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Economic Integration and Regional Business Cycles: Evidence from the Iberian regions

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Abstract

This paper provides evidence of the positive impact of economic integration on EU regions' business cycles convergence by focusing on two neighbouring countries: Spain and Portugal. We show that while a rise in cross-country business cycle correlation has also been experienced by other European countries, it has been relatively more pronounced for Iberian regions. Econometric evidence suggests that the existence of an administrative border, the economic size of regions and their industrial structures can explain a substantial proportion of regional cycles.

Keywords: Economic Integration, Business Cycles, European Regions, Border Effect, Spain, Portugal

JEL Classification: E32, F15, R110

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Introduction

How far can European integration bring the interdependence of national economies? Does the intensification of trade and capital movements influence the pattern of shocks across EU countries? Recent economic literature has provided empirical results on these issues by comparing intranational with international business cycles. For example, Bayoumi and Eichengreen (1993), Wynne and Koo (1997) and Hess and Shin (1997) compare the economic fluctuations among U.S. states and European countries. The main hypothesis of these studies is that intranational business cycles provide natural case studies of economic co-fluctuations between (almost) frictionless regions. Accordingly, regions within the same country tend to have higher business cycles correlations since they are highly integrated. In a recent study, Clark and van Wincoop (2001) have extended this approach in order to compare business cycle correlations of U.S. states and EU countries and to study the determinant of the so-called *border effect*, which is represented by the difference between the average within and cross-countries business cycles correlations[3].

The present paper brings the analysis a step forward by arguing that the dynamics of regional business cycles may condition the way national economies adjust to economic integration. In particular, we follow Fatás (1997) by considering that economic integration may have consequences for the pattern of business cycles that may be easier to identify at a regional rather than a national level. We consider in addition that integration may affect regions along different paths. The business cycle of some regions may converge more than others because of historical links, proximity, or cultural affinities. Initially, these *convergence nests* may indeed be fostered by more global processes such as monetary or customs unions, because

[3] The notion of *border effect* in business cycle studies has to be considered in contrast to the one generally used by trade economists. For example Mc Callum (1995) in a seminal work on border effects in trade uses a gravity model to study the determinants of trade between Canada and the US, the existence of a border effect being represented by the surplus of intra-country trade compared to inter-country trade.

they involve profound changes affecting significantly the movement of persons, capital, goods and services. Economic integration may then have consequences for neighbouring regions that would have been less likely without it. The first aim of this paper is to test this hypothesis by considering the special case of two neighbouring countries: Spain and Portugal. Both countries have undergone a profound integration process largely encouraged by their accession to the European Community in 1986 and the greater openness to international trade and investment that followed. We show in particular that this process has lead to a greater interdependence between these two economies.

The second aim of this paper is to test whether trade and industrial specialisation can explain the pattern of business cycles of Iberian regions. Our analysis lies on the framework developed by Mundell (1961) and Kenen (1969). The later in particular advocates that sectoral specialisation may play an important role in determining regional economic fluctuations. If shocks are mainly sector-specific, only those regions or countries with similar industrial structure can experience symmetric business cycles. To this respect, Krugman (1993) suggests that the US states may provide a good example of what can happen in Europe with increased specialisation among European countries given that the US states tend to be more specialised (and are also more integrated) than European countries[4]. In addition the economic integration process may modify the pattern of sectoral specialisation since the reduction of barriers to trade can encourage the relocation of industries according to the relative strength of comparative advantage and agglomeration economies, see Fujita et al (1999). It follows that the influence of the industrial structure on cross-county business cycle correlation may vary according to the pace of economic integration.

[4] This assertion has been discussed widely in the literature further work suggesting in fact that the level of specialization among US states was roughly similar to the one in Europe, see Krugman (1991 and 1993), Peri (1998) and Clark and van Wincoop (2001) for further discussion on this issue.

The nature of industrial specialisation, trade intensity and business cycle correlations are in fact closely linked, providing strong support for the endogeneity hypothesis of the OCA criteria as recently shown by Frankel and Rose (1998)[5]. The preceding authors emphasize trade as a transmission mechanism of economic fluctuations providing evidence for a panel of industrialised countries. Here we adopt a similar approach and extend the existing literature in a number of ways. First, we present evidence for a significant decrease in the border effect in Iberian regions showing in particular that this process has been fostered by the European integration program and has followed (at a higher rhythm though) the decrease in the border effect observed for the rest of Europe. Second, we regress cross-correlation coefficients on a set of gravity-type and industrial specialisation variables. Both the size of regions and their industrial specialisation appear to be the most significant variables in explaining the growing correlation of Spanish and Portuguese regional business cycles.

The rest of the paper is structured as follows: Section 2 provides a description of the data used, while section 3 analyses the business cycle of Iberian regions with a special emphasis on the period following the accession of these countries to the European Community. In Section 4 we test econometrically the role played by trade and specialisation variables in explaining the economic co-fluctuations of Iberian regions. Section 5 concludes.

2. Data description

We base our empirical study on employment data rather than other more common types of economic variables such as income, prices or GDP. As argued by Fatás (1997), employment

[5] The endogeneity hypothesis suggests that the ex-ante conditions generally used in the OCA theory may themselves be

series are more easily available at the regional level and need not to be deflated, which would be an almost impossible task when dealing with regional data. We use two datasets. The first one comes from the Spanish and Portuguese Instituto Nacional de Estadística (INE) providing quarterly series from the first quarter of 1988 to the last quarter of 1998. Initially, Portuguese quarterly data were available for the period 1983-1999. We chose to restrict the analysis to 1988-1998 given that the regions are only defined in a homogenous way for this period. Moreover, some changes in the definition in employment occurred in Portugal in the first quarters of 1992 and 1998. We handled this and also the potential existence of seasonality both for Portuguese and Spanish regions by regressing the series in levels on quarterly dummy variables as suggested by Miron (1994)[6]. We then used the residuals obtained from these regressions using heteroskedastic robust estimates following White's (1980) method. By doing this we assume that seasonal unit roots are absent which is not a stringent assumption given the short time period being considered. The second dataset is taken from the Cambridge Econometrics database and is mainly based on Regio (Eurostat). It provides annual data on employment for Iberian and also for European regions between 1975-1998. In both data sets the regions' definition is the nuts2 level used by Eurostat with 15 and 5 regions for Spain and Portugal respectively. Tables 1 and 2 provide descriptive statistics.

Before turning to the analysis of the descriptive statistics, the use of employment series calls for a discussion of the Spanish and Portuguese labour market, as well as for an examination of the evidence concerning the regional evolution of employment. As noted by Blanchard and Jimeno (1995) and Castillo et al. (1998), the Spanish and Portuguese economies share

greatly influenced by the existence of a common currency.

6 The de-trended methods used are based on the HP filter, the first and fourth difference of employment series depending on the frequency of the data as explained in the next section.

many characteristics, not least the institutional aspects of their labour market. Some striking differences exist however. In particular the level of unemployment was notably higher in Spain from the end of the 1970ies reaching the highest rate in Europe. Portugal was just at the opposite end with one of the lowest unemployment rates. Despite these differences, Castillo et al. (1998) showed that both economies experienced similar shocks to unemployment since the beginning of the 1980ies. The preceding authors also showed that the transmission mechanisms and the persistence of shocks differed between both countries. Jimeno and Bentolila (1998) also showed that wage rigidity and low labour migration lead to high unemployment persistence in Spanish regions although employment growth shows low persistence. In what follows we put the emphasis on employment growth correlation instead, looking at the way trade and location variables affect the Iberian regions' business cycles.

3. Integration, regional business cycles and the border effect.

Economic integration between Spain and Portugal was given a strong impulse after their accession to the European Community in 1986 and the subsequent implementation of the Single Market Program. In fact, Spain's and Portugal's bilateral economic relationships were already promoted in the late 1950ies when both countries started to liberalise their still tightly regulated economies during their dictatorial regimes. Table 3 provides evidence for this by reporting bilateral trade flow growth averages for the period 1961-1998. While a clear slowdown in this trend occurred in the mid-1970ies until 1985 following a general downturn in world economic activity and international trade, the accession of Spain and Portugal to the European Community in 1986 has in turn played in favour of a vigorous increase in trade growth between both countries and also with the rest of Europe. The last years have also seen growing cross-investment between both countries, in particular Spanish direct investment in

Portugal providing Spanish firms with a strong position in the Portuguese economy as shown by table 4.

Our starting hypothesis is that growing integration may have direct consequences in terms of business cycles correlation both between Iberian and European regions. As shown by Fatás (1999), the Spanish business cycle has been more volatile than its EU counterparts, but became more synchronised with the EU cycle from the mid-1980ies onwards as trade intensity deepened. In a different paper, Fatás (1997) shows that European integration has notably reduced the significance of national borders in terms of business cycle correlation.

Before going further it is important to point out the way the border effect is determined. Cross-correlation coefficients (i.e., the correlation between all European regions) are first computed and then regressed on a constant (the average correlation) and a dummy variable equal to one when two regions j and k belong to the same country and zero otherwise. This dummy variable represents the border effect since it measures the difference between within and cross-country correlation averages. Tables 5-6 provide preliminary evidence on the magnitude of the decline of the border effect among EU regions over the period 1975-98. The reported figures concern annual employment growth cross-correlations between 209 EU nuts2 regions, including the 20 Iberian regions and present country-level average of regions' cross-correlation[7]. It appears that between-countries' regional correlation has increased over time from an average of 0.10 to 0.28 while within countries' correlation has remained fairly stable varying from 0.62 to 0.58. Considering Spain and Portugal in particular we observe an even larger increase in the between-country correlation, from 0.04 to 0.34, which is the highest inter-country correlation for Portugal. The preceding evidence provides some support

[7] We use the Hodrick and Prescott filter and first differences in order to get rid of the trend component of the series and focus on two sub-periods: 1975-87 and 1988-98. Note however that the smoothing parameter λ is set to 6.25 when using the HP filter for annual series as suggested by Ravn and Uhlig (1997) while λ=1600 for quarterly series as suggested by Hodrick and Prescott (1997).

for a decline in the border effect between both European and Iberian regions. The decline in the border effect is also apparent when using moving windows averages over 10 years starting from 1975-85 and ending in 1988-98 for the same set of regions. Figures 1 and 2 describe the results obtained using both HP filter and first differences as de-trending methods together with confidence intervals on the border effect estimates[8]. Two important features emerge: first, the border effect is lower and less significant between Spain and Portugal than between other European regions. Second, the decline in the border effect is much more pronounced for Iberian regions in the years following the accession of Spain and Portugal to the European Community. The picture looks similar using first differenced series where the decline occurs in a more progressive fashion over the whole period[9]. Spain and Portugal have not been the only two neighbouring economies to experience a significant decline in the border effect. Going back to table 5–6, we observe also a rise in between-countries correlation for many country-pairs, especially neighbouring countries like France and Germany, France and Spain, Netherlands and Germany, Belgium and Netherlands, and Austria and Italy, among others. This suggests that other neighbouring regions in the European Union have experienced a similar increase in cross-country business cycles correlation.

Ideally, a more robust test of the impact of growing economic integration on the decline of the border effect would require the use of trade and investment data between regions according to our preceding discussion. However, the lack of information at the regional level

[8] The average correlation coefficient has been obtained by running a simple OLS regression of cross-correlation coefficients on a constant term and a dummy variable equal to one when two regions are located in the same country and zero otherwise. Accordingly, the coefficient □ on this dummy variable represents the border-effect for which a 99% confidence interval can be computed using $\beta_j \pm c.se\left(\hat{\beta}\right)$ to compute the lower and upper bound of the confidence , *se* being the standard errors of the estimated coefficient and c the appropriate percentile for a t_{n-k-1} distribution where n is the number of observations and k the number of explanatory variables. Note that these confidence intervals are not corrected for possible dependency across residuals, possibly biasing the significance of the border effect. This question will be addressed in the next section.

[9] We will discuss the differences in the results between the different de-trending methods in the next section.

does not allow such a test. We then have to rely on indirect explanatory variables that may determine trade such as the size of the regions and the distance between them. However some data on international trade are available on Spanish regions' trade with Portugal for the most recent period. Figure 3 presents evidence using such data and plots an indicator of trade intensity together with business cycle correlation by regions using quarterly data for the period 1988-1998[10]. There seems to be a positive link between each region's business cycle correlation and its trade with Portugal. OLS estimates reported in figure 3 support this result. The conclusions one may draw from this figure are clearly limited however: first because we do not have information on trade between Spanish and Portuguese regions, and, second, because figure 3 compares a country's employment fluctuations (Portugal) with regions' fluctuations (Spain). Thus we need further evidence in order to explain the general trends observed in the business cycle correlation considering all Iberian regions' cross-correlation.

4. Explaining regional business cycles

We follow the methodology proposed by Clark and van Wincoop (2001) in order to study the determinants of the border effect between Iberian regions. The basic equation we test is as follows:

$$\hat{p}_i = x_i'\beta + e_i \qquad (1)$$

where $\hat{p}_i$ is the estimated correlation coefficient between two regions j and k that form the pair i while x_i is a vector of explanatory variables. Frankel and Rose (1998) use a similar

[10] Data are from Dirección General de Aduanas, Ministerio de Economía. Figure 3 is based on correlations computed using HP filtered series. Trade intensity is measured by (Xi + Mi)/(Xt+Mt), where Xi and Mi are the averages export and imports of Spanish region i to Portugal over the period 1988-98 and Xt, Mt represent the average of Spain exports and imports with Portugal.

approach to study a set of industrialised countries and regress cross-correlation coefficients on a variable representing trade intensity using White's (1980) correction for heteroskedasticity. Clark and van Wincoop (2001) argue, however, that the resulting estimator does not take into account possible dependencies across residuals. They propose instead an estimation based on the Generalized Method of Moments (GMM) following Ogaki's (1993) method[11].

In terms of our explanatory variables, as noted earlier, the main explanatory variable is the dummy variable representing the border effect. This variable is equal to one when two regions belong to the same country and zero otherwise. We also use an indicator of industrial dissimilarity (the so-called Krugman index) based on sectoral employment using the following formula:

$$Dissimilarity_{jk} = \sum_{n=1}^{N} \left| s_{nj} - s_{nk} \right| \qquad (2)$$

where s_{nj} and s_{nk} denote the employment shares of sector n in regions j and k, where j and k form the pair of regions i mentioned in equation (1). The sector-level data covers eight sectors: agriculture, banking and insurance, construction, distribution, energy and manufacturing, transport and communications, non-market services and other market services. According to previous arguments, we assume that if shocks are sector-specific then two highly dissimilar regions will face asymmetric shocks. The expected sign for our dissimilarity measure is then negative.

Figure 4 shows that the dissimilarity index remains, on average, fairly stable over the period 1975-98, the dots above the 45^o line indicating a rise in specialisation for the corresponding regions. Portuguese regions (indicated by a *p* in the figure) appear to be more specialised

[11] See Clark and van Wincoop for further details.

than their Spanish counterparts with an average index equal to 0.44, while Spanish regions' average index is equal to 0.31. In addition, regions tend to be more dissimilar when located in different countries. We also observe a decrease in the dissimilarity index from 0.49 on average in 1975-87 to 0.44 in 1988-98. Furthermore in only one case (for the Spanish region Rioja) does one observe a sharp increase in specialisation with respect to all other regions. These changes suggest that industrial dissimilarity may have driven some of the modifications that occurred in the business cycles correlations among more similar Iberian regions and, to some extent, may explain the decline in the border effect shown in the preceding section.

We have to rely on two proxies for trade: distance and size. Distance is computed as the spherical distance (taking into account the curvature of the earth) between two regions' capitals[12]. Size is determined by the sum of the natural logarithms of the average population of two regions. Two large regions will tend to trade more with each other as they produce a wider range of product variety. Their respective markets are also more attractive if transport costs are low[13]. Figure 3 provided some contradictory evidence on this ground however. We observe that Spanish regions like Catalonia or Valencia that trade more with Portugal are not necessarily geographically close to this country. Other regions like Andalusia and Extremadura, physically close to Portugal, do not display especially high trade intensity. As mentioned earlier, this figure only concerns trade between Spanish regions and the whole Portugal so that only partial conclusion can be drawn on this basis. In order to check further the explanatory power of size and distance variables we used them in a regression with annual bilateral trade intensity between Spanish regions and Portugal as a whole as

[12] Coordinates were obtained from http://www.getty.edu/research/tools/vocabulary/tgn/index.html

[13] Note that the size and dissimilarity variables may then be co-linear because of the relationship between size and variety. Such co-linearity is however inherent and difficult to avoid in gravity-type analysis as the one we follow here.

dependent variable over the period 1988-1998. Results confirmed that alternatively distance or adjacency are not good proxies for trade between both countries while only size displayed the expected results. One then needs to be cautious when interpreting the results for the *distance* or *adjacency* variables[14].

Tables 7 and 8 present estimates of the average correlation coefficients using GMM and Ogaki's (1993) specification as outlined above using annual and quarterly series, respectively. A first comparison of both tables reveals somewhat similar results, except for the case of average cross-correlation estimates within Portugal. For example, considering the HP filtered series and the period 1988-98 we obtain an average correlation equal to 0.12. This correlation is not significant when using annual series while the correlation obtained is equal to 0.36 and is statistically significant at the 1% level when using quarterly series for the same period. It should be noted that such differences are likely to be due to the different de-trending methods used here together with the differences in the time span and the frequency of the data. For example first-differences gives much more importance to short term fluctuations with high-frequency series while the HP filter tends to render those fluctuations much smoother.

Overall, the average correlation coefficient between Portuguese regions is low. A closer look at those cross-correlation coefficients reveals in fact that small regions generally display low correlation coefficients, which is also true to some extent for (small) Spanish regions[15]. The magnitude of the border effect also differs according to the series being used in that it is much larger when using annual data. In all cases the border effect estimates display the expected sign and are highly significant. In the case of the annual series for 1988-98, we

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[14] Results from these regressions are available from the authors upon request.

[15] We consider that a region is small when it has less than 200.000 workers. Details on the cross-correlation coefficients available from the authors.

obtain a border effect equal to –0.28 both for the first differenced and HP filtered series, while for the quarterly series the border effect is equal to -0.15. These results may not seem surprising if one considers that over a short horizon regions within the same country may face asymmetric shocks that tend to be smoothed in the long run by redistributive policy at the national level, labour mobility, or changes in labour participation rates. However, previous studies have shown that labour mobility between Spanish regions was fairly low, see Bentolila (1997) for further evidence. We cannot draw any clear conclusion on this point since it is arguably difficult with the data at hands to distinguish between this kind of mechanism and the possible existence of additional noise in the quarterly series.

The decline of the border effect evidenced in the previous section is also apparent from Table 7. We observe a decrease in this border effect from –0.40 in 1975-87 to -0.28 in 1988-98 for the HP filtered series and from –0.69 to -0.28 when using first differences. Splitting the quarterly series into two sub-periods does not provide any conclusive evidence, as shown in table 8. The decline of the border effect lies between 0.03 and 0.04 in absolute term when using both fourth differences and HP filtered series. Clearly, the most important part of this decline has been taking place in the aftermath of 1986 while subsequent economic turbulence in the early 1990ies may explain part of the lower path in the decline of the border effect that followed. The results in table 7 concerning annual series over the time span 1975-1998 show that the significant increase in the between-countries correlation explains the decrease in the border effect, while some mixed evidence appears for within-countries correlation depending on the de-trending method being used.

The question we deal with now concerns the variables that can explain the evolution of the business cycle correlation and the border effect among Iberian regions. As noted earlier, we focus on industrial specialisation and gravity-type variables using different filtering methods in order to check the consistency of our results. Table 9 shows that the distance variable and its substitute, the adjacency variable, are, however, never significant and display changing signs. This result confirms doubts previously raised on the appropriateness of using geographical distance as a measure of regional trade barriers, at least in the case considered here. The dissimilarity index displays the expected (negative) sign, meaning that two regions with different industrial structure will tend to have asymmetric business cycles. The coefficient on this variable is significant at the 1% level when using HP filtered series and displays similar values when using fourth-quarter lags, where the significance level varies from 1 to 10% according the specification and filtering method being used. Size however displays positive and highly significant coefficients in all cases with values ranging between 0.06 and 0.071. Those results are close to the ones presented in table 10. Finally, the absolute value of the border effect is lower than previously, meaning that the set of explanatory variables used here explain part (but not all) of the border effect.

5. Conclusion

This paper provides evidence on the positive impact of economic integration on regional business cycles' correlation. We study the special case of two neighbouring economies: Spain and Portugal. Our analysis mainly uses cross-correlation coefficients based on the GMM method proposed by Ogaki (1993) and used by Clark and van Wincoop (2001). We show that the so-called border effect (i.e., the difference of between and within country business cycles correlations) has notably decreased in Iberian regions in the aftermath of the accession of Spain and Portugal to the European Community. This evidence supports the view that some *convergence nests* may appear in Europe, influencing the way EU nations adjust to the economic integration process. Moreover, our results show that the border effect was less significant for Iberian regions and has fallen at a higher rhythm than for their EU counterparts. However, we also observed that other neighbouring European countries have also experienced a clear decline in the border effect, suggesting that the Iberian experience is not unique and can illustrate the impact of economic integration on regional cycles. In testing the determinants of economic co-fluctuations we show that the relative size and industrial structures of regions were the most significant variables. The latter result suggests that two regions with asymmetric industrial specialisation will also tend to face asymmetric shocks.

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Tables and Figures

Table 1: Descriptive Statistics, level and growth (g) of total employment in Spanish and Portuguese (P) regions.
Quarterly employment data from INE, 198801-199804

	L	Std. g	g.	Min g	Max g
Galicia	957.4	0.0207	-0.0126	-0.0440	0.0282
Asturias	328.2	0.0314	-0.0089	-0.0718	0.0479
Cantabria	161.0	0.0457	0.0111	-0.0642	0.1003
Pais Vasco	691.3	0.0316	0.0118	-0.0630	0.0720
Navarra	184.2	0.0378	0.0194	-0.0769	0.0829
Rioja	87.4	0.0324	0.0021	-0.0725	0.0576
Aragon	407.2	0.0302	0.0105	-0.0591	0.0742
Madrid	1649.8	0.0332	0.0193	-0.0613	0.0691
Castilla-Leon	798.0	0.0302	0.0016	-0.0512	0.0602
Castilla-La-Mancha	510.0	0.0377	0.0076	-0.0525	0.0773
Extremadura	286.2	0.0351	0.0019	-0.0801	0.0632
Cataluña	2162.5	0.0355	0.0161	-0.0640	0.0764
Valencia	1272.4	0.0293	0.0137	-0.0442	0.0581
Andalucia	1800.2	0.0362	0.0146	-0.0734	0.0730
Murcia	324.5	0.0448	0.0190	-0.0352	0.1301
Norte (P)	1640.3	0.0430	0.0034	-0.1132	0.0865
Centro (P)	845.8	0.0408	0.0127	-0.0882	0.0713
Lisboa (P)	1526.4	0.0278	0.0024	-0.0609	0.0510
Alentejo (P)	213.4	0.0447	0.0007	-0.0779	0.1488
Algarve (P)	144.4	0.0471	0.0199	-0.0692	0.1082

Notes:
L =employment level average over the period
Std. g = standard deviation of the growth rate over the period
g. = average growth rate over the period
Min g = minimum growth rate over the period
Max g = maximum growth rate over the period

The growth rate is the four-quarters difference of the logarithms. Average level is expressed in thousands workers.

Sources: Instituto Nacional de Estadistica (Spain and Portugal) and authors' computations.

Table 2: Descriptive Statistics, level and growth (g) of total employment in Spanish and Portuguese (P) regions.
Annual employment data from Cambridge Econometrics, 1975-1998

	L	Std. g	g.	Min g	Max g
Galicia	1038.6	0.0181	-0.0066	-0.0405	0.0321
Asturias	382.6	0.0218	-0.0133	-0.0430	0.0255
Cantabria	177.4	0.0313	-0.0064	-0.0596	0.0791
Pais Vasco	723.9	0.0246	0.0013	-0.0301	0.0613
Navarra	192.3	0.0314	0.0071	-0.0336	0.0853
Rioja	96.8	0.0360	-0.0029	-0.0485	0.0705
Aragon	417.8	0.0280	0.0018	-0.0434	0.0538
Madrid	1563.6	0.0285	0.0132	-0.0333	0.0614
Castilla-Leon	856.8	0.0245	-0.0037	-0.0486	0.0578
Castilla-La-Mancha	497.8	0.0281	0.0044	-0.0409	0.0640
Extremadura	292.3	0.0298	-0.0046	-0.0500	0.0809
Cataluña	2080.3	0.0293	0.0036	-0.0421	0.0559
Valencia	1223.2	0.0280	0.0084	-0.0466	0.0702
Andalucia	1755.0	0.0316	0.0020	-0.0489	0.0520
Murcia	304.8	0.0349	0.0123	-0.0369	0.1129
Norte (P)	1350.4	0.0213	0.0026	-0.0290	0.0667
Centro (P)	725.3	0.0368	0.0013	-0.0821	0.0800
Lisboa (P)	1360.2	0.0255	-0.0042	-0.0692	0.0403
Alentejo (P)	195.1	0.0684	-0.0149	-0.2766	0.1185
Algarve (P)	130.9	0.1007	0.0048	-0.2287	0.3611

Notes:
L =employment level average over the period
Std. g = standard deviation of the growth rate over the period
g. = average growth rate over the period
Min g= minimum growth rate over the period
Max g= maximum growth rate over the period

The growth rate is the first difference of the logarithms. Average level is expressed in thousands workers.

Sources: Instituto Nacional de Estadistica (Spain and Portugal) and authors' computations.

Table 3: Bilateral total trade flows: Spain, Portugal and the European Union, Average annual real growth rate by period, 1961-98

	SP-EU*	SP-PT	PT-EU*
1961-1975	12.5	16.9	4.6
1976-1985	-3.3	1.6	-10.5
1986-1992	12.3	28.2	15.7
1993-1998	1.4	6.6	-0.9

Sources: OECD and authors' computations.
* excludes Spain and Portugal

Table 4: Bilateral trade and direct investment between Spain and Portugal, 1988-97

year	SP DI	PT DI	total FDI	SP EXP	PT EXP	total trade	fdi/trade	cum_fdi / trade
1988	10864	43	10907	304201	153096	457298	2.4	2.4
1989	46582	164	46746	401397	221259	622657	7.5	9.3
1990	35331	446	35777	392154	245000	637154	5.6	13.0
1991	55839	3664	59503	468491	297609	766099	7.8	12.4
1992	64281	10830	75111	566512	316128	882640	8.5	15.3
1993	109311	2378	111690	611601	285291	896892	12.5	20.8
1994	269170	2317	271487	798595	338996	1137591	23.9	33.7
1995	121283	7392	128675	924660	405765	1330425	9.7	30.1
1996	161841	11277	173118	1103634	443080	1546714	11.2	19.5
1997	182309	3677	185986	1329907	466383	1796290	10.4	20.0

Notes:

SP DI = Total Spanish direct investment flows to Portugal
PT DI = Total Portuguese direct investment flows to Spain
SP EXP = Total Spanish exports from Spain to Portugal
PT EXP = Total Portuguese export to Portugal

Total trade = sum of bilateral trade between Spain and Portugal
Fdi / trade = ratio of total bilateral direct investment flows on bilateral trade
cum_fdi / trade = ratio of total bilateral cumulated direct investment flows on bilateral trade

Figures are in constant (1990) millions pesetas

Sources: *Ministerio de hacienda- Departamento de aduanas e impuestos especiales, Dirección General de Transacciones Exteriores y Economía Internacional* and authors' computations.

Table 5: Cross-correlations between EU regions, country-level average: Annual series 1975-87

	AT	BE	DE	DK	ES	FI	FR	GR	IE	IT	NL	PT	SE	UK
AT	0.75	0.28	0.45	0.20	0.05	0.07	0.16	0.17	0.39	0.13	0.48	0.13	-0.11	0.36
BE	0.28	0.61	0.26	0.32	0.18	-0.01	0.25	-0.28	0.45	-0.07	0.16	0.05	0.39	0.55
DE	0.45	0.26	0.81	0.40	0.05	0.23	0.05	-0.12	0.27	0.15	0.38	0.08	-0.43	0.49
DK	0.20	0.32	0.40	0.87	0.03	-0.32	-0.07	-0.17	-0.09	-0.11	0.09	-0.21	-0.08	0.26
ES	0.05	0.18	0.05	0.03	0.44	0.03	0.37	-0.23	0.10	0.09	0.05	0.04	0.22	0.09
FI	0.07	-0.01	0.23	-0.32	0.03	0.81	0.08	-0.01	0.34	0.23	0.24	0.31	-0.32	0.08
FR	0.16	0.25	0.05	-0.07	0.37	0.08	0.46	-0.20	0.33	0.11	0.10	0.03	0.22	0.17
GR	0.17	-0.28	-0.12	-0.17	-0.23	-0.01	-0.20	0.92	-0.41	-0.01	0.13	0.13	-0.05	-0.33
IE	0.39	0.45	0.27	-0.09	0.10	0.34	0.33	-0.41	0.94	0.09	0.26	0.10	0.04	0.36
IT	0.13	-0.07	0.15	-0.11	0.09	0.23	0.11	-0.01	0.09	0.10	0.13	0.07	-0.20	0.02
NL	0.48	0.16	0.38	0.09	0.05	0.24	0.10	0.13	0.26	0.13	0.31	0.16	-0.15	0.24
PT	0.13	0.05	0.08	-0.21	0.04	0.31	0.03	0.13	0.10	0.07	0.16	0.07	0.01	0.10
SE	-0.11	0.39	-0.43	-0.08	0.22	-0.32	0.22	-0.05	0.04	-0.20	-0.15	0.01	0.89	0.15
UK	0.36	0.55	0.49	0.26	0.09	0.08	0.17	-0.33	0.36	0.02	0.24	0.10	0.15	0.76

Notes:
Correlations computed on annual series of regional employment (NUTS2 regions) filtered with Hodrick-Prescott filter with λ=6.25 as suggested by Ravn and Uhlig (1997).

Sources: Cambridge Econometrics and authors' computations.

Table 6: Cross-correlations between EU regions, country-level average: Annual series 1988-98

	AT	BE	DE	DK	ES	FI	FR	GR	IE	IT	NL	PT	SE	UK
AT	0.68	0.36	0.69	-0.22	0.28	-0.02	0.37	-0.14	0.28	0.36	0.50	0.30	0.13	-0.05
BE	0.36	0.68	0.46	0.28	0.65	0.47	0.58	-0.08	0.52	0.42	0.52	0.31	0.54	0.32
DE	0.69	0.46	0.89	-0.20	0.35	-0.10	0.38	-0.16	0.27	0.56	0.56	0.30	0.19	-0.16
DK	-0.22	0.28	-0.20	0.54	0.37	0.52	0.26	-0.02	0.36	0.01	0.09	0.05	0.39	0.37
ES	0.28	0.65	0.35	0.37	0.66	0.62	0.59	-0.15	0.52	0.36	0.48	0.34	0.63	0.42
FI	-0.02	0.47	-0.10	0.52	0.62	0.87	0.57	-0.12	0.58	0.04	0.25	0.25	0.77	0.69
FR	0.37	0.58	0.38	0.26	0.59	0.57	0.66	-0.14	0.62	0.27	0.46	0.32	0.71	0.43
GR	-0.14	-0.08	-0.16	-0.02	-0.15	-0.12	-0.14	0.10	-0.04	-0.12	-0.13	-0.16	-0.18	-0.05
IE	0.28	0.52	0.27	0.36	0.52	0.58	0.62	-0.04	0.60	0.18	0.42	0.24	0.64	0.42
IT	0.36	0.42	0.56	0.01	0.36	0.04	0.27	-0.12	0.18	0.42	0.40	0.23	0.18	-0.07
NL	0.50	0.52	0.56	0.09	0.48	0.25	0.46	-0.13	0.42	0.40	0.48	0.32	0.34	0.15
PT	0.30	0.31	0.30	0.05	0.34	0.25	0.32	-0.16	0.24	0.23	0.32	0.12	0.30	0.14
SE	0.13	0.54	0.19	0.39	0.63	0.77	0.71	-0.18	0.64	0.18	0.34	0.30	0.93	0.59
UK	-0.05	0.32	-0.16	0.37	0.42	0.69	0.43	-0.05	0.42	-0.07	0.15	0.14	0.59	0.60

Notes:
Correlations computed on annual series of regional employment (NUTS2 regions) filtered with Hodrick-Prescott filter with $\lambda=6.25$ as suggested by Ravn and Uhlig (1997).

Sources: Cambridge Econometrics and authors' computations.

Table 7: Average-correlations and border effect estimates: Annual series

	Hodrick-Prescott filter (λ=6.25)		
	1975-1998	1975-87	1988-1998
(0) Within PT	0.10*	0.07	0.12
	(0.07)	(0.09)	(0.12)
(1) Within ES	0.60***	0.48***	0.67***
	(0.06)	(0.09)	(0.06)
(2) Within countries	0.55***	0.44***	0.62***
	(0.05)	(0.09)	(0.06)
(3) Between countries	0.18***	0.04	0.34***
	(0.07)	(0.06)	(0.07)
(4) Border effect = (2) *minus* (3)	-0.37***	-0.40***	-0.28***
	(0.06)	(0.12)	(0.06)
	First-difference		
	1975-1998	1975-87	1988-1998
(0) Within PT	0.07	0.16**	0.13
	(0.06)	(0.08)	(0.13)
(1) Within ES	0.65***	0.67***	0.61***
	(0.05)	(0.09)	(0.08)
(2) Within countries	0.60***	0.63***	0.57***
	(0.04)	(0.08)	(0.08)
(3) Between countries	0.16**	-0.06	0.29***
	(0.07)	(0.09)	(0.09)
(4) Border effect = (2) *minus* (3)	-0.44***	-0.69***	-0.28***
	(0.09)	(0.13)	(0.04)

Note: Standard errors in parentheses obtained using GMM and Ogaki's (1993) specification
* significant at 10%, ** 5%, *** 1%

Table 8: Average-correlations and border effect estimates: Quarterly series

	Hodrick-Prescott filter (λ =1600)		
	1988:01-1998:04	1988:01-1992:04	1993:01-1998:04
(0) Within PT	0.36***	0.36***	0.34**
	(0.05)	(0.08)	(0.14)
(1) Within ES	0.62***	0.69***	0.50***
	(0.05)	(0.08)	(0.09)
(2) Within countries	0.60***	0.66***	0.49***
	(0.05)	(0.08)	(0.09)
(3) Between countries	0.45***	0.51***	0.37***
	(0.05)	(0.08)	(0.11)
(4) Border effect = (2) *minus* (3)	-0.15***	-0.15***	-0.12*
	(0.04)	(0.02)	(0.06)
	Fourth-difference		
	1988:01-1998:04	1988:01-1992:04	1993:01-1998:04
(0) Within PT	0.35***	0.42***	0.37***
	(0.05)	(0.07)	(0.10)
(1) Within ES	0.55***	0.66***	0.55***
	(0.06)	(0.05)	(0.07)
(2) Within countries	0.53***	0.64***	0.53***
	(0.06)	(0.05)	(0.07)
(3) Between countries	0.39***	0.50***	0.42***
	(0.06)	(0.06)	(0.09)
(4) Border effect = (2) *minus* (3)	-0.14***	-0.14***	-0.11***
	(0.03)	(0.02)	(0.03)

Note: Standard errors in parentheses obtained using GMM and Ogaki's (1993) specification
* significant at 10%, ** 5%, *** 1%

Table 9: Explaining the Border Effect: Quarterly series

	Hodrick-Prescott (λ =1600)			Fourth-difference		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Border	-0.11***	-0.10***	-0.10***	-0.09***	-0.09***	-0.10***
	(0.04)	(0.04)	(0.04)	(0.03)	(0.036)	(0.03)
Distance	0.01	-	-	-0.002	-	-
	(0.02)			(0.023)		
Adjacency	-	0.00	-	-	0.016	-
		(0.02)			(0.02)	
Dissimilarity	-0.18**	-0.17**	-0.17***	-0.198*	-0.183*	-0.194**
	(0.08)	(0.08)	(0.07)	(0.11)	(0.11)	(0.10)
Size	0.06***	0.06***	0.06***	0.071***	0.071***	0.071***
	(0.01)	(0.01)	(0.01)	(0.014)	(0.013)	(0.013)
$\overline{R}^2$	0.39	0.39	0.40	0.40	0.40	0.40
Nobs	190	190	190	190	190	190

Note: Standard errors in parentheses obtained using GMM and Ogaki's (1993) specification
* significant at 10%, ** 5%, *** 1%

Table 10: Explaining the Border Effect between Spain and Portugal: Annual series

	HP Filter (λ =6.25)								
	1975-1998			1975-1987			1988-1998		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)
Border	-0.35***	-0.30***	-0.30***	-0.37***	-0.34***	-0.34***	-0.31***	-0.24***	-0.24***
	(0.06)	(0.06)	(0.06)	(0.13)	(0.13)	(0.13)	(0.06)	(0.07)	(0.06)
Dist	0.13***	-	-	0.06	-	-	0.14***	-	-
	(0.02)			(0.05)			(0.01)		
Adj	-	-0.02	-	-	0.00	-	-	-0.02	-
		(0.02)			(0.04)			(0.02)	
Dissim	-0.56***	-0.49***	-0.47***	-0.46**	-0.43*	-0.43**	-0.55***	-0.53***	-0.51***
	(0.13)	(0.13)	(0.13)	(0.21)	(0.23)	(0.21)	(0.14)	(0.13)	(0.14)
Size	0.05***	0.05***	0.05***	0.03***	0.03***	0.03***	0.03	0.03	0.03
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
$\overline{R}^2$	0.52	0.49	0.48	0.35	0.34	0.35	0.34	0.29	0.29
Nobs	190	190	190	190	190	190	190	190	190
	First-difference								
	1975-1998			1975-1987			1988-1998		
Border	-0.41***	-0.36***	-0.36***	-0.62***	-0.59***	-0.59***	-0.30***	-0.23***	-0.23***
	(0.10)	(0.10)	(0.09)	(0.16)	(0.14)	(0.14)	(0.05)	(0.05)	(0.05)
Dist	0.14***	-	-	0.08*	-	-	0.13***	-	-
	(0.02)			(0.04)			(0.02)		
Adj	-	-0.04	-	-	-0.05	-	-	-0.01	-
		(0.02)			(0.04)			(0.03)	
Dissim	-0.65***	-0.59***	-0.57***	-0.74***	-0.73***	-0.70***	-0.63***	-0.60***	-0.59***
	(0.12)	(0.12)	(0.12)	(0.25)	(0.27)	(0.25)	(0.14)	(0.12)	(0.14)
Size	0.05***	0.05***	0.05***	0.06***	0.06***	0.05***	0.05*	0.05*	0.05*
	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.03)
$\overline{R}^2$	0.63	0.59	0.59	0.70	0.70	0.70	0.35	0.31	0.31
Nobs	190	190	190	190	190	190	190	190	190

Note: Standard errors in parentheses obtained using GMM and Ogaki's (1993) specification
* significant at 10%, ** 5%, *** 1%

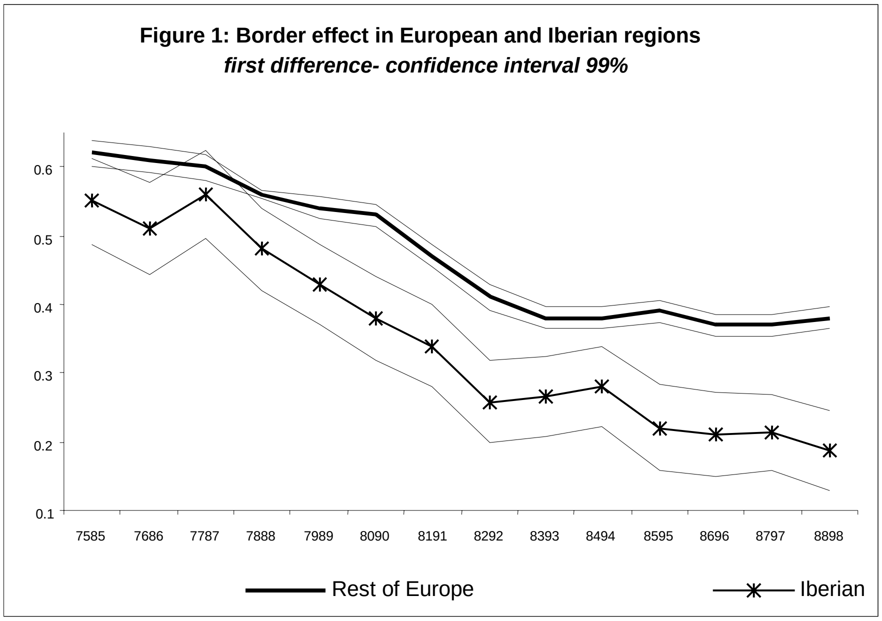


Figure 1: Border effect in European and Iberian regions
first difference- confidence interval 99%
0.6
0.5
0.4
0.3
0.2
0.1
7585
7686
7787
7888
7989
8090
8191
8292
8393
8494
8595
8696
8797
8898
Rest of Europe
Iberian

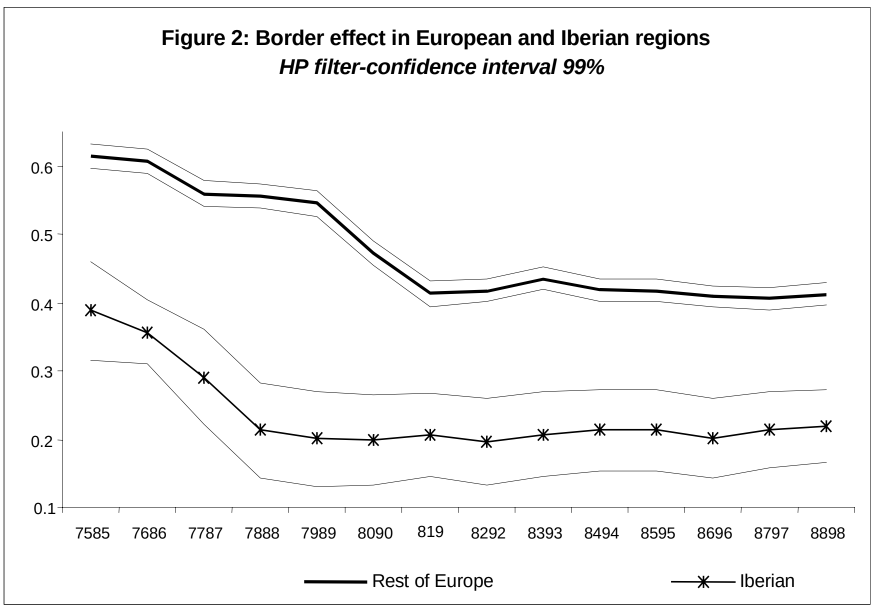


Figure 2: Border effect in European and Iberian regions
HP filter-confidence interval 99%
0.6
0.5
0.4
0.3
0.2
0.1
7585
7686
7787
7888
7989
8090
819
8292
8393
8494
8595
8696
8797
8898
Rest of Europe
Iberian

Figure 3: Trade intensity and Business Cycle correlation Spanish regions vs. Portugal, 1988-98

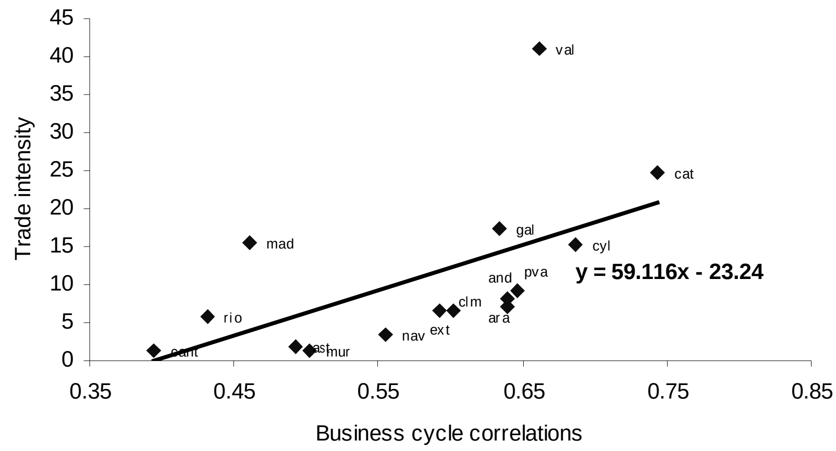
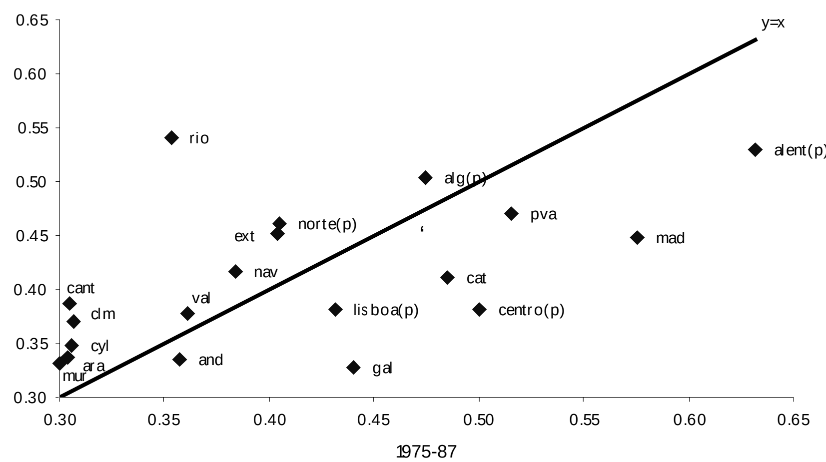


Figure 4: Change in specialisation, average by regions 1975-98



Note: (p) Portuguese region