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Abstract

This paper empirically examines the extent to which regions within the *same country* differ in their exposure to a common currency and as a result to a unique monetary policy. We estimate an Optimum Currency Areas (OCA) index based on the main theoretical macroeconomic determinants. We use data from the Spanish regions for the period 1992-1998 and Germany is taken as a *numeraire*. Results allow us to forecast whether sharing the same currency is equally suitable for regions that differ in the relevant OCA determinants, despite being equally exposed to shocks at the national level. The results suggest three main findings. First, relatively large, more diversified and open regions are best prepared to share the same currency. Second, the real exchange rate differs significantly between Spanish regions although these differences remain smaller than those between countries. Third, whereas the regional degree of synchronisation with the European Union (EU) business cycle is strongly associated with the OCA index, differences in fiscal performance and the unemployment rate were poor predictors of the currency area index performance.

Key words: optimum currency area, regional integration and Spanish regions.
JEL: F33, F15.

1. Introduction

Economic and monetary integration has a significant impact on the structure and the allocation of resources among countries and regions within countries. In Europe, monetary integration may be characterised by a rise in the regional specialisation (KRUGMAN, 1993, 1991, 1990), an increase of trade intensity between regions involved (FRANKEL AND ROSE, 1997; ROSE, 2000), and finally, by a stronger business cycle synchronisation resulting in the inability to use country specific instruments to overcome regional asymmetries. In a setting like the one described there is a general concern that the uneven distribution of the macroeconomic costs and benefits of the EMU may exacerbate regional inequalities both *between* and *within* European Union (EU) member states (NIJKAMP AND WANG, 1999). Theoretical findings (MARTIN, 1999; PALUZIE, 2001) and empirical evidence (ESTEBAN AND VIVES, 1994) suggest that as a result of differences in productivity, trade intensity and especially asymmetries in the distribution of transaction costs, regional inequalities will increase. ALBEROLA and MARQUES (2001) using data on Spanish regions show that there are still persistent price variations across regions within a single country, mainly due to dissimilarities in labour productivity and income between these regions. Similar predictions hold when labour productivity is analysed in the EU (CUADRADO ROURA ET AL, 2000).

Although the building process of the EMU has remained at the country level, the expected regional effects within an EU country cannot be dismissed. Some studies show that regions within some EU countries are not integrated areas. RAYMOND and GARCIA (1998) use an association analysis of the cyclical component of the regional GDP to show that Spanish regions appear to be “heterogeneously integrated”. IAMMARINO, S. and SANTANGELO, G.D, (2000), show detectable heterogeneity between Italian regions in their capacity to attract foreign capital and in competitiveness. As a result we would expect significant differences in the regional capacity to cope with the adjustment requirements of a common currency despite being part of the same country. This could translate into widespread differentials in relative price variability and in turn in the real exchange rate variability between regions within a country.

This paper examines whether there are significant differences in the way in which regions within a country will be able to support stable real exchange rates. The establishment of a common currency entails that nominal exchange rate cannot be used as a policy instrument to improve regional competitiveness artificially. Real exchange rate variability (resulting from price variability) thus contains relevant information on the capacity of a region to maintain an irrevocable fixed exchange rate arrangement, such as a monetary union. The main issue tackled in this paper is the following: is the EMU equally suitable for regions within a single country? What are the determinants of EMU performance at the regional level? Can we extrapolate the same determinants used at the national level to regions *within* a country which in turn, have been exposed to the same economic policies for a large period of time? To deal with these questions we rely on the optimum currency area (OCA) framework as it has been shown to be an appropriate model for predicting real exchange rate at the country level (BAYOUMI and EICHENGREEN, 1997).

The EMU has attracted much attention in the academic literature worldwide, which has attempted to predict the regional effects of monetary arrangements in different geographic areas. Nevertheless, major difficulties arise when it comes to its operationalisation of an optimum currency area (OCA) (DE GRAWVE and VANHAVERBEKE, 1993). A first type of empirical study compares the EMU with the US as a benchmark for an optimum currency area. Alternative studies use data from a set of specific countries (FRANKEL and ROSE, 1997), or they pool international country-based data to determine the "optimum" number of OCA's in the world (ARTIS, M; KOHLER, M and MÉLITZ, J (1998). Prior empirical evidence assessed on a country basis shows that a relevant set of OCA determinants explains exchange rate variability at the national level (BAYOUMI and EICHENGREEN, 1997; COSTA AND BATALLA, 1999). Some recent studies – conducted after the implementation of the Euro as a common currency - deal with the expected effects on output disturbances of a change in the interest rate. TREMOSA and PONS (2001) employ a VAR methodology to show that a change in the interest rate has an asymmetric impact on the different EU countries. It should be noted, however, that previous research is based on the assumption that pre-existing countries should be the exclusive actors of currency areas. This is a strong assumption indeed and one that may not always be sustainable in the light of the OCA theory. Although a common currency replaces the pre-existing national currencies, there tend to be noticeable historical variations within a single country. After the implementation of EMU, however, the

existence of regional differences becomes more relevant as it is anticipated that the national component of exchange rate variability will be reduced. Studies pooling country level data together to discover country specific conditions may therefore hide strong contrary regional economic effects, which are artificially hidden when data is not regionally desegregated.

Given that some shocks are sector specific, diversification is a desirable characteristic for regions as it may help to reduce regional shock asymmetry (KENEN, 1969). Prior empirical evidence shows that although national specific cycles are more important than sector-specific cycles in most countries, in Spain, Belgium and the Netherlands both types seem to be of similar importance (RAMOS ET AL, 1999). Accordingly, the establishment of EMU does not eliminate regional-specific asymmetries within countries. Significant differences might be found across regions in maintaining price stability arrangements, although wages are centrally determined which may therefore lead to differences in the relative prices of regions within a country (ALBEROLA and ESCRIBANO, 2001). Therefore, it may be worth analysing the determinants of real exchange rate stability from a regional rather than a national perspective.

The whole paper is fully empirical and presents three main results. First, we find support for an application of the OCA theory at the regional level within a country. Secondly, Spanish regions appear to show significant differences in their capacity to cope with a European common currency, although regional differences are lower than those observed between European countries in BAYOUMI and EICHENGREEN (1997). Third, the OCA index is strongly associated with the degree of synchronisation with the EU business cycle and economic regional size, and to a lesser extent associated with the degree of openness.

The paper is organised as follows. Section Two introduces some theoretical structure and shows the preliminary empirical analysis undertaken to guide the study. In Section Three we describe the data and empirical methodology applied. Section Four sets out the empirical results and contains some concluding remarks in which regional policy implications are discussed.

2. Regional macroeconomic determinants of a currency area

The establishment of EMU implies that the nominal exchange rate is no longer an available economic policy instrument for adjusting the real exchange rate. However, the compound consequence are the associated reductions in transaction costs and in the uncertainty associated with exchange rate risks, and other effects which follow from this such as a rise in bilateral intra –EU trade (FRANKEL and ROSE, 1997).

From an overview of the economic theory, the appropriate conceptual framework to analyse whether there are differential effects on regions within the same country of joining a currency union is the theory of the optimum currency areas (OCA). This theory has been empirically tested and predicts successfully the variability of exchange rates between currencies in several specific economic areas (BAYOUMI and EICHENGREEN, 1988). Some criticism arises when judging the suitability of a monetary on the basis on the criteria that follow the OCA theory. FRANKEL AND ROSE (1997, 1998) argue that in the event of monetary union in Europe, the structure of these economies is likely to change, since the elimination of nominal exchange rate variability will increase trade, which will in turn lead to a larger correlation between business cycles. This was also pointed out in the famous European Commission study entitled “One Money, One Market” (EUROPEAN COMMISSION, 1990). However, although larger trade links might lead to a greater synchronisation of business cycles, they might simultaneously influence specialisation, as KRUGMAN (1993) points out. The observation that higher trade integration results in a higher business cycle synchronisation, might be the combined result of both specialisation and integration effects, showing a larger effect of the second. However, this doesn’t guarantee that in this feature will not shift in the future. Additionally, regions differ in their capacity to take advantage of the greater trade intensity resulting from the economic integration, therefore an increase in trade might enhance economic asymmetries between regions. Finally, empirical evidence at the regional level in Spain (ESTEBAN and GUAL, 1999) shows that although trade links with the European Union are large in most Spanish regions, the degree of synchronisation of is still noticeably small for some of them.

The analysis of the OCA determinants in Europe is nonetheless informative about the relevant structural limitations associated with the set up establishment of a monetary area. Factor mobility was historically the principal determinant to be examined (MUNDELL, 1961). As previous studies show, labour mobility is very low within the European Union and is subject to the strong limitation of cultural and linguistic barriers (BEGG, 1995). Capital mobility may function as an adjustment mechanism under the restrictive assumption of constant returns to scale (BAYOUMI and EICHENGREEN, 1993). However, OCA microeconomic determinants such as wage rigidity and labour mobility have been excluded from our analysis. This paper concentrates on the macroeconomic determinants instead. Microeconomic determinants may, in certain circumstances, play a role at the regional level. However, nominal wages are still centrally determined and labour mobility is too small to play a significant role in predicting real exchange rate variability in Spain. As in the rest of the European Union (EU), prices and salaries in Spain are not flexible enough to be used as a policy instrument in the short run (VIÑALS and JIMENO, 1996). Evidence from Spain shows a high real wage rigidity at the regional level (VILLAVERDE, 1999) and as a result of both social and economic factors, regional mobility in Spain has been declining since the 1970s (BENTOLILA, 1997).

As noted, in this paper we concentrate in the macroeconomic benefits of OCAs. As a result of the literature revision four relevant determinants that might influence the suitability of a region to become exposed to a common currency¹. First the degree of regional specialisation or product diversification is typically a variable that might influence the ability of regions to counteract sector specific shocks (KENEN, 1989). Second, bilateral trade and openness determines the capacity of regions to benefit from reductions in transaction costs (MCKINNON, 1963). Third, the existence of shock asymmetries once a currency area is set up, no counter-cyclical monetary policy can be applied (BAYOUMI and EICHENGREEN, 1993) and, finally a fourth determinant is economic size (MUNDELL, 1961).

According to the OCA theory output disturbances, diversification and trade intensity may be an important predictor of exchange rate variability. We use cluster analysis to classify

¹ See BAYOUMI AND EICHENGREEN (1988) for a revision of the OCA macroeconomic criteria.

regions according to these three predictors as a way to guide the further interpretation of results.

a) *Symmetry with the EU business cycle*

Regions differ in their business cycles for two main reasons: regional specialisation and national economic policies. The first refers to the mix of products in which each region specialises, and hence the sensitivity to industry specific shocks. The second is concerned with differences in economic policies, which are responsible for regional fluctuations at the *country level*. ESTEBAN and GUAL (1999) compared the share of the regional business cycle explained by the European component across the 17 Spanish regions. Empirical analysis shows that the regional business cycle of the Spanish front-runner regions (in particular Catalonia, being open and highly industrialised, and Madrid, as the administrative centre) is mostly driven by the German business cycle. Whereas the cyclical component of the German business cycle explains more than 80% of the Catalan or Madrid business cycles it explains less than 20% of the La Rioja or Cantabrian business cycle. This implies that Catalonia and Madrid are supposedly the regions, which are least sensitive to *country specific shocks* (See Table 1). Additionally, in 1999 the two regions produced 20% and 17% of the Spanish GDP respectively. Other regions that exhibit a large synchronisation relative to the EU business cycle are those that are either relatively more open to trade or are largely diversified. If we focus, however, on those regions that are less diversified and more closed to trade we find a reduced share of the business cycle is explained by the EU component. This result confirms that the theoretical framework employed yields some predictive power.

b) *Diversification and openness*

As Table 1 shows, the share of manufacturing production as a proportion of total GDP shows strong regional differences. However, the OCA theory establishes that specialisation might play a very important role since a highly specialised region is more likely to be affected by sector specific shocks. Regions such as The Canaries and Balearic Islands are more specialised as services account for more than three-quarters of the overall employment. In conjunction with specialisation, the openness to trade with the rest of the EU is another variable that should theoretically be relevant. As a result differences in the degree of openness

might be determinants in the capacity of a region to benefit from reductions in transactions costs arising from monetary union. Spanish regions can be classified according to these criteria using cluster analysis. Table 2 shows the result of a preliminary cluster analysis of two main variables employed here: the degree of openness and the degree of specialisation. This classification (although partial) shows perceptible differences in terms of the degree of openness and diversification across Spanish regions. Diversification has been measured using the Herfindahl index of specialisation using employment data, and openness has been computed on the basis of imports and exports as a share of the total regional GDP (see Table 2). This empirical feature can be viewed as prior evidence of how heterogeneous the benefits from the EMU might be.

c) Size

The size of a region is purported to have an influence on the level of benefits accruing to a region as a result of EMU. Essentially, it claimed that being small magnifies the benefits noted above. When considering size at the *regional* (rather than country) level, opposite results may be expected, however, because the larger a region is the more likely that the region will influence national economic policy. Additionally, it might be that smaller regions might tend to specialise more and as a result might be more prone to suffer regional specific shocks. Moreover, large regions within a country are nevertheless small relative to the overall size of the EU, and as a result we might find that differences are too small to be empirically significant. For instance, whereas the Catalan GDP was 20% of the Spanish GDP in 1999, it would be only 6.5% of the German GDP². Finally, taking account of the economic size of regions may eliminate the common measurement bias introduced when measuring relative trade.

² Therefore, if Catalonia were a single country instead of a region, then it would be qualified as a small country in comparative terms.

3. Empirical methodology

Data

The data employed were collected from two different sources. Regional data on GDP at constant prices, industrial production, consumer price index and employment were obtained from the regional database of the Spanish National Institute of Statistics (INE) so-called *Contabilidad Regional de España*. From this data we computed three main variables that were used in the OCA index estimation: (a) the diversification indices, (b) a variable of output disturbances and the (c) size index of each Spanish region. Data on regional trade and exchange rates have been obtained from the *Spanish Institute of Foreign Trade* (ICEX). From this dataset it was possible to obtain relative trade indicators, and in conjunction with the consumer price index, the real exchange rates for the whole period. . The period analysed is 1992-1998, since this period is the relevant one from the monetary convergence perspective for two main reasons. First, because it refers to the pre-accession period to the EMU, it is therefore worthwhile examining this period rather than going further back, although this entails a smaller data set. In addition, is too soon to have data on the post accession period. Second, because convergence plans were approved annually by each member state and involved both the central government and regions, results obtained might be showing how different regions prepare themselves to become less dependent on the national currencies.

The explanatory variable on which the OCA index was based was the variability of the real exchange rate. The index was obtained using regression panel data analysis using data for all Spanish regions. The country that was taken as a *numeraire* to estimate the suitability of a monetary union was Germany as a proxy of the so-called “EU core”. An alternative method would have been to look at EU averages, however this data tends to contain more noise than using a single country as a comparative reference.

The methodology used implicitly assumes that the purchasing power parity law (PPP) plays a role at the regional level. PARSLEY and WEI (1996) show a higher robustness of the PPP law at the regional level despite the finding that most factors explaining prices variation at the country level (*i.e.* nominal exchange rate and tariffs) play a very limited role now, while other determinants might be relevant instead. Real exchange rates were computed for each

region as the relevant variable from which to measure currency union integration. The reasons for using these variables are various. First, since a common currency mainly leads to price stability, a convergence index should include real rather than nominal exchange rates. Second, following BAYOUMI AND EICHENGREEN (1997), the variability of nominal and real exchange rates is the result of the choice of the exchange rate regime. Therefore if a monetary union implies freezing exchange rate between countries (and hence regions) involved, the historical exchange rate variability would be the appropriate endogenous variable to use in our model. Bilateral exchange rates were computed as:

$$e_{i1} = 1/\alpha \left[\sum_{i=2}^n (\hat{P}_i + \hat{E}_{i1} - \hat{P}_1) \right] \quad (1)$$

where e_{i1} refers to real exchange rate, $\hat{P}_i$ are the perceptual changes in the price level between regions $i=1,2,\dots,17$ with German changes in the price level $\hat{P}_1$, E_i refers to the change in the bilateral nominal exchange rate and finally α is an adjustment term referring to the share of non tradable goods in the economy for each region. Differences in price variation levels between regions might respond to several biases. In this paper we control for demand pressure differentials between regions by looking at differentials between the Spanish average inflation. Additionally, following ABEROLA AND MARQUES (2001) the composition effect resulting from different consumption baskets in different Spanish regions was controlled for, with the evidence showing no significant influence on results.

The OCA index estimation

The OCA theory examines those variables that make exchange rates stable and thus those regions that show fewer real exchange rate disturbances may be the most suitable for a monetary union. As a result, the explanatory variables included in the model are the following four. First, ‘*asymmetric disturbances*’ as measured by the standard deviation of the differences in output in logarithmic terms. Second, the ‘*degree of diversification*’, accounting by the commodity composition of production. Third, the degree of ‘*relative trade*’ with respect to

the EU core (e.g. Germany), which allows for measuring trade benefits and, finally a measure of ‘*relative size*’ that reflects the fact that small countries would benefit most from the EMU.

The model is empirically specified as follows:

$$SD(e_{ij}) = \alpha + \beta_1 SD(\Delta y_i - \Delta y_j) + \beta_2 DIV_{ij} + \beta_3 TRADE_{ij} + \beta_4 SIZE_{ij} + \mu$$

(2)

where i and j refers to Germany and the specific Spanish region respectively. The endogenous variable refers to real regional exchange rate variability. As explained before, the exogenous variables are four (Table 3 contains the definitions of all variables). The estimation method is the standard OLS using panel data analysis estimated with and without controlling by time and individual effects. Essentially, we try to capture all the OCA determinants in a unique equation. The data did not show significant multicollinearity problems and the estimation was corrected by the existence of heteroscedasticity.

4. Results

Table 4 shows the estimates of real exchange rates between Germany and each of the Spanish regions. As is shown, there is a large variability between Spanish regions in the real exchange rate at the regional level, which results from differences in relative prices and confirms that price behaviour is not homogeneous in a monetary union. Estimation results from equation (2) are shown in (3) for the period 1991-1998. Standard errors are set into the parentheses:

$$\begin{aligned}
 SD(e_{ij}) = & 0.028 + 0.068SD(\Delta y_i - \Delta y_j) + 0.06DIS_j - 0.113TRADE_j - 5.4 \times 10^{-5} SIZE_j \\
 & (0.014) (0.024) \quad (0.034) \quad (-0.022) \quad (-2.5 \times 10^{-5})
 \end{aligned}
 \tag{3}$$

$$N=136, \text{ Adj} - R^2 = 37.4 \text{ S.E} = 0.0002, F(4,114)=14.4$$

Results confirm the initial predictions and all coefficients are significant at least at an acceptable 5-10% significance level. A rise in either output disturbances or in the degree of regional specialisation is expected to increase real exchange rate variability. Higher trade linkages are influential as they reduce the exchange rate variability by 11%. Interestingly the role of size has an opposite coefficient to the one that we would expect from the OCA theory as it shows a small negative sign. This result is not entirely strange, however, and in fact results from an inverse Balassa–Samuleson hypothesis at the regional level (ALBEROLA and MARQUES, 2001). Prices tend to increase less in regions that enjoy higher income and productivity. Explanations given for this phenomenon are several; for example the centralised setting of wages is a possible factor. This result demonstrates that the larger the size of the region within Spain, the smaller the exchange rate variability.

Table 5 shows the OCA index. This was obtained as follows: trade variables were forecast by running regressions for successive moving averages of eight year periods 1985-1992, 1988-1995 and 1990-1998. The dependent variable was necessary to construct projections of the independent variables. To forecast asymmetric shocks, we computed the

standard deviation of the change in the log of the relative output between Spanish regions and Germany for a ten year period centred in the current year and regressed to a time trend for the period 1985-1992. To extrapolate similarity structures we used the two most recent years. For other variables we used actual data. Figure 1, shows the movements between 1992 to 1998. There are two regions - Catalonia and Madrid - which appear to show relatively large movements in monetary terms. However, the monetary integration index suggests that there have not been significant changes in regional positions from 1992 to 1998. This result is consistent with other empirical studies being undertaken which examine convergence in factor prices (WEBBER, 2001), where it was shown that the convergence process in factor prices did not accelerate after 1992.

These results provide some important insights into the determinants of monetary convergence between regions. From an OCA standpoint, it is interesting to see whether predictions using this index would be consistent with other work being done using alternative methodologies.

Table 6 displays the correlation coefficients for the whole period between the OCA index and the relevant variables with which an association was expected. The OCA index shows a strong association with the business cycle synchronisation and regional size whereas openness with the EU is significant just at the 10% significance level. This finding is consistent with ALBEROLA and MARQUES (2001). The correlation rate with the share of the regional business cycle explained by the EU cycle is -0.67 ($p=0.004$) and the correlation rate with regional size is -0.701 ($p=0.002$). Moreover, the association between openness towards the EU is -0.37 ($p=0.1$). This is also shown in figure 2. Business cycle synchronisation appears to be a good predictor of the regional OCA position. Accordingly, several studies undertaken using business cycle synchronisation (ARTIS AND ZHANG, 1999) might lead to similar results.

We cannot extrapolate our results to a consideration of EMU overall since sources of real exchange rate variability and relative price variation might be markedly different between Spain and the rest of the EU. However, differences in the degree of economic integration with the EU between Spanish regions suggest that substantial differences will be found in the adaptation process to a common currency across countries. Although the integration process

has been built up from country units, regions do play an important role since those regions that adopt similar common economic habits and patterns are presumably in a better position to counteract heterogeneous economic shocks.

5. Concluding remarks

A reduction in the barriers to trade and the rise in factor mobility might lead national borders to exhibit a lower economic significance as the process of European integration deepens (FATAS, 1997). This paper is intended to be a contribution to the study of the regional dimension of the monetary union in Spain, a southern European country that provides an interesting application for such investigations.

This paper explores three separate related questions. First, we have tested the implementation of the OCA index at the regional level and in particular the existence of real exchange rate differences between Spanish regions. Second, the determinants of the exchange rate variability at the regional level have been identified, with a discussion of the facts and features on the basis of existing literature. Finally, from results obtained the study identifies those relevant variables that are associated with OCA predictions.

Within a specific country, regional shocks may differ according to asymmetric business cycles, trade linkages and industry specialisation. We find that the sustainability of a "fixed-for-ever" exchange rate may differ between regions within a single country. When the OCA theory is applied, results were consistent and it produced reliable predictions. Regions that are characterised larger relative to the country, that's show strong trade links, large diversification and strong business cycle synchronisation with the EU are those regions that are theoretically expected to performed better than others in currency integration terms.

Our results have shown that OCA theory is helpful in predicting real exchange rate variability not only *between* countries but also at a regional level within a single country, even though some results had to be reinterpreted. Regions which are part of the same country, although they may be extremely heterogeneous, are expected to be more integrated. Real exchange rate stability is found to be higher in richer regions and those, which are relatively more, open to trade. Significant regional differences were identified when clustering regions across certain OCA determinants. These differences were all partially integrated in an OCA

index which suggested that in the case of Spain, the two front runner regions, Catalonia and the Madrid area, seem to have achieved a large currency area homogeneity during the convergence period 1992-1998. Divergence (albeit small) in regional relative prices and real exchange rates is in line prior research. Our results were fairly consistent with ALBEROLA and MARQUES (2001) as real exchange differentials seem to be persistent across Spanish regions, although here we introduced other issues as the role of non-tradable goods when calculating price differentials. Further, the regional OCA index is highly associated with the synchronisation with the EU business cycle and moderately with rates of openness.

The public policy implications of these results are important from both a regional economics and a monetary policy perspective. If the heterogeneity noted between Spanish regions is replicated within EU countries and labour market rigidities remain, then fiscal redistribution adjustments will be the sole instrument available to counteract the consequences of asymmetries in shocks at the country level resulting from a unified monetary policy.

In the light of the OCA theory, those regions that exhibit significant barriers to monetary integration should implement a series of policy instruments to overcome possible asymmetric shocks that arise, in particular due to heterogeneity in EU regions. As NIJKAMP AND WANG (1999) argue, a monetary union, which is non-Pareto-optimal due to unmet OCA determinants, may exacerbate regional inequalities. As far as fiscal policy is the sole remaining policy implemented at the level of EMU member states, EU states fiscal policy instruments are expected to play an active role in smoothing regional inequalities at the country level sometimes leading to very significant fiscal imbalances (CASTELLS ET AL, 2000). In Spain as in other EU countries, a large part of public expenditure is still centralised and regional redistribution schemes hide strong fiscal imbalances between the regions. Thus it is no coincidence that fiscal imbalances between regions are likely to benefit the most from the EMU (CASTELLS, 1998). Therefore, an additional justification for a regional analysis of European monetary union is that cross-country analyses may not capture the relevant regional differences, which exist within EMU countries.

The rise of regional inequalities is expected to bring political issues to the fore in addition to economic considerations. Front runner Spanish regions show significant fiscal imbalances. Recent estimates indicate that Spanish front runner regions such as Catalonia

show an annual fiscal deficit of around 8% (CASTELLS ET AL, 2000). On the one hand, the withdrawal of nominal exchange rates as a way to artificially manipulate regional asymmetries and the adoption of an EU determined monetary policy leaves EU member states with fiscal redistribution as the unique public policy instrument available to counteract regional asymmetries resulting from EMU. On the other hand, however, this scenario might encourage front runner regions to play a more active role in the EU decision making process.

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Table 1. Basic OCA-threshold criteria

	Manufacturing sector in total GDP (1994)**	% European Business Cycle*
Andalucia	0.17	68
Aragón	0.30	41
Asturias	0.33	59
Balearic Islands	0.10	34
Canaries	0.11	-
Cantabria	0.27	19
Castilla-León	0.27	23
Castilla-La Mancha	0.26	74
Catalonia	0.33	83
Valencian Community	0.28	58
Extremadura	0.19	28
Galicia	0.23	56
Madrid	0.19	82
Murcia	0.23	55
Navarra	0.39	53
Basque Country	0.39	57
La Rioja	0.33	18

*ESTEBAN AND GUAL (1999).

** Mean of EU-15 was 0.19 in 1994.

Table 2. Cluster analysis of Spanish regions according to diversification and openness ratios with the EU

	Strongly Open	Moderately Open	Weakly open
Specialised	Extremadura	Madrid	Balearic Islands, Canarias
Other	Andalucía, Murcia, Castilla La Mancha	Valencian Community, Castilla León	Cantabria, Asturias
Diversified	Catalonia, Navarra, Aragón	Basque Country, Rioja, Galicia	

Table 3. Variables employed

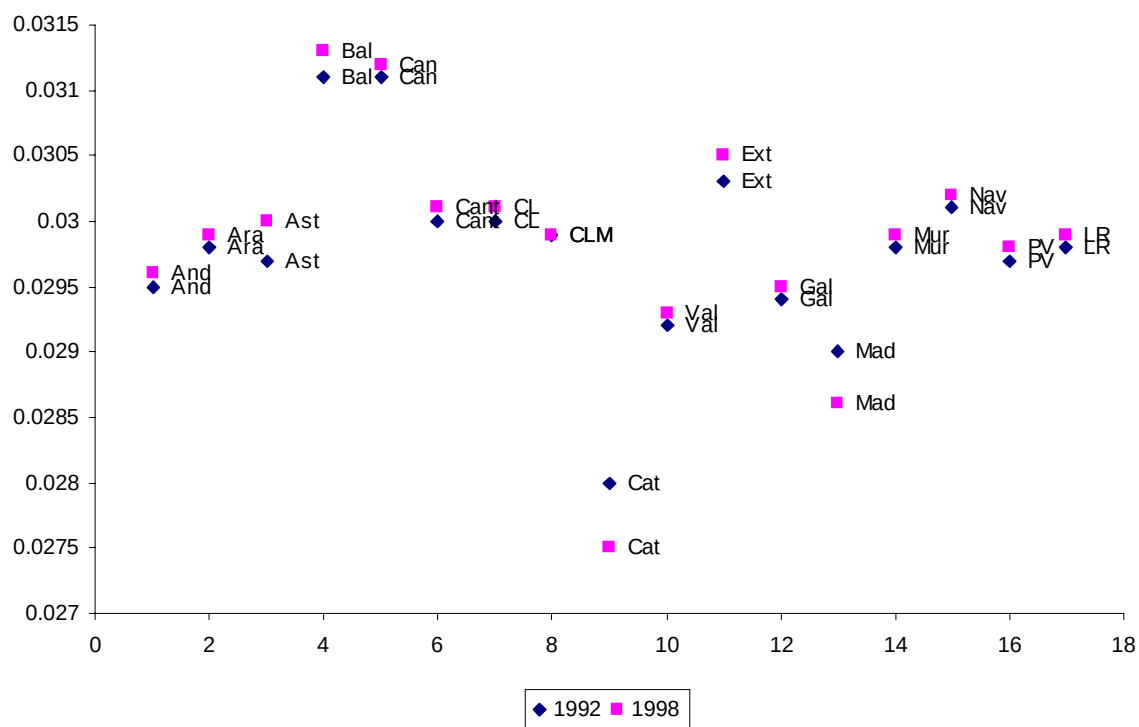
Variable	Description
Exchange rate variability $SD(e_{ij})$	Standard deviation of the change in the logarithm of the annual real exchange rate between Germany and each Spanish Region.
Size $SIZE_{ij}$	Arithmetic average of the log of GDP in ECU's of each Spanish region with Germany.
Diversification DIV_{ij}	Sector composition in the output of the Spanish regions and Germany using measures using the <i>Herfindalh</i> index.
Output disturbances $SD(\Delta y_i - \Delta y_j)$	Standard deviation of the change on the log of the relative output between Spanish regions and Germany.
Bilateral trade $TRADE_{ij}$	Average value of exports scaled by GDP of Spanish regions and Germany

Table 4. Adjusted real exchange rate Spanish Peseta/ German DM

	Period 1992-1994	Period 1995-1998	Total 1992-1998
Andalucia	91.17	104.13	98.57
Aragón	93.19	106.58	100.84
Asturias	90.10	102.95	97.44
Balearic Islands	86.49	99.52	93.94
Canaries	92.17	105.48	99.78
Cantabria	88.93	102.03	96.42
Castilla-León	93.25	106.73	100.95
Castilla-La Mancha	89.66	102.53	97.01
Catalonia	84.57	96.35	91.30
Valencian Community	85.72	98.37	92.95
Extremadura	96.97	110.63	104.77
Galicia	90.11	102.97	97.46
Madrid	91.14	103.71	98.32
Murcia	89.65	103.28	97.44
Navarra	106.89	122.43	115.77
Basque Country	84.49	97.05	91.67
La Rioja	86.45	99.25	93.76

Note: estimated are arithmetic averages for each period considered.

Figure 1. Movements in the OCA index between 1992 and 1998



Note: We use the first letters of each region name, i.e. Catalonia is referred to as Cat and Madrid as Mad, except for composite names that we use the two initials.

Table 5. Yearly OCA Index versus Germany (predicted values)

Region	1992	1995	1998
Andalucia	0.0295	0.0297	0.0296
Aragón	0.0298	0.0300	0.0299
Asturias	0.0297	0.0300	0.0300
Balearic Islands	0.0311	0.0313	0.0313
Canaries	0.0311	0.0312	0.0312
Cantabria	0.0300	0.0300	0.0301
Castilla-León	0.0300	0.0301	0.0301
Castilla-La Mancha	0.0299	0.0279	0.0299
Catalonia	0.0280	0.0293	0.0275
Valencian Community	0.0292	0.0305	0.0293
Extremadura	0.0303	0.0299	0.0305
Galicia	0.0294	0.0296	0.0295
Madrid	0.0290	0.0291	0.0286
Murcia	0.0298	0.0300	0.0299
Navarra	0.0301	0.0302	0.0302
Basque Country	0.0297	0.0298	0.0298
La Rioja	0.0298	0.0299	0.0299

Table 6. Correlation coefficients with relevant variables

Variable	Coefficient	(s.e)
Share of total EU Cycle	-0.67**	(0.004)
Diversification index	-0.27	(0.200)
Size	-0.72**	(0.002)
Openness rate with EU	-0.36*	(0.100)
Unemployment rate	0.02	(0.921)
Debt as a share in GDP	-0.32	(0.214)
Deficit as a Share in GDP	-0.32	(0.223)

**Significant at a 5% level or less.

* Significant at a 10% level.

Figure 2. Association between the business cycle synchronisation and the OCA index

