X_t = \beta(\beta'\beta)^{-1}\beta' X_t + \beta_\perp(\beta_\perp'\beta_\perp)^{-1}\beta_\perp' X_t. \tag{24}$$

In our case, with 2 cointegrating vectors out of three series, β spans a two dimensional subspace of R^3 and $\beta_\perp$ is a 3×1 vector. In the right hand side of the previous equation, the first part defines the stationary components and the second the permanent components. However, it still remains to identify the common stochastic trend itself. This can be achieved by defining the common trend as

$$ct_t = (\beta'_{\perp}\beta_{\perp})^{-1}\beta'_{\perp}X_t \tag{25}$$

where $\beta_{\perp}$ represents the loading factors (i.e. an scale measuring the relative importance of the trend for each series). In our case the estimates of the loading factors are $\beta_{\perp}$ = [0.10 -0.23 0.25]'. Therefore, the common trend is more important for the behaviour of retail sales and unemployment than for that of industrial production. Probably a more interesting way to understand the relative importance of the common trend for each series is to compare the original series with the common trend (scaled up to the loading factor). Figure (6) contains the series and the common trend. We find rather remarkable that a single series in conjunction with the factor loadings $\beta_{\perp}$ can do such a good job in tracking the three series. Just as an indication of the tracking we have computed the R^2 of the regressions of each of the original series against a constant and the common trend. finding values of 0.82, 0.95 and 0.97 for industrial production, unemployment and retail sales respectively.

Finally, recall from equation (3) that our common trend should correspond to real money supply [3]. In order to informally check whether our common trend has any relationship with Spanish money supply, we have plotted both series in Figure (7) (scaled by the mean and variance to make the series comparable). It is striking to see how, during this period of intense capital flows in the Spanish economy, our common trend is able to track the main features of Spanish money supply. However, it fails to track the upward trend after the EMS crisis, reflecting perhaps the structural changes (such as, for example, a change in the marginal propensity to save) advanced by some analists to explain the sluggishness in the recovery of the Spanish economy after the recession. The final

[3] We have also checked whether other elements related to aggregate demand, such as the real exchange rate and government spending, have any relationship with the common trend. We have found the evolution of these series much less related to the common trend than that of the money supply.

test is to give a formal content to this comparison. In order to do so we have performed the Johansen cointegration test between these two series. The results show evidence of cointegration between the two series, as we expect from the model, and therefore our common trend is not only the underlying driving force of the economy but also a good representation of Spanish real money supply. Thus, the condition (iii) of the theoretical model is also satisfied by the data.

3.4 The Effects of the Common Trend on the Business Cycle

Once we have identified the common underlying trend of the economy, the last step is to study the dynamic implications of this common stochastic trend for the cyclical behaviour of the economy. This will be related to condition (i) of the theoretical model, namely whether aggregate demand shocks have a permanent effect on economic variables. This task can be achieved by specifying a structural system, computing the impulse responses of the variables to a shock in this trend and assessing how much of the cyclical variability of each variable is due to fluctuations in the common trend.

Therefore we specify a structural VAR model for our series. Consider again a $N \times 1$ vector X_t such that the first differences admit the following representation:

$$\Delta X_t = C(L)\epsilon_t \tag{26}$$

where ϵ_t is a multivariate white noise process with zero mean and variance Σ and $C(L)$ is a matrix polynomial in the lag operator L

$$C(L) = I - C_1 L - C_2 L^2 - ... \tag{27}$$

satisfying standard regularity conditions. If X_t is cointegrated and there are r cointegrating vectors, the Granger Representation Theorem implies that the rank of $C(1)$ (i.e. the matrix of long-run multipliers) is $N - r$. Although (26) is appealing from a theoretical point of view, in practice a much more useful representation is the Vector Error Correction Model (VECM). That is, if X_t is cointegrated and there are r cointegrating vectors then it is possible to write

$$(I - A_1 L - A_2 L^2 ... - A_{p-1} L^{p-1})\Delta X_t = \alpha\beta' X_{t-p} + \epsilon_t \tag{28}$$

where A_i is a $N \times N$ matrix and both α and β are $N \times r$. β above is the matrix of cointegrating vectors and α is the matrix of loading factors. If we define the orthogonal complements of α and β as $\alpha_\perp$ and $\beta_\perp$, Johansen (1989) shows that the long run impact matrix $C(1)$ can be expressed as

$$C(1) = \beta_\perp(\alpha'_\perp \Psi \beta_\perp)^{-1}\alpha_\perp \tag{29}$$

where $\Psi = I - \sum_{i=1}^{p-1} A_i$. In order to compute the matrix $\beta_\perp$ is enough to define it as the eigenvectors associated with the unit eigenvalues of the matrix $(I - \beta(\beta'\beta)^{-1}\beta')$.

Equation (26) is a reduced form relation for X_t which is interesting for estimation and forecasting. However, what is of interest for us are the structural relations leading to (26), and we will discuss now how the cointegrating relationships restrict this set of structural relations and how they can be used to draw inferences about structural relations from $C(L)$ and Σ. To be more specific, consider a structural model

$$\Delta X_t = D(L)u_t \tag{30}$$

where now $D(L) = D_0 - D_1 L - D_2 L^2 ...$ and u_t is again a vector white noise process with covariance matrix Ω. From (26) and (30), it is not difficult to observe that $\epsilon_t = D_0 u_t$, $C(L) = D(L)D_0^{-1}$ and $C(1) = D(1)D_0^{-1}$. The identification of the structural model will be achieved through two sets of restrictions. First, the cointegrating restrictions impose constraints on $D(1)$, the matrix of long run multipliers. In particular, the rank of $D(1)$ is equal to the rank of $C(1)$, and this restriction identifies the permanent components. Second, we have a trivariate system with two cointegrating relationships, which implies one permanent and two transitory components. Thus, our second identifying restriction will be that the innovations to the permanent components are assumed to be uncorrelated with the innovations to the transitory components (i.e. Ω is a diagonal matrix). Therefore, this identification scheme is equivalent to identify the common trend shock as the common long run component in X_t. This identification is basically the same used in King et al. (1991).

Algebraically, define the partitioned matrix

$$D_* = [\alpha_\perp(\alpha'_\perp \Psi \beta_\perp) \;\; \alpha] \tag{31}$$

so that

$$\Delta X_t = C(L) D_* D_*^{-1} \epsilon_t = C(L) D_* v_t. \tag{32}$$

Define now B as the unique lower triangular square root of $E(v_t v_t')$ and $u_t = B^{-1} v_t$. Notice that u_t has an identity covariance matrix. Then, we can write

$$\Delta X_t = C(L) D_* D_*^{-1} \epsilon_t = C(L) D_* v_t = C(L) D_* B u_t = C(L) D_0 u_t = D(L) u_t. \tag{33}$$

Observe now that,

$$D(1) = C(1) D_0 = [\beta_\perp 0] B = B(1,1)[\beta_\perp 0] \tag{34}$$

where $B(1,1)$ stands for the element in the first row and first column. We can also normalize $\beta_\perp$ so that one of the elements is unity. This can be easily achieved by redefining

$$D_0 = \frac{D_* B}{B(1,1)\beta_\perp(i)} \tag{35}$$

where i indicates the order of the desired element with 1, and then $\beta_\perp^N$ will represent the normalized long run response of the variables to innovations in the permanent component.

In our system we have normalized the long run response of retail sales to 1. Bearing in mind that the ordering in the system is industrial production, unemployment and retail sales, our estimates suggest that the normalized long run responses to an innovation of one standard deviation in the common trend would be given by $\beta_\perp^N = [0.42 \;\; -0.90 \;\; 1]'$. Figure (8) shows the complete impulse response functions together with one standard deviation bands computed as in Lutkepohl (1991). Three main results emerge from these figures:

(1) There is a positive effect of positive monetary shocks in both industrial production and retail sales, being the effect larger on retail sales. There is a large increase on impact, and the effect stabilizes after 8 months although for retail sales it keeps increasing smoothly up to three years after the shock.

(2) There is a significant negative effect of positive monetary shocks on unemployment. The effect is smooth over time and stabilize after two years.

(3) The long run effect is significantly different from zero in all the cases, satisfying condition (i) of the theoretical model. Therefore, a negative monetary shock leads to a persistent decrease in both industrial production and retail sales and a persistent increase in unemployment. Notice also that the responses of retail sales and unemployment are double the size of that of industrial production and take longer to stabilize: this is exactly what happened at the end of the last recession in Spain, output started to recover but consumption and unemployment lagged well behind in the recovery.

Finally, we want to quantitatively evaluate the contribution of innovations in the common trend to the variability of each of the series. This question is addressed in Table 3, which shows the fraction of the forecast error variance attributed to innovations in the common trend. The results suggest that the innovation in the permanent component plays a dominant role in the variance of industrial production and retail sales, 91% and 84% respectively after two years, although substantially more for industrial production at short horizons. However, it explains very little of unemployment variability at short horizons, 25% after a year, although this percentage increases with time and arrives at a 74% after three years. Confirming our previous conjecture, this result can be interpreted as the effect of the rigid structure of the Spanish labour market, which prevents unemployment from adapting rapidly to changes in economic conditions.

Table 3: Forecast Error Variance Decomposition

HORIZON	IP	VUN	RS
1	0.67	0.00	0.49
4	0.74	0.04	0.58
8	0.81	0.13	0.67
12	0.85	0.25	0.73
16	0.88	0.37	0.78
20	0.89	0.48	0.81
24	0.91	0.57	0.84
28	0.92	0.65	0.86
32	0.92	0.70	0.88
36	0.93	0.74	0.90

4 Conclusions

This paper has tried to give an explanation to Spanish unemployment. Our theoretical framework has been an insider-outsider model with full hysteresis augmented to incorporate the differential characteristics of the Spanish case, such as an increasing labour supply and an intense process of job destruction in the agricultural sector. Such a model predicts that the first difference of unemployment would be stationary around a deterministic component, and that output, consumption and unemployment would be driven by a common monetary trend which has permanent long run effects on the variables.

We have shown that the Spanish data validates the theoretical implications of the model. We decompose the evolution of unemployment into two factors: a deterministic factor probably due to increases in labour supply and job destruction in agriculture, and a stochastic factor which reflects the influence of the underlying common trend of the economy, a *virtual* unemployment series in Marimon and Zilibotti's terminology. If we consider this *virtual* unemployment series we show that Spanish unemployment is not different from that of the rest of Europe (in 1994 it would have been at the level of 1977) and that it comoves with industrial production and retail sales in a way consistent with standard economic theory. We also show that its fluctuations have followed closely, although with a lag of around two years, the path of Spanish monetary policy over the last 15 years. In particular, the tightening of monetary policy after 1987-88 reversed the downward trend in unemployment in 1990 and the further tightening after 1989 and the entrance in the EMS resulted in the upward trend in unemployment after 1992.

We find in the data evidence of the two cointegrating relationships predicted by the model, and the resulting common monetary trend tracks well Spanish money supply and explains surprisingly well the behaviour of all three series.

This evidence is completed with the dynamic analysis, which shows that positive monetary shocks have positive long lasting effects on industrial production and retail sales, larger on retail sales, and negative permanent effects on unemployment. The effects on retail sales and unemployment are double the size of that of industrial production and take longer to stabilize, replicating what happened at the end of the last recession in Spain and suggesting that the last recession was caused mainly by the strong deflationary policies implemented during the eighties. Finally, the variance decomposition analysis has confirmed our conjecture regarding the lagged effect of monetary policy on unemployment, and suggests again the presence of rigidities in the Spanish labour market.

The policy implication of this paper is that, if the correction of the disequilibria of the Spanish economy needs a continuation of these restrictive monetary policies, we can forecast a further increase in unemployment if these policies are not accompanied by deep reforms in both product and labour markets which ease the absortion of the increased labour supply. It is also true that if labour supply stabilizes we can expect a decrease in unemployment as a result of job creation. However, regarding the reform in labour markets, we would like to stress that just the simple flexibilization of labour contracts may not be enough to achieve the desired objective given the complementarities across unemployment policies (see Coe and Snower (1996) for a detailed account), as the recent experience with the introduction of short term contracts has shown. Rather, perhaps a little revolution is needed for the Spanish economy to work at full steam.

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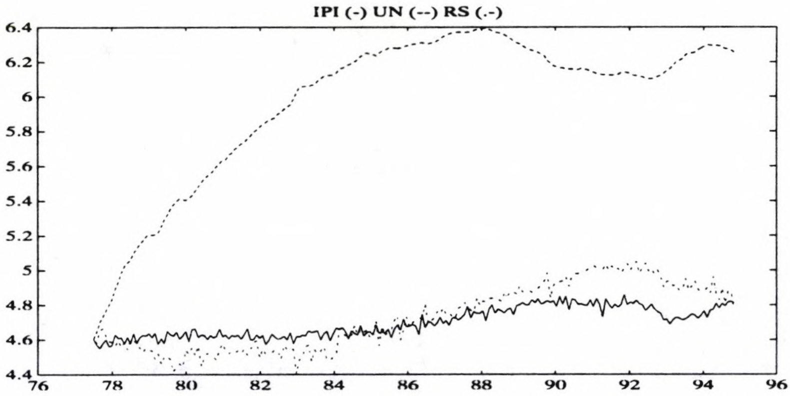

Figure 1: Logs of the Series

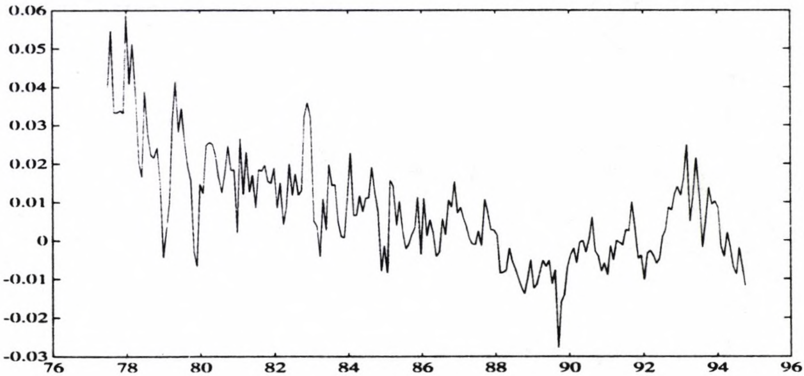

Figure 2: First Differences of Unemployment

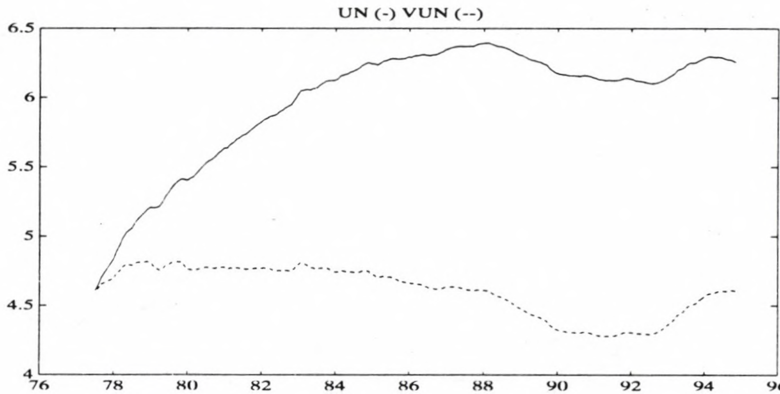

Figure 3: Real and *Virtual* Unemployment

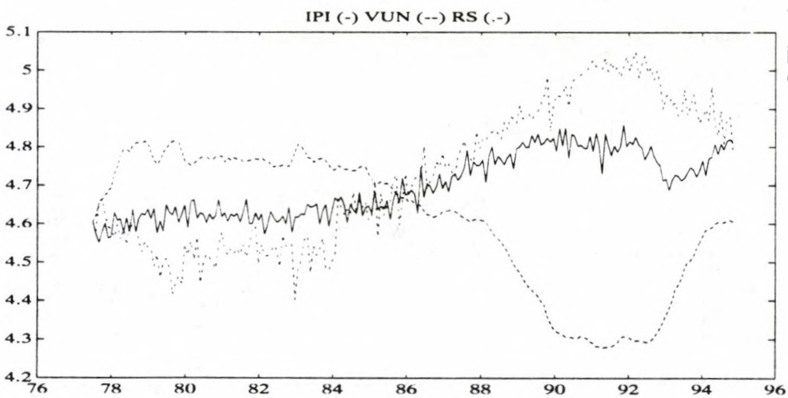

Figure 4: The *Virtual* Economy

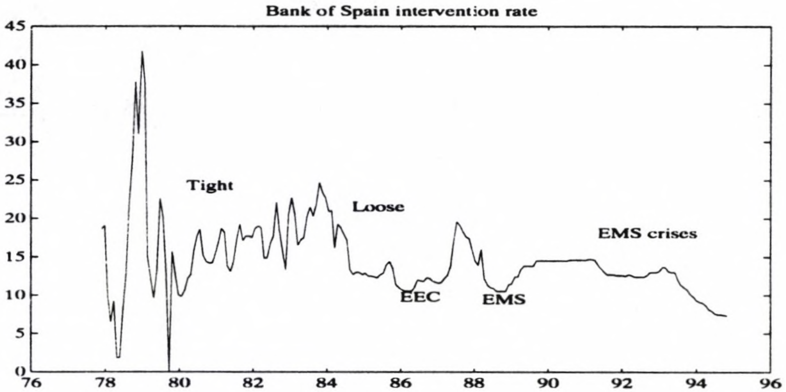

Figure 5: Bank of Spain Intervention Rate

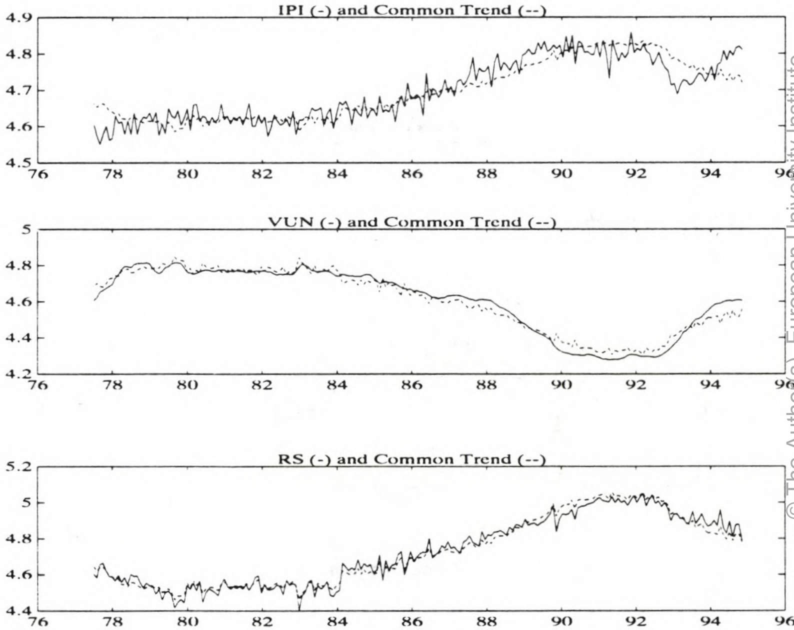

Figure 6: Series and the Common Trend

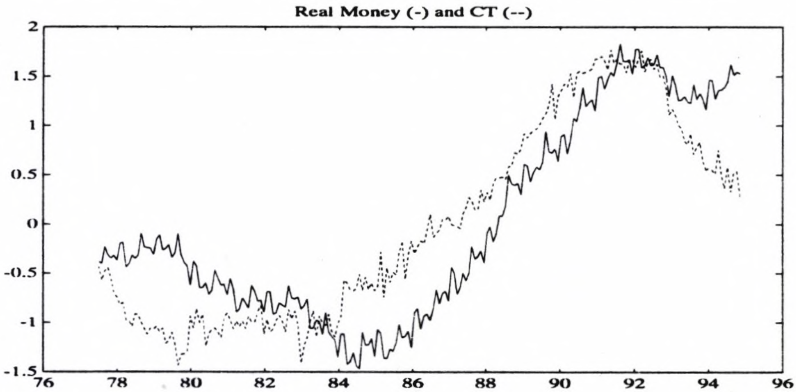

Figure 7: Money Supply (-) and the Common Monetary Trend (-.-)

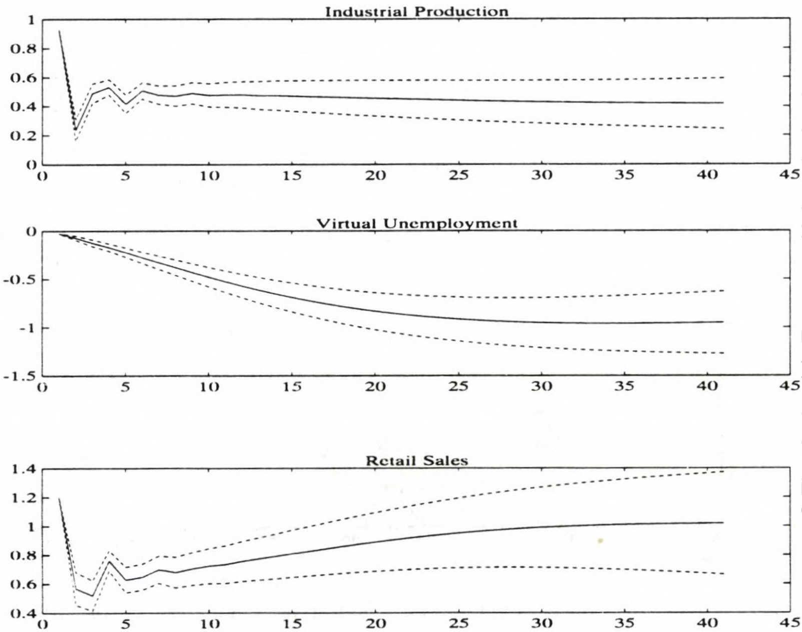

Figure 8: Impulse Responses to an Innovation in the Common Monetary Trend

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