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## A regional panel data analysis of the Spanish Beveridge curve

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# **38th Congress of the European Regional Science Association**

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## **A REGIONAL PANEL DATA ANALYSIS OF THE SPANISH BEVERIDGE CURVE**

**ABSTRACT:** Unemployment is one of the most important problems of the Spanish and European economies. A possible analysis, vastly extended in recent literature, focuses on mismatch problems between labour demand and supply. In this sense, the empirical relationship between the vacancy rate and the unemployment rate, the so-called Beveridge curve, offers a potential instrument to characterise the unemployment of the considered economy. Different studies, such as Jackman et al. (1989), Pissarides (1986, 1990) Antolín (1994) among others, point out that outward shifts of the Beveridge curve can be interpreted as increases in structural unemployment. The identification of these shifts provide useful information that can be used for policy planning.

The main objective of this paper is to identify the outward shifts of the Beveridge curve for the Spanish economy in the period 1978-1996. We also analyse a possible change in the elasticity of unemployment to vacancies since middle 80's. We use annual data from the Encuesta de Población Activa (INE) and the Estadística de Empleo (INEM), as both sources provide regional disaggregated data. In order to analyse the effect of unemployment rate persistence we use a Dynamic Panel Data (Arellano and Bond, 1991).

## **I. Introduction.**

The labour market behaviour can be characterised by the relationship between labour force and available jobs in a given economy. Imperfect information together with lots of jobs being continuously created and destroyed, justify the existence of a relationship between unemployment and vacancies. In this sense, and even in the case the market is perfectly efficient, both unemployed and employers need a minimum search period.

In 1945 Beveridge defined the concept of equilibrium unemployment rate taking into consideration the relationship between unemployment and vacancies. However, a theoretical framework for the relationship between both variables has not been developed enough until 1986, when Pissarides analysed this relationship as the interaction between two curves: the UV curve, or Beveridge curve (vacancies demand), and VS curve (vacancies supply).

If we compare the evolution of vacancies and unemployment in different OECD countries<sup>1</sup> with the values for the Spanish economy (figure 3), differences are evident. While for the majority of OECD countries this relationship is negative, for the Spanish economy it is positive. In the present work, we have analysed this special behaviour of the Spanish economy paying special attention to four concrete aspects. First, we investigate what kind of factors can explain the outward shift of the Spanish Beveridge curve from 1981 to 1985. Second, figure 3 shows the relationship between unemployment and vacancies is very different between 1978 to 1985 and 1986 to 1996, suggesting a possible change in elasticity of unemployment to vacancies. Third, using panel data analysis for 17 Spanish regions, we analyse if there exists enough evidence to think that relationship between unemployment and vacancies is homogeneous for all regions or, in other words, if differences among Spanish regions are important. Finally, estimates for Spanish economy using aggregated data reveal that persistence in Spanish unemployment rate is very important. In this sense, Antolín (1994) and García-Brosa (1996b) use one lag in unemployment rate to take into account this persistence into the Beveridge curve. In the present work, we show that factors considered by the literature cannot only explain the outward shift of the Spanish curve, but also the unemployment persistence. This fact is very important because the introduction of one period lagged unemployment rate was only justified until now by econometric reasons to solve a problem of information in aggregated analysis.

This paper is structured as follows. First, in the next section we develop the description of theoretical framework of UV and VS curves. Nevertheless, the description of the VS curve has been done in an intuitive way as we have focused on the analysis of the Beveridge curve because following empirical analysis will be done from this point of view. In section three we present the main results of estimates of the Spanish Beveridge curve for the period 1978-96, using panel data information of 17 Spanish regions. Finally, we summarise the main conclusions. An appendix with definition and description of the employed variables can also be found.

## **II. The theoretical framework.**

Following Pissarides (1986, 1990), the relationship between the unemployment rate and the vacancies rate can be summarised through the analysis of the UV curve, or Beveridge curve, and the VS curve (figure 1). The first explains labour market equilibrium where unemployment inflows and unemployment outflows are equal. The second shows the equilibrium between unemployment and vacancies where firms maximise profits.

In previous lines we have argued the existence of a relationship between unemployment and vacancies, however, we have not explained whether this relationship has to be positive (VS) or negative (UV). The main goal of this section is to explain the nature of these two possibilities.

### ***II.1 The VS curve.***

It is convenient for firms to fire new workers, so to post vacancies, when the marginal revenue of a job is higher than the cost of searching and finding a suitable worker. In this sense we refer not only to wages, but also to the cost of the searching process. So, when unemployment is high we can expect that it will pressure wages down and, being the rest of factors constant, firms will post more vacancies due to the decrease in hiring costs. So, a positive relationship between unemployment and vacancies should be found.

However, the VS curve shifts to the right, being the labour force constant, when any exogenous change affects hiring costs and/or expected profit from a matching between an unemployed and a job. For example, a higher pressure from unions in the collective bargaining process with firms will lead to an outward shift to the right of the VS curve because firms will post less vacancies independently of the unemployment level. In the same way, an improvement in unemployment benefits or an increase in their duration will have a similar effect. This is because the reservation wage of unemployed will increase to any level of vacancies.

## ***II.2 The Beveridge curve or UV curve.***

As we have commented, the Beveridge curve represents the equilibrium between unemployment and vacancies (where the outflows and inflows from unemployment are balanced). In this sense, the relationship among unemployed stock, inflows and outflows can be summarised by the following expression:

$$\Delta U = S - H \quad (1)$$

where U is the unemployed stock, S the inflows and H the outflows. So, changes in unemployment are the difference between inflows and outflows.

Inflows are determined by specific shocks to jobs associated to structural changes in demand. Normally, these shocks are expressed by changes in relative prices. In this sense, we consider that the relative price of output is high enough to allow production, or low enough to lead to a separation. Consequently, a separation rate  $s$ , will be considered exogenous to the hiring process.

Outflows will be produced when one unemployed is hired<sup>2</sup>. This hiring process depend on two probabilities: the probability that an offer is made to an unemployed and the probability that this offer is accepted by him<sup>3</sup>. In this sense, the main factors that affect these probabilities are the following:

1. *Available jobs in the economy*: The more available jobs, the higher probability to be hired. There is a positive relationship between vacancies and matchings.
2. *The search intensity of unemployed and employers*: If we consider that all unemployed are available to work and they look for suitable jobs during a period of time, the higher time used in search, the higher likelihood of finding a suitable job. Nevertheless, even using the same time to search a suitable job, they do not have the same likelihood to be employed. The rest of characteristics being constant, as long as an unemployed is in this situation, he will be less interesting to employers because there is a loss of skills. In the same way, being unemployed for a long period of time leads to a discouraged state of unemployed.

A lot of factors can modify the intensity of search of unemployed and employers:

- a. Unemployment benefits: There is no doubt that the existence of benefits for unemployed are needed from a social point of view. However, if these benefits are too generous and/or extended over an excessive period of time, unemployed will reduce the search intensity<sup>4</sup>.
- b. The existence of specific groups of unemployed workers as long-term unemployed as we have commented before, young unemployed who do not have enough experience or unemployed of thirty years old or more, have a lot of difficulties in finding a job<sup>5</sup>.
- c. The structure of the labour relationships<sup>6</sup>: higher firing costs<sup>7</sup> lead employers to have reticences before making new contracts.

All these factors lead to different likelihood of unemployed workers to be hired by an employer, being specially relevant, the structure of unemployment and the opportunity cost of being unemployed. So, from aggregated point of view, we will consider that there are  $rU$  unemployed workers searching for a suitable job, where  $r$  is the search intensity ( $0 \leq r \leq 1$ ).

1. *Mismatch*: If an unemployed is specialised in a concrete job (a special sector or in a specific region of a country), this worker can have skills that can be so different from those needed to develop a job that has been offered to him. So, given vacancies and unemployed, if they are not compatible there will be less matchings.

Consequently, outflows can be expressed in the following way:

$$H = H(rU, V, F) \quad (2)$$

+ + (+/-)

So, there exists a matching function that depends positively on *effective* unemployed and vacancies, and positively (negatively) on a group of factors such as mismatch between demand and supply, the generosity of unemployment benefits or some laws that can improve (worsen) the compatibility between vacancies and unemployed. If we consider that this function is concave and homogeneous of degree one, we can make the following transformations:

$$\frac{H}{U} = h(r, \theta, f) \quad (3)$$

where  $r$  is the search intensity,  $\theta$  is the number of available vacancies by unemployed as a measure of the market tightness and  $f$  represents all those factors, commented previously, that makes vacancies and unemployment more or less compatible.

If we consider  $E$  as the employed stock, the expression (1) can be transformed in the following way:

$$\Delta\left(\frac{U}{U+E}\right) = \frac{S}{U+E} - \frac{H}{U+E} = \frac{S}{E} \frac{E}{U+E} - \frac{H}{U} \frac{U}{U+E} \quad (4)$$

So, changes in unemployment rate can be analysed as the difference between the inflow rate multiplied by the employment rate and the product of outflow rate and the unemployment rate, so:

$$\Delta u = s(1-u) - hu \quad (5)$$

Moreover, in the stationary state there is no variation in the unemployment rate, so using the expressions (5) and (3) we can obtain:

$$u = \frac{s}{s + h(r, \theta, f)} \quad (6)$$

The expression (6) expresses the relationship between vacancies and unemployment where outflows and inflows are equal.

The expression (6) is the so-called Beveridge curve and it is plotted in figure 2. As it can be seen, this function has a negative slope because with a higher number of available vacancies, the probability of being hired also increases. However, if this probability increases less than proportionally with the number of vacancies, this curve will be convex to the origin. A reduction of vacancies will produce less matchings, diminishing the outflow rate, increasing unemployment, and so, causing a movement over the curve from A to B. But if an exogenous change in inflow rate happens, the movement will be from A to C, so the Beveridge curve will shift to the right. In the same way, if the mismatch worsens or the search intensity diminishes, it will cause a shift of UV curve to the right. An example of the later can be an increase of benefits of unemployed or an increase in their duration.

### ***II.3 Joint analysis of VS and UV curves.***

Layard *et al.* (1990) consider three kind of changes and how they affect the VS and UV curves. These authors make differences among, aggregated demand shocks, structural shocks and hysteresis.

The main effect of an aggregated demand shock is a shift of the VS curve. In this sense, there are three kinds of effects. The first can be provoked by a shock on aggregated demand that leads to an outward shift of the VS curve. However, if this fall in aggregated demand is important enough, it can produce an increase in the separation rate. If this is the case, an outward shift of the UV curve will also be produced. The second kind of outward shift can be provoked by an increase in union's pressure in the wage bargaining process. Finally, an improvement in benefits from unemployment and/or an increase in their duration, will have the same effects. So, the main effect is a shift of the VS curve provoking a movement in the UV curve from A to B (figure 2).



However, the nature of a structural change is completely different. A structural change provokes a shift of the UV curve. The factors than can produce this shift, as we have commented previously, come from either changes in sectoral demand or changes in matching effectiveness. The last comes from either an increase on mismatch or either in search effectiveness whose effects are longer than the initial shock.

Hysteresis provokes an outward shift of the VS with a subsequent outward shift of the UV curve. The former movement displaces the VS from A to B and the later displaces the UV curve from B to C or D. Nevertheless, to know whether this movement goes to C or D, as has been pointed by these authors, is very difficult with this kind of analysis.

### **III. Econometric Analysis of the Spanish Beveridge Curve.**

Before explaining the empirical analysis of the behaviour of unemployment rate and vacancies rate of the Spanish economy, we should make some comments about the variables that we have used in this study. In Spain, unlike other countries, there is not a survey to know how many and what kind of vacancies have been offered by firms. The only available information about vacancies is offered by the INEM (*Instituto Nacional de Empleo*). This institution provides two kinds of registered job offers: named job offers, where firms notify the name of the worker who is going to fill the vacancy, and a generic job offers, where firms notify the vacancy and the institution searches a suitable worker. So, we have a register of vacancies (generic job offers) and a register of hiring. We only know when vacancies have been registered and, consequently, when they stop being vacancies.

Antolín (1994) proposed a method to correct official vacancies under the assumption that the INEM is less efficient than the market, so, he considered that the duration of official vacancy is higher than the duration of vacancy in the market<sup>8</sup>. In this work we have used this method to correct official vacancies.

The main characteristics of the Spanish UV space are shown in figure 3. As it can be seen, from 1981 to 1985 a clear outward shift of UV curve has happened. During this period, the unemployment and vacancy rates have increased. However, from the middle of the 80's to 1996, there is a negative-sloped counterclockwise loop around the UV curve with continuous shifts of the VS curve. In this sense, during the period 1985-96 there is not a joint increase of

unemployment rate and vacancies rate. Anyway, the main goal of this work is to analyse the behaviour of the Spanish Beveridge curve during the period 1978-96. So, we will concentrate our analysis in the outward shift that has possibly happened during 1978-85. Moreover, we try to analyse if a change in the elasticity from vacancies to unemployment has worked. In this sense, as has been pointed out by Layard *et al.*(1990), a flatter Beveridge curve implies that an increase in job vacancies decreases unemployment by more. So, labour market policies may have increased the marginal rate of job matching.

In order to analyse the differences between the two periods, we have used a regional panel data from 17 Spanish regions. To do this, we have corrected regional vacancies using the correction suggested by Antolín (1994) under the assumption that INEM has the same inefficiency in all regions<sup>9</sup>. Neither, we do not have regional information about the unemployed who have been unemployed for one month or less. To solve this problem, we have corrected regional unemployed shorter than six months by the national share of one-month or less unemployed respect to six months or less unemployed a national level. We have preferred this alternative rather than using the same aggregated inflow rate for all regions.

In order to analyse the behaviour of the Beveridge curve for the Spanish economy during the period 1978-96, we have approximated expression (6) to:

$$lur_{it} = \alpha_0 + \alpha_1 lcvr_{it} + \alpha_2 f_{it} \quad i = 1, \dots, 17 \quad (7)$$

where  $lur_{it}$  and  $lcvr_{it}$  are, respectively, the unemployment rate and the corrected vacancy rate of region  $i$  and  $f_{it}$  denotes those factors that can explain the shifts of the Beveridge curve.

As it can be seen in figure 3, there is a positive-sloped relationship between unemployment rate and corrected vacancy rate. However, this behaviour is not homogeneous for the whole period. Between 1978 and 1981, the unemployment rate increased in an outstanding way. Meanwhile, the vacancy rate decreases very slowly. However, in 1981 a progressive shift of the pairs (v,u) begins. This change can clearly been seen in figure 4, where the Spanish tightness is plotted. In order to explain this shift we have introduced an homogenous-truncated trend ( $T81$ ) for all regions.  $T81$  takes the value 0 from 1978 to 1980, 1 to 5 from 1981 to 1985, and 5 for the rest of the period as any shift is not appreciated.

In table 1 we show the estimates of expression (6) for the period 1978-96. Note that the relationship between unemployment rate and corrected vacancy rate (column 1) is not a negative relationship. In fact, if the correlations between both rates are analysed (table 5) for all regions, they are positive except for the region of Madrid. However, the introduction of an homogeneous-truncated trend (table 1, column 2) allows us to separate the relationship between both variables of the shift of this relationship. Consequently, once we have accepted the existence of this shift, the objective is to find the factors that can help us to explain it. Regarding this, as we have commented in previous lines, possible causes of a shift of UV curve can be an increase in inflow rate, structural changes in labour supply, mismatch and the effect of different factors than can change, directly or indirectly, search intensity.

The characteristics of this period in the Spanish economy have lead us to consider as main factors of the outward shift the destruction of employment (*lsr*) and the strong changes that the Spanish productive structure has suffered. These two facts have generated incompatibility between demand and supply, so, presence of mismatch (*mm*) has to be considered. In fact, the intensive mechanisation process of the agriculture sector and the strong process of rationalisation of the Spanish industry have generated a huge surplus of labour force. This surplus has not been absorbed by the low services sector growth. In the same way, the huge rise in long-term unemployment (*lusl*) can give us information about the evolution of the search intensity of unemployed<sup>10</sup>.

Aside these factors, we have considered other as the female unemployment share and youth unemployment share in order to capture changes in unemployment structure. However, none of these factors have helped us to explain the outward shift of the Spanish UV curve.

Columns (3) to (5) of table 1 show the individual effect of the factors that we have finally considered to explain this outward shift. The results show it. However, the difference between the long unemployment share and the rest is important. In spite of this difference, we have estimated the joint effect of all factors. As column (6) shows, all factors are significant and have the correct sign. However, models from column (2) to (6) have two problems that should be pointed out. First, residuals from all the models are strongly autocorrelated. Second, the introduction of an homogeneous-truncated trend seems to force the panel to be estimated as a

random effects model. Note that all Hausman tests present very low values. In this sense, an homogeneous-truncated trend for all regions implies that the shift starts in the same period and has the same intensity for all regions. As it can be seen, the value of the coefficient associated to the trend has been reduced. So, in order to understand whether is the trend the variable which is conditioning the panel to a random effects estimation, we have dropped it out in column (7). This estimation corroborates that trend caused low Hausman test values in columns (2) to (6), but we have not solved the residual autocorrelation and a misspecification problem could exist.

Jimeno and Bentolila (1995) found that regional Spanish unemployment rates present a high degree of persistence. Jimeno (1996) pointed out that possible reasons that can cause persistence are either economic reasons, as supply and demand shocks, or institutional reasons that cause the existence of adjust costs in demand and hysteresis in wage determination. So, we have introduced one period lagged unemployment rate in order to consider the presence of persistence. In this sense, we have followed authors as Jackman *et al.* (1989, 1990), Antolín (1994) or García-Brosa (1996b), in order to find whether the main results change. So, we have introduced in expression (7) one period lagged unemployment rate:

$$lur_{it} = \beta_0 + \beta_1 lur_{it-1} + \beta_2 lcvr_{it} + \beta_3 f_{it} \quad i = 1, \dots, 17 \quad (8)$$

The introduction of a lag of the endogenous variable as an explanatory one provokes a serious problem in panel data estimates. Correlation between time-invariant-individual effects and a lag of the endogenous variable leads to biased and inconsistent estimates. To solve this problem we have followed the methodology proposed by Arellano and Bond (1991) estimating the panel by the generalised moments method. Expression (8) has been estimated in first differences, using all orthogonality available restrictions and using as instruments all exogenous variables and their first lag (except for *T8I*). All estimates presented are one-step robust estimates.

Table 2 presents the dynamic model estimates. Note that all variables have correct signs and are significant. But, as it has been pointed out by Arellano and Bond (1991), using lags of  $y_{it-1}$  as instruments is a valid option only if the model in levels has a white noise perturbation term. This lead us to a model in first differences with first order autocorrelation but not a

higher one. In case of a higher level of autocorrelation, the Sargan test will not be correct. Consequently, estimates from columns (1) to (4) are not right because  $m1$  and  $m2$  tests reject the null hypothesis of no autocorrelation. So, we have considered a richer order of lags in the unemployment rate. Estimates in columns (5) to (8) are better than those in columns (1) to (4). However, none of the models is stationary and the introduction of factors in order to explain the shift worsen the consistency of the estimates. Note the difference among  $m2$  test in columns (5)-(6) and (7)-(8).

Once we have reached this point of the analysis, it could be better to analyse the two periods separately. The first one, the outward shift from 1981 to 1985. The second one, the counterclockwise loop from 1985 to 1996. So, for the first period, we have followed the same strategy as for the period from 1978 to 1996. But, for the second one, we have limited the analysis to the relationship between unemployment and corrected vacancies.

The estimates for the first period are shown in table 3. These estimates help us to understand the problems for the whole period. The introduction of an homogeneous trend for all regions forces the panel to a loss of regional heterogeneity. However, the introduction of the inflow rate, the existence of mismatch and the long-term unemployment have two important effects. First, the consideration of all factors with the trend (column 3) shows the low signification of this variable. Nevertheless, this specification leads to a total lost of heterogeneity. Note that in this case the effect is stronger than for the whole period because the  $LM$  test suggests a pool estimation without any regional effect. Second, we have solved the problem of autocorrelation in residuals. Consequently, due to the low significance of the coefficient associated to the trend, we have estimated the model without it (column 4). The estimates corroborate the trend effect commented before.

We have also considered one lag of the unemployment rate in order to compare these estimates with those from the whole period. In table 4, columns (1) to (4), we show the estimates of the Beveridge curve for the period from 1978 to 1985 with one period lagged unemployment rate. The  $m2$  test does not allow to reject the null hypothesis of no autocorrelation. So, as we will show later, the inconsistency of estimates for the whole period has its origin in the counterclockwise loop that has happened since the middle of the 80's.

Respect to the signs and significance of the variables, as column (2) shows, there is a surprising negative value of the coefficient associated to the trend. However, it has to be considered that we are analysing a relationship among growth rates. In this sense, the difference of  $T81$  ( $DT81$ ) takes values 0 for the period 1978-80 and 1 from 1981 to 1985. So, the negative sign indicates that growth rates of unemployment rate are lower in average during 1978-80 than in 1980. In fact, for the aggregated economy, the growth rate of unemployment rate from 1979 to 1980 is 0.3260, while for the period 1981-85 is 0.1353. However, for the vacancies case they are, respectively, -0.2255 and 0.3915. So, there is a shift, but during this period the growth of unemployment is speeding down. Nevertheless, the joint introduction of lagged unemployment rate and factors that can explain the outward shift do not affect the trend. In fact, if we eliminate it (column 4), coefficients associated to the inflow rate, mismatch and long-term unemployment share, do not change a lot. So, given the estimates of the static model, there could exist some incompatibility among the time trend, lagged unemployment rate and the factors that we have considered.

For the second period we have limited the analysis to the relationship between the unemployment rate and the vacancy rate. The specification without lagged unemployment is shown in table 3, column (5). From the results it can be considered that this relationship does not seem to exist. However, the high first order autocorrelation of residuals have lead us to include lagged unemployment rate. The results are shown in table 4, column 5. The  $m2$  test rejects the null hypothesis of no second order autocorrelation. So, we have introduced two lags in unemployment rate in order to capture the autocorrelation. In column 6 it can be seen that the consistency problem has been solved. But the model is not stationary. However, there are some evidence to think that problems of stationary and consistency are due to the change in the relationship between unemployment and vacancy rates since middle of the 80's.

Respect to long run unemployment to vacancies elasticity, Antolín (1994)<sup>11</sup> obtains elasticities of -0.1965 and -0.2. The value depends on the structure of lags in vacancies rate and the inflow rate. Elasticity changes to -0.2556 when the shift variable is replaced by the long-term unemployment share. However, García-Brosa (1996)<sup>12</sup> obtains an elasticity of -0.30 when she considers only unemployment rate, a lagged one period unemployment rate, vacancies rate and the shift variable. This elasticity changes between -0.2774 and -0.7442 depending on the mismatch index used to explain the outward shift. However, these estimates consider the

presence of persistence by means of lagged unemployment rate and a AR(1) is introduced to obtain consistent estimates. This can be related to problems that we have found estimating the whole period and the second period.

In our case<sup>13</sup>, the only consistent estimates we have obtained for the period 1978-96 are those in columns (5) and (6) of table 2. In spite of being not stationary models, the elasticities are, respectively, -0.0013 and -0.1138. In this sense, our results are closer to Antolín (1994) than to García-Brosa (1996b). However, the no stationarity of the models suggests that this results should be taken with some care.

Nevertheless, we have consistent estimates for the period 1978-85. We have obtained elasticities of -0.0557 (table 3, column 4), -0.0891 (table 4, column 2) and -0.0871 (table 4, column 4). All these values are closer to those presented by Antolín (1994) than those from García-Brosa (1996b).

Regarding the second period, elasticities change between -0.3378 and -0.1329. However, as it has been commented before, in the first case the estimates are not consistent and in the second are no stationary. Anyway, we think that a change in elasticity of unemployment to vacancies could have worked. In this sense, between 1985 and 1990 the unemployed pool was reduced in 528.300 people, but between 1990 and 1994 they increased in 1.296.950. The unemployment rate changed during the first period from 21.46% to 16.25%, and during the second from 16.25% to 24.15%. So, in front of a negative aggregated shock, the Spanish labour market continues adjusting quantities but not prices. Consequently, it is true, as Layard *et al.*(1990) have pointed out, that a flatter Beveridge curve leads to an improvement in marginal rate of job matching. So, an increase in available jobs can lead to diminish the unemployment rate by more than proportionally. But, when a destruction of jobs process is happening, the effect is opposite. In this sense, given the high unemployment rates of the period and how they have increased since 1990, the segmentation of the Spanish labour market provokes an adjustment consisting in firing workers<sup>14</sup>. This can be due to the power of insiders in the collective bargaining process with firms.

## IV. Conclusions

In this work we have analysed the behaviour of the Spanish Beveridge curve between 1978 and 1996. It shows that the factors that we have considered contribute to explain the outward shift between 1981 and 1985. The inflow rate shows the strong restructuring process of the Spanish economy during the period. In the same way, the turbulence index from Layard *et al.* (1991), shows that the surplus of labour force has not been absorbed with enough speed. In respect to the long-term unemployment, it indicates a loss in search intensity of unemployed workers. However, the interpretation of the later factor is complicated due to its endogeneity, as has been commented by Jackman *et. al* (1990). In the same way, this variable can be affected by other factors such as mismatch, effect pointed out by García-Brosa (1996b). So, these results have to be considered with some care.

Regarding to regional heterogeneity, it is important in the estimates without one period lagged unemployment rate. So, to analyse if the factors considered explain not only the outward shift, but also the existence of persistence, further research should be carried out. In this sense, if this is true, the use of lagged unemployment could be a consequence of limited information in aggregated analysis.

We have found some evidence about a change in the elasticity of unemployment to vacancies since middle of the 80's. This fact can lead us to consider that labour policies of the second period have improved the matching rate. However, given the higher unemployment rates at the beginning of the 90's and that they have increased a lot since then, we can think that the Spanish labour market has adjusted the negative shock by means of firing workers. This fact could have been helped by the high level of segmentation of the Spanish labour market. Anyway, this effect has to be studied more precisely.

## Notes

- (1) This comparison can be seen in Jackman *et al.* (1990).
- (2) It means that we do not consider discouraged workers and unemployed who leave labour force.
- (3) Andrés *et al.* (1989) conclude that variations in the duration of unemployment depend more on the probability of offering a job than on accepting it.
- (4) In this respect, Gonzalo (1997) conclude that the higher potential duration of unemployment benefits the higher expected unemployment duration. In the same way, García-Brosa (1996a) find that unemployment



- benefits have a higher effect during the first months of unemployment than after a year. García-Pérez (1996) obtains the same results; unemployment benefits lead to a lower probability of quitting unemployment.
- (5) In this respect, García-Pérez (1996) conclude that the unskilled, older than 30 years and women, are groups with less probability of quitting unemployment.
  - (6) Jimeno (1996) points out that the introduction of new kinds of labour contracts since the labour reform of 1984, have lead labour market to a segmented market and that the Spanish collective bargaining is highly inflationary.
  - (7) In this sense, Jimeno (1996) and De la Dehesa (1997) have argumented that Spanish firing costs are one of the highest in Europe.
  - (8) For a better analysis of the correction method, see Antolín (1994).
  - (9) This correction has been used by Dolado and Gómez (1996).
  - (10) Variables are defined in appendix.
  - (11) The period analysed was 1977-91. The results commented come from table A3 with a correction coefficient of  $k=0.2$ .
  - (12) Tables 4.1 and 4.2. It has to be pointed out that García-Brosa (1996b) uses official vacancies.
  - (13) In this work, we have used a correction factor of  $k=0.25$  following Gómez and Dolado (1996) and suggested by Antolín (1994).
  - (14) In this respect, Sanromá and Ramos (1998) show that in the Spanish case "... it is needed an intensive growth of unemployed workers to slightly bend wages down" (translation is ours).

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## Appendices (Variables).

**lur<sub>it</sub>**: logarithm of unemployment rate of region *i*. *Encuesta de Población Activa*.(INE).

**lcvr<sub>it</sub>**: logarithm of corrected vacancy rate of region *i* (Antolín, 1994). *Estadística de Empleo* (Ministerio de Trabajo y Seguridad Social) y *Encuesta de Población Activa* (INE).

$$lcvr_{it} = \ln\left(\frac{V_{it}}{L_{it}}\right)$$

where:

$$V_{it} = \left[1 + k \frac{OUT_{it}^N}{OUT_{it}^U}\right] V_{it}^A$$

$V_{it}$  = Corrected vacancies of region *i*.

$k$  = Relative efficiency factor from Public Unemployment Service to market.  
Estimated in 0.25.

$OUT_{it}^N$  = Named job offers of region *i*.

$OUT_{it}^U$  = Generic job offers plus job offers removed of region *i*.

$V_{it}^A$  = Public vacancies (Offers not covered at the end of the month).

**mm<sub>it</sub>** : Turbulence index of the region *i* (Layard, et al., 1991). *Encuesta de Población Activa* (INE).

$$mm_{it} = \frac{1}{2} \sum \left| \Delta \left( \frac{N_{jit}}{N_{it}} \right) \right|$$

where:

$N_{it}$  employment region *i*.

$N_{jit}$  employment region *i* sector *j*, where *j* = Agriculture, Industry, Construction and Services.

**lusI<sub>it</sub>**: long unemployment share of region *i* (more than one year). *Encuesta de Población Activa* (INE).

**lsr<sub>it</sub>**: logarithm of the inflow rate of region *i*. Inflow rate (Unemployed less one month) respect to employment. *Encuesta de Población Activa* (INE).

$$lsr_{it} = \ln\left(\frac{\hat{U}_{it}(1)}{N_{it}}\right)$$

where:

$$\hat{U}_{it}(1) = \left(\frac{U_t(1)}{U_t(6)}\right) U_{it}(6)$$

$\hat{U}_{it}(1)$  is the corrected unemployed less than one month of the region *i*.

$U_t(1)$  national unemployed less than one month.

$U_t(6)$  national unemployed less than six months.

$U_{it}(6)$  unemployed less than six months of the region *i*.

REM & FE Estimates. Dependent Variable <i>lur</i> (Greene, 1993)							
	(1) REM	(2) REM	(3) REM	(4) REM	(5) REM	(6) REM	(7) FE
<i>c</i>	2.9359 (43.176)	1.9198 (21.358)	2.0254 (20.370)	1.8774 (19.768)	1.3515 (12.959)	1.4832 (15.613)	
<i>lcvr</i>	0.2502 (13.235)	-0.0978 (-3.888)	-0.0812 (-3.416)	-0.0908 (-3.905)	-0.1030 (-5.075)	-0.0719 (-3.915)	-0.0524 (-3.247)
<i>T8I</i>		0.1934 (17.804)	0.1802 (14.032)	0.1929 (17.808)	0.1057 (8.205)	0.0360 (2.362)	
<i>lsr</i>			0.0348 (1.892)			0.1176 (7.270)	0.1367 (10.718)
<i>mm</i>				0.0225 (1.745)		0.0336 (3.221)	0.0350 (3.344)
<i>lusI</i>					0.0181 (9.987)	0.2323 (12.816)	0.0268 (21.353)
<i>R</i> <sup>2</sup>	0.2279	0.4694	0.4957	0.4697	0.4860	0.5837	0.8622
<i>H</i>	1.1098 [0.2921]	0.0001 [0.9999]	0.0001 [1.0000]	0.0001 [1.0000]	0.0001 [1.0000]	0.0001 [1.0000]	20.730 [0.0003]
<i>LM</i>	470.67 [0.0000]	960.33 [0.0000]	553.46 [0.0000]	969.66 [0.0000]	1161.72 [0.0000]	568.16 [0.0000]	560.14 [0.0000]
<i>Autoc.</i>	0.6094	0.6675	0.6689	0.6639	0.6230	0.5906	0.5738

Table 1. Panel Data Estimates of the Spanish Beveridge Curve.  
Period 1978-96.

REM & FE & POOL Estimates. Dependent Variable <i>lur</i> (Greene, 1993)					
	SAMPLE: 1978-85				SAMPLE: 1986-96
	(1) REM	(2) REM	(3) POOL	(4) FE	(5) REM
<i>c</i>	2.9278 (29.730)	1.8204 (15.558)	3.1554 (35.649)		2.8188 (44.484)
<i>lcvr</i>	0.2847 (7.700)	-0.1211 (-3.403)	-0.0411 (-2.615)	-0.0557 (-3.495)	-0.1965 (-7.572)
<i>T8I</i>		0.2420 (14.889)	0.0161 (1.507)		
<i>lsr</i>			0.8846 (28.966)	0.8960 (14.486)	
<i>mm</i>			0.0225 (2.054)	0.0258 (2.375)	
<i>lusI</i>			0.0263 (21.080)	0.0307 (26.685)	
<i>R</i> <sup>2</sup>	0.1818	0.4840	0.9446	0.9589	-0.0036
<i>H</i>	2.0547 [0.1517]	0.0001 [0.9999]	0.0001 [1.0000]	22.4866 [0.0001]	2.2208 [0.1361]
<i>LM</i>	67.8736 [0.0000]	198.744 [0.0000]	2.2654 [0.1322]	5.3015 [0.0213]	498.07 [0.0000]
<i>Autoc.</i>	0.4890	0.4096	0.0560	0.0737	0.5652

Table 3. Panel Data Estimates of the Spanish Beveridge Curve.  
Period 1978-85 & 1986-96

GMM-Estimates (Arellano&Bond 1991)								
Dependent Variable <i>lur</i> (all variables are in first differences)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>c</i>	0.0022 (1.578)	-0.0012 (-0.556)	-0.0664 (-10.467)	-0.0556 (-9.5714)	0.0049 (0.7309)	0.0014 (0.7309)	-0.0056 (-7.3956)	-0.0502 (-6.9616)
<i>lur(-1)</i>	0.7809 (39.115)	0.7192 (20.038)	0.7294 (19.924)	0.8226 (23.315)	1.0849 (25.359)	1.0145 (18.833)	0.8533 (12.288)	0.9433 (14.393)
<i>lur(-2)</i>					-0.3761 (-9.3312)	-0.4035 (-9.2022)	-0.1442 (-2.9688)	-0.1196 (-2.2011)
<i>lcvr</i>	-0.0505 (-4.617)	-0.0869 (-4.283)	-0.0538 (-2.801)	-0.0034 (-0.4193)	-0.0017 (-0.2073)	-0.0443 (-2.3056)	-0.0343 (-1.7204)	0.0144 (2.0605)
<i>T8I</i>		0.0368 (2.550)	0.0580 (4.353)			0.0467 (3.0802)	0.0533 (4.2055)	
<i>lsr</i>			0.3328 (10.221)	0.3047 (8.6751)			0.2872 (7.6935)	0.2757 (6.7124)
<i>mm</i>			0.0135 (3.254)	0.0162 (4.1204)			0.0148 (4.1977)	0.0178 (4.8527)
<i>lusI</i>			0.0046 (3.084)	0.0045 (2.7360)			0.0025 (1.9242)	0.0020 (1.2726)
<i>Wald</i>	1784.7 [0.0000]	1306.1 [0.0000]	6079.1 [0.0000]	9968.8 [0.0000]	996.65 [0.0000]	1479.7 [0.0000]	3931.0 [0.0000]	2784.7 [0.0000]
<i>Sargan</i>	402.45 [0.0000]	416.05 [0.0000]	321.85 [0.0000]	337.10 [0.0000]	225.10 [0.0000]	227.67 [0.0000]	219.50 [0.0001]	224.14 [0.0002]
<i>m1</i>	-2.7337	-2.6926	-3.4199	-3.3072	-3.5395	-3.5787	-3.6090	-3.5030
<i>m2</i>	-2.7196	-2.7748	-3.1253	-2.8993	-1.8357	-1.8857	-2.5857	-2.2695

Table 2. Dynamic Panel Data Estimates of the Spanish Beveridge Curve. Period 1978-96.

GMM-Estimates (Arellano&Bond 1991)						
Dependent Variable <i>lur</i> (all variables are in first differences)						
	SAMPLE: 1980-85				SAMPLE: 1986-96	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>c</i>	0.0657 (3.745)	0.1542 (4.728)	0.0950 (5.809)	0.0046 (0.366)	-0.0014 (-0.315)	-0.0711 (-2.5174)
<i>lur(-1)</i>	0.5794 (7.077)	0.5190 (6.401)	0.4108 (8.180)	0.4891 (7.620)	0.5073 (9.955)	0.9892 (15.037)
<i>lus(-2)</i>						-0.5238 (-16.246)
<i>lcvr</i>	-0.0639 (-3.745)	-0.0429 (-2.716)	-0.0209 (-1.4356)	-0.0445 (-2.666)	-0.1662 (-4.101)	-0.0711 (-2.5174)
<i>T8I</i>		-0.0936 (-3.011)	-0.0995 (-6.006)			
<i>lsr</i>			0.4821 (10.561)	0.4559 (8.689)		
<i>mm</i>			0.0185 (4.011)	0.0176 (2.948)		
<i>lusI</i>			0.0114 (4.939)	0.0104 (3.723)		
<i>Wald</i>	83.010 [0.0000]	119.69 [0.0000]	407.21 [0.0000]	326.12 [0.0000]	221.91 [0.0000]	1066.5 [0.0000]
<i>Sargan</i>	87.836 [0.0000]	91.938 [0.0000]	77.900 [0.0000]	85.322 [0.0000]	280.35 [0.0000]	120.13 [0.0000]
<i>m1</i>	-3.2601	-3.0204	-2.9953	-3.1704	-0.2698	-3.3235
<i>m2</i>	-1.4956	-1.1646	0.5322	0.1714	-2.5822	-1.7569

Table 4. Dynamic Panel Data Estimates of the Spanish Beveridge Curve.  
Period 1978-85 & 1986-96.

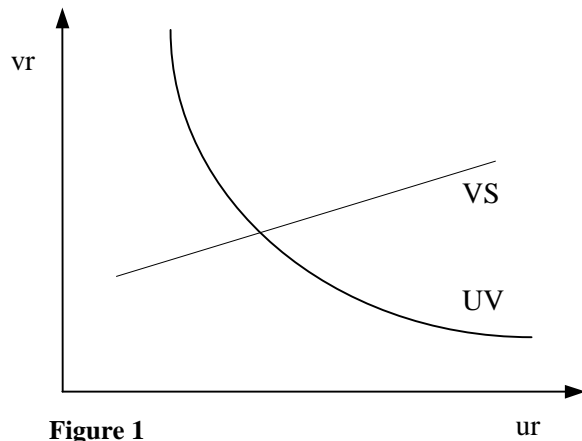


Figure 1

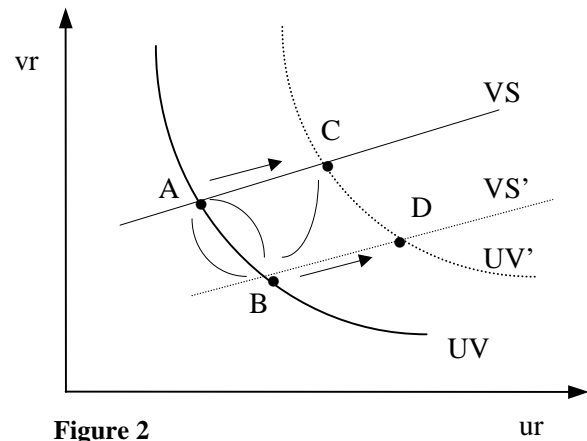


Figure 2

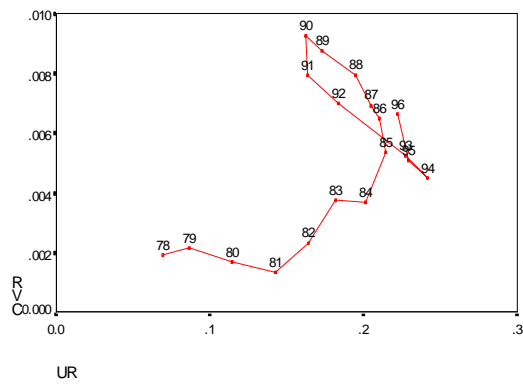


Figure 3. Spanish Beveridge Curve. 1978-96.

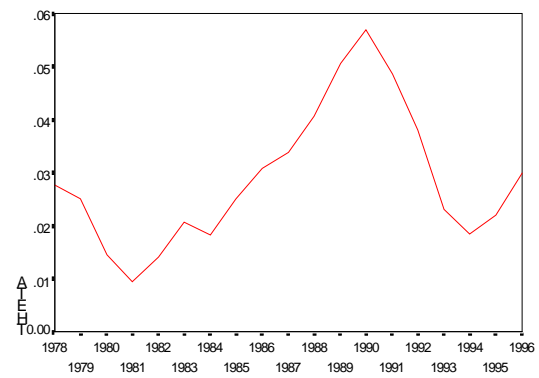


Figure 4. Tightness of the market (v/u).

Region	1978-96	1978-85	1986-96	Region	1978-96	1978-85	1986-96
Andalucía	.64	.85	-.50	Cataluña	.16	.51	-.36
Aragón	.28	.77	-.63	Extremadura	.61	.87	.49
Asturias	.61	.78	-.65	Galicia	.50	.82	-.70
Baleares	.23	.77	-.64	Madrid	-.52	-.59	-.73
Castilla-León	.63	.88	-.94	Murcia	.31	.67	-.86
Castilla-La Mancha	.49	.57	-.49	Navarra	.30	.78	-.05
Comunidad Valenciana	.33	.75	-.76	País Vasco	.67	.82	-.16
Canarias	.63	.85	-.56	Rioja (La)	.33	.92	-.63
Cantabria	.47	.57	-.65				

Table 5. Correlations between ur and cvr.