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39th Congress of the European Regional Science Association

**STRUCTURAL AND CYCLICAL EFFECTS ON THE
SPANISH UV RELATIONSHIP[†]**

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ABSTRACT: The relationship between the unemployment rate and the vacancy rate has been vastly analysed for different European economies. Authors such as Jackman *et al.* (1989), Pissarides (1986,1990), Antolín (1994) among others, have found that outward shifts of the uv relationship can be interpreted as increases in structural unemployment. However, there is another group of authors, such as Börsch-Supan (1991) or Wall and Zoega (1997) among others, who consider that uv relationship deals more with business cycle than with changes in structural variables. Consequently, the Beveridge curve is not a good instrument to distinguish the cyclical unemployment from the structural unemployment.

In the present study we analyse the influence the structural factors and the cyclical factors on the Beveridge curve. As we show when we develop the theoretical model, the shifts can only be explained by means of structural factors, but the register nature of the vacancies produces cyclical effects on the estimated shifts. Hence, following the methodology proposed Wall and Zoega (1997) we separate both components and conclude that the structural factors such as the long-unemployment share, the regional mismatch and the inflow rate, explain the Spanish Beveridge curve behaviour as well as the considered regional Beveridge curves.

[†] This paper has been prepared jointly with Suriñach, J. and López-Bazo, E. also members of the Quantitative Regional Analysis Research Group.

1.

2. Introduction

Beveridge defined in 1994 the equilibrium unemployment rate as the relationship between the unemployment rate and the vacancy rate. From then on, lots of studies about the subject appeared but it is Pissarides (1990) who sum up this literature and develops a theoretical model where the equilibrium in the labour market is obtained from the negative relationship between the unemployment rate and the vacancy rate. The market equilibrium is achieved when unemployment outflow balances the unemployment inflow.

The study of the Beveridge curve focuses not only on the relationship between both variables, but also on which are the factors that can explain the outward and inward shifts of the curve over the period of study. Obviously, this has both theoretical and empirical problems. One could even say that the last ones have conditioned the former. Until few years ago, the basic methodology of study consisted of a graphical analysis of the relationship. This graphical analysis together with the researcher's knowledge helped to determine the shifts of the relationship through time. Hence, the last step, as the theoretical model suggests, was to explain the shifts with the aid of structural factors.

Since this very first kind of empirical analysis, some authors such as Börsh-Supan (1991) or Wall and Zoega (1997), questioned the usefulness of the Beveridge curve to difference between structural and cyclical unemployment. They argued that the shifts of the Beveridge curve can be explained by both structural and cyclical factors and, in consequence, the quantification of the shifts cannot be associated with either of them.

From other point of view, other group of authors such as Blanchard and Diamond (1989) or Dolado and Gómez (1996), analysed the influence of structural and cyclical factors on the movements of the Beveridge curve. They used structural autoregressive vector models to analyse the influence of both components in order to determine their influence on the Beveridge curve through time. However, these authors did not identify which specific factors, such as the long-term unemployment share, the inflow rate or mismatch, are behind this structural component.

This paper focus on the evolution of the Spanish Beveridge curve and on some of its regions from 1978 to 1996. It tries to show how the structural component can explain the shifts of the curve. Once the cyclical component is considered, its is possible to identify the factors are hidden behind these movements. The methodology used on this purpose is a panel data analysis with territorially disaggregated information.

The remainder of the paper is structured as follows: the theoretical framework and the movements of the Beveridge curve are briefly described in section two. Section three looks at the problems referred to the quantification of vacancies for Spain; next, the shifts of the Spanish Beveridge curve and for some of its regions are estimated in section four. Afterwards, we also difference between the structural and the cyclical components associated to each shift of the different Beveridge curves (national and regional). A concluding section summarises the main aspects analysed in the paper and opens some future research lines.

3. The Theoretical Framework:

3.1. Flows, Stocks and the Derivation of the Beveridge Curve¹.

As we have said previously, the Beveridge curve shows the equilibrium between the vacancy and the unemployment rates where the inflows and outflows are balanced. According to this, the relationship among the unemployment stock, the outflows and the inflows can be expressed as follows:

$$\Delta U = S - H \quad \text{Error! Unknown switch argument.}$$

where ΔU is the increase in the unemployment stock, S represents the inflow and H the outflow. Thus, the change in unemployment can be obtained as the difference between both flows. If we consider E as the employment stock, an equivalent expression to (1) is the following:

¹ In this section we summarise part of the main contributions of Pissarides (1990)

$$\Delta\left(\frac{U}{U+E}\right) = \frac{S}{U+E} - \frac{H}{U+E} = \frac{S}{E} \frac{E}{U+E} - \frac{H}{U} \frac{U}{U+E} \quad \text{Error! Unknown switch argument.}$$

switch argument.

where changes in the unemployment rate can be analysed by means of the difference between the inflow rate times the employment rate and the outflow rate times the unemployment rate. Consequently, the previous equation (2) can be expressed as:

$$\Delta u = s(1-u) - hu \quad \text{Error! Unknown switch argument.}$$

where Δu is the increase in the unemployment rate, s is the inflow rate, $(1-u)$ is the employment rate and h represents the outflow rate. If we consider the steady state, where there is no variation in the unemployment rate, the expression (3) can be summarised by the balance between flows:

$$s(1-u) = hu \quad \text{Error! Unknown switch argument.}$$

Different authors, such as Pissarides (1986) or Jackman *et al.* (1990) among others, have analysed the behaviour of the outflow and the inflow rates for different European economies. These studies reveal that the inflow rate behaviour has remained very stable through the different periods under analysis, and the increase of unemployment can be associated to reductions in the outflow rate. For the Spanish case, Antolín (1994, 1997) shows the increase in the inflow rate for the Spanish economy, but for him, it is also the outflow rate the reason of the high increase in the unemployment. Following this line of reasoning, we will consider that the inflow is caused by specific shocks to the jobs that are associated with changes in demand. These shocks induce changes in the relative prices. In this sense, we will also consider that the relative price of an unemployed output is high enough to maintain the matching, or low enough to break up the labour relationship. So s will be exogenous in our model.

With respect to the outflow rate, all exit from unemployment is produced as a consequence of a matching. This matching process depends on two probabilities: the probability of one offer is made to an unemployed, and the probability that this offer will be accepted by him. The main factors that may be influencing both probabilities are, mainly, the following:

1. *The availability of jobs in the economy.*
2. *The search effectiveness of the unemployed and the employee search.*

1. Not everybody has the same probability of being employed. So, from an aggregated point of view, we will consider that there exist rU unemployed that are searching for a job, where r is the mean effectiveness search ($0 \leq r \leq 1$).

3. *Mismatch:* If we analyse this relationship in an aggregate framework, the number of matches by period, will not only depend on rU and V , but also will depend on how jobs and workers are distributed by sectors, by occupations and by regions. If they are less compatible there will be fewer matches. So, either increases in rU -both, mean effectiveness search and the number of unemployed people- and/or increases in V will induce a higher number of matches. Following the same line, there will be some factors that can increase or reduce the number of matches by period such as the mismatch between supply and demand, or changes in protection employment laws that may induce changes in the search effectiveness of both unemployed and employees. Consequently, the outflows can be expressed in the following way:

1.

$$H = H(rU, V, F) \quad H_{rU}, H_V > 0, \quad H_F \leq 0, H_F \geq 0$$

switch argument.

Expression (5) represents the matching function and shows that the matches occurring by period (H) have a positive dependence on the effective unemployed (rU) and the vacancies (V), and have also a positive (negative) dependence on those factors (F) commented before that, given vacancies and unemployed, these are more (less) compatibles. If we consider that this function is concave and

homogeneous of degree one², the relationship between the levels of the variables can be expressed as follows:

$$h = \frac{H}{U} = h(r, \mathbf{q}, f) \quad h_r, h_q > 0, \quad h_f \leq 0, h_f \geq 0 \quad \text{Error! Unknown switch argument.}$$

switch argument.

where the outflow rate (h) is a function of the mean effectiveness search (r), the available jobs by unemployed (\mathbf{q}), and of those factors (f) that, given vacancies and unemployed, worsens or betters the matching efficiency.

Combining (4) and (6), we obtain:

$$u = \frac{s}{s + h(r, \mathbf{q}, f)} \quad \text{Error! Unknown switch argument.}$$

and, as it can be seen, for s , r , and f fixed, increases in the vacancy supply induce decreases in the unemployment rate.

3.2. Movements and Shifts of the Beveridge Curve.

Expression (7) shows the equilibrium in the labour market in the period t where the outflows and inflows are balanced. Figure 1 is the graphic representation of expression (7), known as the Beveridge curve. As it can be seen this function has a negative slope due to the fact that the higher available jobs, the higher probability of being employed. This function is also convex with respect to the origin given that this probability increases less than proportionally with the number of vacancies. Nevertheless, as we are interested in the time-analysis evolution for the Spanish economy, we have to analyse which is the dynamic adjustment and how it responds to different kinds of shocks. In this sense,

² See Pissarides (1990) and Wall and Zoega (1997).

Blanchard and Diamond (1989) summarise these shocks in the following three kinds of perturbations that can affect the Beveridge curve position:

- Aggregate activity shocks.
- Structural shocks.
- Labour force shocks.

Suppose that we begin our analysis at a point such as A in figure 1 and the economy is affected by a negative aggregated activity shock. At the first moment, this will induce a reduction in vacancies. Consequently, the decrease in the vacancy rate, *ceteris paribus*, will bring down the number of matches, decreasing the outflow rate and inducing an increase in the unemployment stock. This movement follows the arch-trajectory underneath the Beveridge curve from A to B (figure 1). In case of a positive aggregate activity shock, the analysis is similar. If we begin the analysis at point B and the economy suffers from positive aggregate activity shock, the vacancies will increase and the probability of matching will improve. So, *ceteris paribus*, the higher the number of matches the lower the outflow and, consequently, the unemployment rate will decrease (point A). In this sense, aggregate activity shocks origin counter-clockwise movements around a stable Beveridge curve.

The difference between aggregate activity shocks and structural shocks is that in the former, the shock moves vacancies and unemployment in different directions. However, the later moves vacancies and unemployment in the same direction and shifts the curve. The structural shock can be induced by the exogenous factors of the expression (7). Hence, changes in mean search effectiveness (search intensity and/or unemployed eligibility) will produce a shift from A to C. Given vacancies, there will be less effective unemployed and, as a consequence, less matches, less outflows and an increase in the unemployed rate.

With respect to the labour market laws, changes in unemployment benefits that increase the quantity of benefits or the period of reception may cause an increase of the reservation wage and it results in the same effect as in a reduction in the search intensity. The long-term unemployment share is a variable that might capture these changes. The mismatch between unemployed and vacancies also

implies fewer matches by period and produces the same effect as in the previous cases. Last, an exogenous increase in the inflow rate imply that, given vacancies, an increase in the unemployed stock that would shift the curve to the right.

The labour force shock has a similar effect as a structural shock. The difference between both is that the labour force shock causes a temporary shift to curve, returning to its prior position in less than one year (Blanchard and Diamond 1989). An increase of the labour force will produce an increase in the unemployment rate and a decrease in the vacancy rate. This will shift the curve from A to D (figure 1). Afterwards, the probability of matching will improve and the unemployment rate will return to a position such as A.

Nevertheless, we have to assume that all these factors may be affecting the Beveridge curve position at the same time. In this sense, if we assume that our economy at point B and it is affected by a positive aggregate shock, the logical movement is from B to A. But, if is a structural shock that is affecting in the same direction, the final position could be either A or C.

From the graph of the Spanish Beveridge curve (figure 2), we can distinguish between two periods. From the last seventies through to the middle eighties it seems that the Spanish Beveridge curve has suffered an outward shift. However, from the middle of the eighties until 1996 shift in the curve might run parallel to a counter-clockwise adjustments in the curve. Clearly, this is one of the points we are trying to shed light on in our empirical exercise.

4. Statistic Information for the Spanish Economy.

The existence of few observations is one of the major problems that the analysis of the Beveridge curve. This problem impedes to analyse a considerable set of variables that can explain the shifts of the curve together with the dummy variables that control these shifts. The utilisation of territorially disaggregated panel data allows us to solve this problem. Thus, the panel data will allow us to estimate the annual shifts for the Spanish Beveridge curve.

Before analysing the relationship between the Spanish vacancy rate and the Spanish unemployment rate, it is convenient to comment on some problems the quantification of vacancies in

Spain has. Thus, the rest of this section comments on some specific problems related to the Spanish vacancies.

In Spain, the available information about vacancies is offered by the Public Unemployment Service (*Instituto Nacional de Empleo*, INEM). The INEM registers two kinds of job offers: "named" job offers and "unnamed" job offers. The first ones are those which firms notify a vacancy together with the name of the worker who is going to take the vacancy up. The last ones are those that firms want the INEM to search for suitable workers. Hence, for the Spanish case, we need to estimate the real vacancies existing in the labour market.

Antolín (1994) propose a correction method for the Spanish case under the hypothesis that the INEM is less efficient than the market in the matching process. Thus, he considers that the duration of a vacancy is higher in the INEM than in the market. Antolin's correction method was proposed to correct the aggregated national vacancies. In this work we have used the same method under the additional hypothesis that the INEM is as efficient as the market in all the Spanish territory³

5. Empirical Analysis of the Shifts of the Beveridge Curve.

5.1. Aggregated and Regional Estimates of the Shifts.

To analyse the Spanish Beveridge curve shifts, we followed a proposition of Wall and Zoega (1997) and we estimated equation (8) for the aggregated national and for the regions composed of three or more provinces⁴.

$$lur_{pt} = t_t + m_p + a \text{ } lvc r_{pt} + e_{pt} \text{ Error! Unknown switch argument.}$$

³ With respect to the correction methodology, see appendix I and Antolín (1994).

⁴ Analysed regions: Andalucía, Aragón, Cataluña, Castilla León, Castilla La Mancha, Comunidad Valenciana, Galicia and País Vasco.

Where $\ln u_{pt}$ is the logarithm of the unemployment rate of the province p , t_i stands for the time dummies, m_i stands for the individual dummies, $\ln vcr_{pt}$ is the logarithm of the corrected vacancies rate and e_{pt} stands for a noise.

Table 1 shows the obtained results. First of all, given the peculiar behaviour of the Spanish Beveridge curve (figure 2) and the regional curves⁵, one could think of the lack of significance of the vacancy rate for Spain, Aragón, Cataluña, Castilla la Mancha, and Galicia, the vacancy rate is not significant, probably due to the behaviour in the first part of the period. Besides, in general terms, time-dummy variables are explaining the evolution of the unemployment rate since 1978.

Table 2 shows the shifts obtained as the difference between the time dummies whereas table 3 groups them and shows the changes of the direction of the shifts. As it can be seen, the behaviour of the selected regions, with the exception of País Vasco, is similar to the aggregated national. It seems that there exist strong outward shifts from the last seventies until the middle eighties, and inward shifts until the first nineties. From this last period until the middle nineties another outward shift happens. Hence, given the similar appearance among the aggregated shifts and the regional shifts (with the exception of the País Vasco), we considered an alternative aggregated shifts analysis by means of the sum of the regional shifts weighted by the share of the labour force. As it can be seen from figure 2, the evolutions of the shifts obtained from panel with the 50 Spanish provinces (**National Aggregated**) and the weighted regional shifts (**Regional Weighted**), they are very similar except for 1985 and 1990. If we take a look at the Spanish Beveridge curve (figure 2), it presents strong changes of direction for these years. In fact, the correlation between both series is as high as 0.99 (table 5). Hence, we could consider the panel for eight regions (39 of 50 provinces that represent the 70.22% of employed and the 71.34% of the unemployed during the period) is a good approximation for the aggregated national.

5.2. Shifts Analysis.

To analyse which factors can explain the shifts, we estimated the expression (9) following the methodology proposed by Wall and Zoega (1997).

$$\mathbf{t}_{it} = \mathbf{h}_i + S_{it} \mathbf{b}_1 + C_{it} \mathbf{b}_2 + \mathbf{e}_{it} \text{ Error! Unknown switch argument.}$$

Where \mathbf{t}_{it} are the time-dummy-estimated coefficients of the region i , \mathbf{h}_i represents the individual dummy variables for the eight regions, S_{it} is a matrix which columns are the variables approaching the structural factors, C_{it} is a matrix which columns are the variables approaching the cyclical, \mathbf{b}_1 and \mathbf{b}_2 are vectors collecting the parameters for such factors and \mathbf{e}_{it} stands for a noise.

Given the process of estimation of the shifts in the previous panels, we should to expect the cyclical factors not to explain the shifts. Only the structural factors should explain the shifts. However, as we will see, the cyclical factors do explain part of the variations of unemployment. This fact is due to the Spanish vacancies nature. As we have dealt, vacancy data come from registers carry out by the INEM. This register process can be affected by the cycle if the employees offer less jobs when they anticipate a negative aggregate shock, or offer more vacancies when they anticipate a positive aggregated shock (Schettkat. R, 1994). When the matching process is less efficient, the anticipation effect would be greater. Moreover, If we add the correction method to this process, the behaviour of the cycle related to the shifts could be very difficult to eliminate in the first step. So, the shifts estimated could be affected by the business cycle if the vacancy rate does not represent correctly the business cycle.

Wall and Zoega (1997) used the regional unemployment rate to capture the cycle. In our case, we have considered that unemployment is not a good proxy because it has been used in the previous estimates and the relationship between the shifts and the unemployment rate is fairly obvious. So we considered the gross value added growth rate ($\mathbf{g_gva}$)⁶ and the women unemployment share (\mathbf{wus}). With respect to the structural factors, we have taken the inflow rate (\mathbf{s}), the long term unemployed share

⁵ We have decided not to include the regional Beveridge curve because of room shortage.

⁶ The definition of the variables and the sources can be consulted in the appendix I

(**lus1**), and a regional mismatch measure (**mmr**) based on the turbulence index of Layard *et al.*(1991)⁷. We did not consider the labour force growth rate because in previous studies (López-Tamayo, 1998) its inclusion did not explain the behaviour of the Spanish Beveridge curve. In this sense, we subscribe the comments made by authors as Blanchard and Diamond (1989), Antolín (1991) and Gómez and Dolado (1996). As t_{it} are centred in 1978 we have centred all variables in this period with the exception of **g_gva**.

Table 4 shows that the factors used present the correct signs and signification. The long-term unemployment share (**lus1**), the inflow rate (**s**) and the regional mismatch (**mmr**) all have a positive effect, as we have argued when we developed the theoretical model. The gross value added growth rate (**g_gva**) and the women unemployment share (**wus**) have a negative effect, as we should expect from the counter-clockwise adjustment process.

With respect to the structural factors, the interpretation is quite direct. The long-term unemployment share (**lus1**) has a positive effect over the shifts, reflecting a decrease in the search intensity and/or eligibility of unemployed people (increase in **lus1**). As a consequence, this effect causes a minor outflow from unemployment denoting positive shifts from 1978. The regional mismatch index (**mmr**) shows that the mismatch has influenced in the same sense and, given vacancies and unemployment, an increase in the mismatch produces situations moved away from 1978. With respect to the inflow rate (**s**), this variable captures the exogenous inflows that have been affecting the Spanish economy, especially during the period 1978-1986, and consequently, shows a direct shift from 1978.

With respect to the cyclical factors, its interpretation is not so direct as in the structural case. The sign of the coefficients has to be associated with the counter-clockwise adjustment process. So positive variations of (**g_gva**) have to be negatively related to the shifts. In terms of the figure 1 if we analyse a shift from A to D over a horizontal axis, this movement could be decomposed into two movements. The first one would be an outward shift from A to C and, the second one, an inward shift

⁷ We also considered the same measure of sectoral mismatch with Agriculture, Industry, Construction and Services. However, this measure did not explain the behaviour of the Beveridge curve. In fact, the regional mismatch could be capturing this effect

from E to C. So, had our shifts in the estimation process a cyclical component, they would not be measuring the segment AC, but measuring the segment AE. Consequently, in order to analyse the shifts due to structural factors and obtain the segment AC, we should extract the segment CE (associated with the cyclical component) from AE.

The explanation of the behaviour of the women unemployment share (**wus**) is more complicated. An increase in the women unemployment share should produce an increase of the inflow and, from this point of view, it should be positively related to the shifts. So, why is the women unemployment share negatively related to the shifts? The generalised explanation is that women enter the labour market when employment perspectives are better. In this sense, the women behaviour could probably be denoting an increase in the inflow but hiding a higher outflow due to better perspectives. We have regarded as important to maintain this variable so as capture the women's behaviour.

5.2.1. Analysis of the Results for the Aggregated National

Figure 2 shows how the obtained adjustment captures the evolution of the shifts. This is corroborated by the correlation between the weighted sum of the adjusted shifts (**Adjusted**) and the national aggregated shifts obtained from the panel data estimates for the 50 Spanish provinces (0.96 in table 5). When considering regional weighted shifts, the correlation does not change.

Once we estimated the whole effect, we tried to analyse the influence of the structural and cyclical factors. This distribution can be seen in the bar diagram of figure 2. However, to understand this figure and its relationship with the Spanish Beveridge curve, we will use the pictures in figure 3, where different cases of decomposition in structural and cyclical components are shown.

In figure 3, type A shows how a shift from A to C can be decomposed in two parts. A structural outward shift from A to B and a positive effect associated with the business cycle from B to E. Type B shows the global effect of a structural outward shift and a lower negative cyclical effect. Type C shows the global movement that could be caused by a structural outward shift that is compensated by a higher negative cyclical effect. Finally, type D shows how negative structural and cyclical components would affect the global movement.

In terms of the bar diagram of figure 2, we can appreciate a movement of type A from 1979 to 1980 with positive effects in two components. This case can be seen in the Spanish Beveridge curve (figure 2) and shows an outward shift of the equilibrium denoted by the structural component. Later on, from 1981 to 1985 the movements follow type B, where a positive outward shift predominates over a little negative cyclical effect. This effect translates into new outward shifts of the equilibrium worsening the matching process. Since 1985 a change in the weight of the components has happened. A better behaviour of the business cycle begins a counter-clockwise adjustment process. This effect is captured by a higher weight of the cyclical component. However, the structural component has a strong positive effect during the period 1986-1988 showing outward shifts of the equilibrium but with reductions in the unemployment rate. This period can be associated with movements of type C and they can be identified again in the Spanish Beveridge curve. During the period 1989 through 1992 movements are of type D where both components affect negatively the estimated shift. The structural component shows an inward shift of the relationship between vacancies and unemployment, whereas the cyclical effect shows a decrease in unemployment and an increase in vacancies over the new curve. This effect can be seen again in the Beveridge curve during the years 1989 and 1990. The following cases until 1993 have not been captured by our model and they should be, regarding to the graphical analysis of the curve, movements and a negative structural component with a lower positive cyclical effect. The period 1986-1992 has to be analysed in more detail because it is totally new. Until now, as it was very difficult to analyse the Beveridge curve year over year, a vast number of studies considered the structural factors as gradually worsening over the whole period. Here, we have shown that this component has improved from the middle of eighties through first of the nineties causing negative shifts. From 1992 through 1993, the economy has changed from both negative effects to both positive effects and since 1993 these effects turn to be of type A (outward shift), B (outward shift) and D (inward shift).

As it can be seen from the bar diagram in figure 2, the structural component explains the shifts of the Spanish Beveridge curve once one has extracted the cyclical component. In fact, the structural component presents a correlation with the **National Aggregated** and with the **Regional Weighted** of 0.96 (table 5). The cyclical component presents a correlation of -0.61 and -0.56 respectively. The last

picture of figure 2 shows the accumulated shift. It has to be noted that the structural component explains the accumulated estimated shifts for the Spanish economy for the period 1978-96.

5.2.2. Analysis of the Results for the Regions.

The results concerning the analysed regions, show a correlation between the shifts obtained with the panel of each separated region and the adjusted shifts obtained with the suggested model (table 6). The correlation analysis shows that the adjustment obtained is acceptable for the majority of cases. However, there exist cases such as País Vasco, that its behaviour is very difficult to adjust. So these results have to be analysed with some care.

Once discounted the cyclical component, the importance of the structural component can be seen in figure 5. The structural component presents a positive relation with the shifts whilst the variables accounting for cyclical factors are, as expected, negatively correlated with changes in unemployment. With respect to their distribution through time, until the middle eighties, the structural component predominates over the cyclical component. This fact may explain the outward shifts of the regional Beveridge curves (table 3 with the exception of the País Vasco). There also exists a clear different regional behaviour since the middle eighties. In Andalucía, Aragón, Castilla la Mancha and Comunidad Valenciana, we can observe that the structural component is inducing outward shifts and there also exists some persistence in it. However, Cataluña, Castilla León and Galicia, begin the inward shifts before the other group of regions. In the same period, this last group of regions also presents a clear negative cyclical effect that is stronger than the one observed for the first group. This effect is showing not only an inward shift, but also a higher increase of the vacancy rate, as shows figure 3 (type D). For the years 1991 and 1992, the case of Cataluña shows an inward shift to the origin we could not see in the aggregated case. Since 1993 the structural component turns to have a strong positive impact shifting all the regional Beveridge curves to the right. However, in 1996 most of the analysed regions experienced an inward shift.

The accumulated effect of both components can be seen in figure 6. As in the Spanish case, the structural component explains the outward shifts of the regional Beveridge curves.

6. Conclusions

The present study has analysed the influence the structural factors and the cyclical factors on the Beveridge curve. Up to now, the majority of studies considered that the counter-clockwise movements associated to cyclical effects as separated from the structural effects. From an empirical point of view, the shifts have been analysed by means of dummy variables in aggregated regression models. Since these dummy variables were explained both by structural and cyclical factors, some authors have considered that the Beveridge curve is not a good instrument to analyse the cyclical and structural unemployment.

As we showed when we developed the theoretical model, the shifts can only be explained by means of structural factors, but the register nature of the vacancies produces cyclical effects on the estimated shifts. Hence the main problem was how to extract this cyclical component. In the present study, following an initial idea of Wall and Zoega (1997), we have shown that it can be possible to separate both components and the analysis of both of them explains the Spanish Beveridge curve behaviour quite accurately.

With respect to the obtained results, we have to notice that the Spanish Beveridge curve shifts are explained mainly by structural factors, specially the long-term unemployment share, the regional mismatch and the inflow rate.

One important contribution of this study is that the structural factors explained the inward shift of the Spanish Beveridge curve from 1986 to 1992. Up to now, this effect was attributed to the cycle effect and it was considered that the structural effects had worsened during the whole period. Now we can extend the analysis and relate this effect to some legal changes that happened during this period, in order to quantify its effects on unemployment.

With respect to the regional results, the structural component predominates over the cyclical component in all regions (figure 6). However, some regions present structural persistence when the cycle begins to affect the economy reducing the unemployment rate. When the activity worsens the structural component strongly shifts the Beveridge curve to the right, though.

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APPENDIX I (Variables).

lur_{pt} : logarithm of the unemployment rate of the province p . Encuesta de Población Activa.(INE).

$$lur_{pt} = \ln \left(\frac{U_{pt}}{L_{pt}} \right)$$

where:

U_{pt} total unemployment of the province p .
 L_{pt} labour force of the province p .

$lcvr_{pt}$: logarithm of the corrected vacancy rate of the province p .(Antolín, 1994). Estadística de Empleo (Ministerio de Trabajo and Seguridad Social) and Encuesta de Población Activa (INE).

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

where:

V_{pt} corrected vacancy of the province p .

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

k relative efficiency factor from Public Unemployment Service to market. estimated in 0.25.

OUT_{pt}^N named job offers of the province p

OUT_{pt}^U generic job offers plus job offers removed of province p .

V_{pt}^A public vacancies of the province p .(Offers not covered at the end of the month).

L_{pt} labour force of the province p .

mmr_{it} : mismatch 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} total employment of the region i

N_{pit} employment of the province p of the region i .

$lusI_{it}$: long-term unemployment share of the region i (more than one year). Encuesta de Población Activa (INE).

s_{it} : inflow rate of the region i . Inflow (unemployed searching less than one month) respect to the employment of the period. Encuesta de Población Activa (INE).

Cáceres	
La Coruña	
	Galicia
Lugo	
Orense	
Pontevedra	
Madrid	Madrid
Navarra	Navarra

Murcia	Murcia
Alava	
	País Vasco
Guipúzcoa	
Vizcaya	
La Rioja	La Rioja

APPENDIX II. Results

Table 1. Panel Data Estimates of the Regional and National Beveridge Curves for Spain.

Dependent Variable: Log of the Unemployment Rate¹.

	Spain	Andalucía	Aragón	Cataluña	Castilla León	Castilla La Mancha	Comunidad Valenciana	Galicia	País Vasco
Lvcr	-0.012 (0.014)	0.020 (0.005)	-0.136 (0.117)	0.038 (0.059)	0.038 (0.014)	-0.020 (0.021)	0.075 (0.034)	0.006 (0.102)	0.480 (0.029)
1979	0.313 (0.059)	0.156 (0.061)	1.337 (0.623)	0.322 (0.076)	0.248 (0.092)	0.176 (0.099)	0.208 (0.017)	0.233 (0.053)	-0.249 (0.518)
1980	0.529 (0.077)	0.282 (0.071)	1.736 (0.805)	0.420 (0.186)	0.426 (0.116)	0.399 (0.161)	0.484 (0.099)	0.532 (0.053)	-0.204 (0.270)
1981	0.784 (0.079)	0.498 (0.089)	2.038 (0.814)	0.917 (0.1089)	0.660 (0.135)	0.778 (0.070)	0.705 (0.147)	0.803 (0.104)	0.020 (0.059)
1982	1.022 (0.079)	0.603 (0.064)	2.330 (0.737)	1.234 (0.077)	0.868 (0.104)	1.042 (0.115)	0.986 (0.098)	1.007 (0.100)	-0.086 (0.334)
1983	1.188 (0.087)	0.705 (0.078)	2.406 (0.796)	1.386 (0.111)	1.000 (0.079)	1.114 (0.203)	1.194 (0.061)	1.252 (0.162)	0.087 (0.226)
1984	1.279 (0.091)	0.811 (0.077)	2.456 (0.872)	1.466 (0.129)	1.116 (0.082)	1.176 (0.196)	1.222 (0.059)	1.449 (0.261)	0.270 (0.261)
1985	1.406 (0.094)	0.908 (0.091)	2.692 (0.784)	1.451 (0.211)	1.274 (0.077)	1.295 (0.196)	1.246 (0.069)	1.560 (0.353)	0.182 (0.273)
1986	1.497 (0.092)	0.935 (0.069)	2.810 (0.754)	1.561 (0.140)	1.403 (0.081)	1.341 (0.165)	1.321 (0.057)	1.656 (0.351)	0.092 (0.170)
1987	1.495 (0.098)	0.946 (0.071)	2.881 (0.868)	1.508 (0.107)	1.394 (0.090)	1.277 (0.170)	1.248 (0.057)	1.712 (0.350)	0.404 (0.273)
1988	1.466 (0.099)	0.951 (0.075)	2.867 (0.867)	1.398 (0.116)	1.332 (0.098)	1.284 (0.197)	1.191 (0.060)	1.751 (0.318)	0.300 (0.311)
1989	1.412 (0.099)	0.882 (0.066)	2.797 (0.821)	1.238 (0.098)	1.323 (0.100)	1.294 (0.221)	1.087 (0.027)	1.671 (0.329)	0.137 (0.132)
1990	1.315 (0.101)	0.838 (0.092)	2.709 (0.780)	1.038 (0.172)	1.232 (0.098)	1.182 (0.247)	0.956 (0.051)	1.622 (0.417)	0.335 (0.137)
1991	1.240 (0.097)	0.770 (0.075)	2.430 (0.835)	0.975 (0.167)	1.145 (0.108)	1.080 (0.255)	0.959 (0.012)	1.626 (0.424)	0.276 (0.343)
1992	1.261 (0.096)	0.790 (0.085)	2.476 (0.821)	1.107 (0.147)	1.124 (0.110)	1.062 (0.271)	1.120 (0.029)	1.701 (0.354)	0.239 (0.088)
1993	1.410 (0.096)	0.891 (0.083)	2.604 (0.829)	1.322 (0.138)	1.303 (0.101)	1.265 (0.243)	1.311 (0.035)	1.971 (0.302)	0.201 (0.197)
1994	1.605 (0.096)	1.036 (0.082)	2.911 (0.812)	1.668 (0.107)	1.464 (0.103)	1.485 (0.239)	1.536 (0.058)	2.080 (0.283)	0.409 (0.261)
1995	1.661 (0.096)	1.081 (0.079)	2.934 (0.781)	1.752 (0.119)	1.555 (0.097)	1.485 (0.211)	1.539 (0.063)	2.167 (0.274)	0.180 (0.111)
1996	1.595 (0.094)	1.050 (0.087)	2.817 (0.753)	1.651 (0.118)	1.500 (0.089)	1.514 (0.218)	1.413 (0.097)	2.055 (0.283)	0.133 (0.252)
Provinces	50	8	3	4	9	5	3	4	3
Obs.	950	152	57	76	171	95	57	76	57
R	0.90	0.94	0.82	0.96	0.92	0.82	0.97	0.93	0.77

1. Estimated for individual effects are not supplied although they were included in each estimation.
Standard errors in parenthesis.

Table 2. National and Regional Estimated Shifts.

Year	Spain	Andalucía	Aragón	Cataluña	Castilla León	Castilla La Mancha	Comunidad Valenciana	Galicia	País Vasco
1979	0.313	0.156	1.337	0.322	0.248	0.176	0.208	0.233	-0.249
1980	0.216	0.126	0.399	0.099	0.178	0.223	0.275	0.299	0.045
1981	0.255	0.217	0.302	0.497	0.234	0.379	0.221	0.271	0.223
1982	0.238	0.105	0.292	0.317	0.208	0.264	0.281	0.205	-0.106
1983	0.166	0.102	0.077	0.152	0.132	0.072	0.208	0.244	0.173
1984	0.090	0.105	0.050	0.081	0.116	0.062	0.027	0.197	0.183
1985	0.127	0.097	0.236	-0.015	0.158	0.120	0.024	0.111	-0.089
1986	0.092	0.028	0.118	0.110	0.129	0.046	0.075	0.096	-0.090
1987	-0.002	0.011	0.071	-0.053	-0.009	-0.064	-0.072	0.056	0.312
1988	-0.029	0.005	-0.013	-0.110	-0.062	0.007	-0.057	0.039	-0.103
1989	-0.053	-0.069	-0.071	-0.160	-0.009	0.011	-0.104	-0.080	-0.163
1990	-0.097	-0.045	-0.088	-0.200	-0.091	-0.113	-0.131	-0.049	0.198
1991	-0.075	-0.067	-0.279	-0.063	-0.088	-0.101	0.004	0.004	-0.059
1992	0.021	0.020	0.046	0.132	-0.021	-0.018	0.160	0.075	-0.038
1993	0.149	0.101	0.128	0.215	0.180	0.203	0.192	0.271	-0.037
1994	0.194	0.145	0.306	0.346	0.161	0.221	0.225	0.109	0.208
1995	0.057	0.044	0.023	0.084	0.091	0.000	0.003	0.087	-0.229
1996	-0.066	-0.031	-0.117	-0.101	-0.056	0.029	-0.126	-0.112	-0.047

Table 3. Direction of the National and Regional Shifts

Year	Spain	Andalucía	Aragón	Cataluña	Castilla León	Castilla La Mancha	Comunidad Valenciana	Galicia	País Vasco
1979	→	→	→	→	→	→	→	→	←
1980	→	→	→	→	→	→	→	→	→
1981	→	→	→	→	→	→	→	→	→
1982	→	→	→	→	→	→	→	→	←
1983	→	→	→	→	→	→	→	→	→
1984	→	→	→	→	→	→	→	→	→
1985	→	→	→	←	→	→	→	→	←
1986	→	→	→	→	→	→	→	→	←
1987	←	→	→	←	←	←	←	→	→
1988	←	→	←	←	←	→	←	→	←
1989	←	←	←	←	←	→	←	←	←
1990	←	←	←	←	←	←	←	←	→
1991	←	←	←	←	←	←	→	→	←
1992	→	→	→	→	←	←	→	→	←
1993	→	→	→	→	→	→	→	→	←
1994	→	→	→	→	→	→	→	→	→
1995	→	→	→	→	→	←	→	→	←
1996	←	←	←	←	←	→	←	←	←

Figure 1. Graphical Analysis of the Movements of the Beveridge Curve.

Figure 2. The National Beveridge Curve.

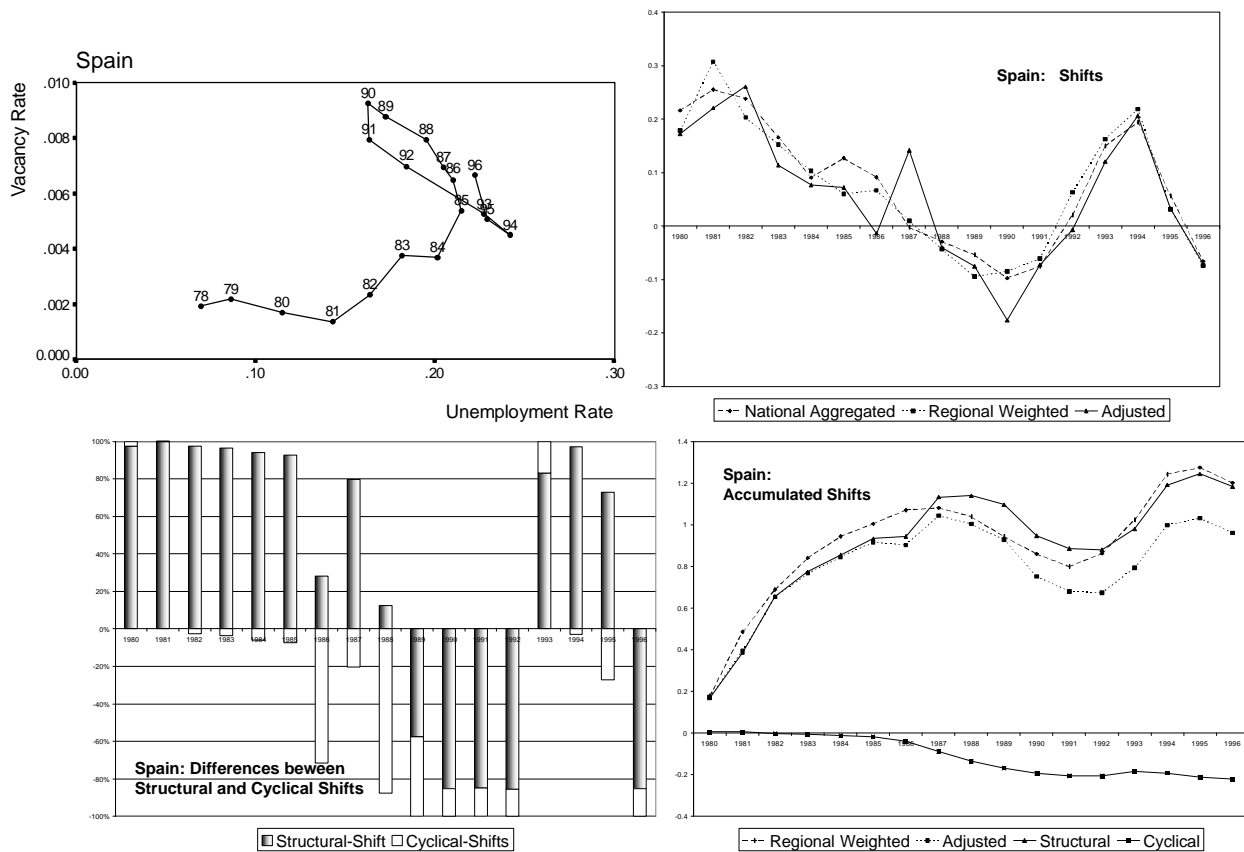


Table 4. Regional Shifts Explanatory Factors.

Dependent Variable: Regional Estimated Shifts

Variable	Coefficient	Std. error
s	29.48	12.04
lus1	3.32	0.21
mmr	1.28	0.54
g_gva	-0.82	0.44
wus	-0.52	0.37
Andalucía	-0.02	0.07
Aragón	1.6	0.06
Cataluña	0.28	0.06
Castilla León	0.34	0.06
Castilla La Mancha	0.36	0.06
Comunidad Valenciana	0.18	0.06
Galicia	0.48	0.07
País Vasco	-1.02	0.08
R2	0.96	
Obs.	144	
Wald	260.33 [0.0000]	
m1	2.4619 [0.0150]	

Table 5. National Correlation Analysis.

Spain	Correlation
National Aggregated with Regional Weighted	0.99
National Aggregated with Adjusted	0.96
Regional Weighted with Adjusted	0.96
Structural Adjusted with National Aggregated	0.98
Cyclical Adjusted with National Aggregated	-0.61
Structural Adjusted with Regional Weighted	0.96
Cyclical Adjusted with Regional Weighted	-0.56

Table 6. Regional Correlation Analysis.

	Adjusted with Regional	Regional with Structural	Regional with Cyclical	Structural Weigh
	(1)	(2)	(3)	2 /(2 + 3)
Andalucía	0.89	0.86	-0.66	0.57
Aragón	0.87	0.97	-0.62	0.61
Cataluña	0.76	0.86	-0.26	0.77
Castilla León	0.96	0.94	-0.55	0.63
Castilla La Mancha	0.92	0.88	-0.53	0.62
Comunidad Valenciana	0.74	0.75	-0.39	0.66
Galicia	0.78	0.92	-0.82	0.53
País Vasco	0.78	0.77	-0.57	0.57

Figure 3. Graphical Analysis of Structural and Cyclical Effects.

Figure 4. Regional Estimated Shifts and Adjusted Shifts

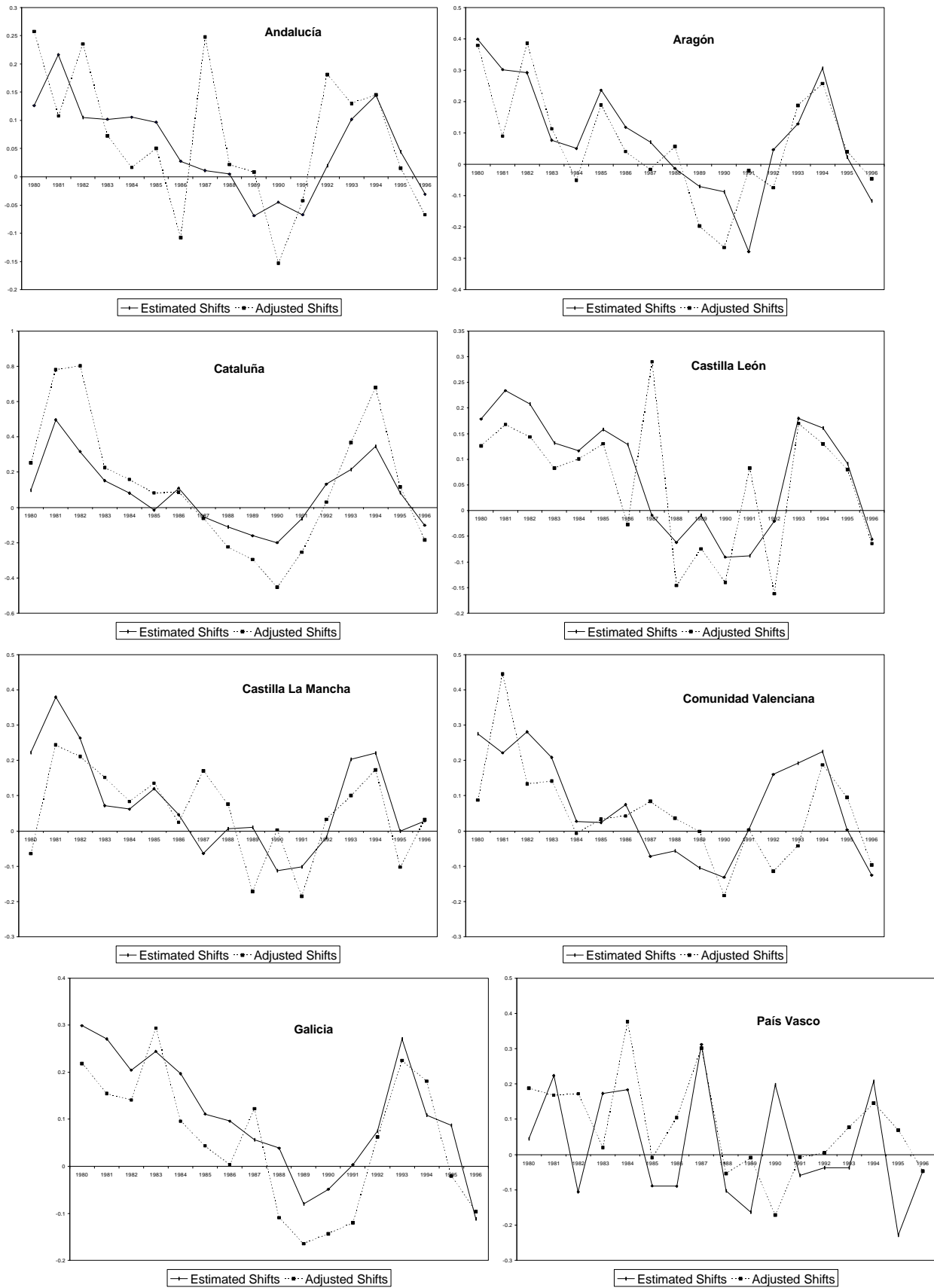


Figure 5. Regional Distribution between Structural and Cyclical Shifts.

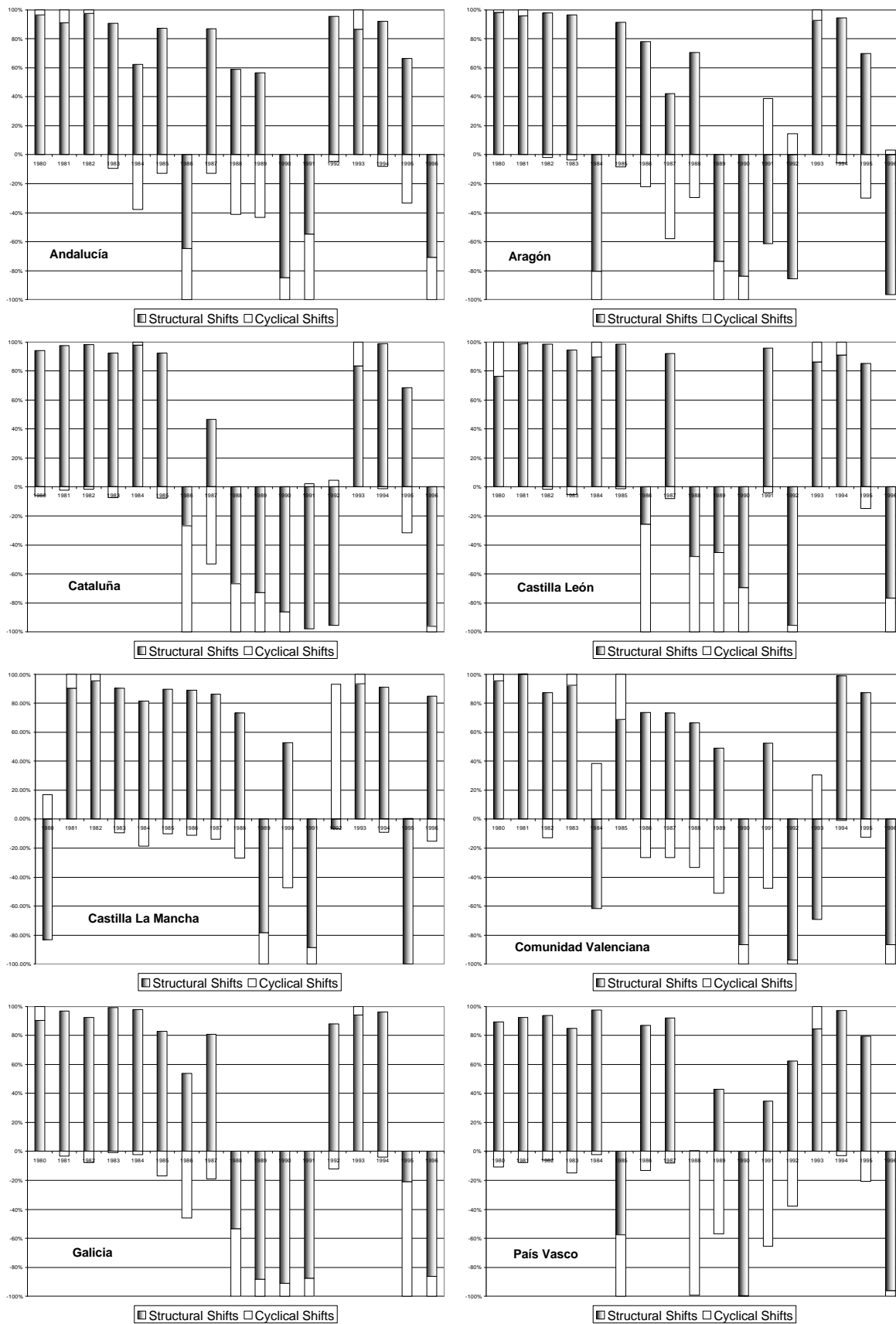


Figure 6. Regional Accumulated Shifts

