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European Integration and Regional Business Cycles

A test for the Spanish Case

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Abstract:

It is a well-known fact that economic integration processes tend to link business cycles among participating economies. Strengthening of commercial relationship, changes in direct investment patterns, capital flows, etc. contribute to explain this progressive coincidence of economic fluctuations.
The aim of this contribution is to show empirical evidence of this cyclical pattern at regional level. Nevertheless, what could be true at national level may differ when considering regions: regional business cycles can show convergence or divergence patterns simultaneously. The paper will be focused to analyse if the European integration process have led to more regular (synchronised) business cycles among the Spanish economy as well as among its regions.

Keywords: Regional business cycles, economic integration, European Union, convergence.

1. Introduction

There is a well-known hypothesis in the literature on the effects of economic integration baring relation to the cyclical behaviour of the economies participating in any process of integration. As commercial relations are improved and trade intensified, a certain regularity can be observed in the economic cycles of the economies of the integration area. These cyclical evolutions are seen to be more synchronised and have a length which is increasingly coincident. These results have also led us to think that in a process of integration, the risk of asymetric shocks is progressively less, therefore making the mechanisms of specific economic policy to compensate these, unnecessary. The hypothesis of growing cyclical synchronisation has led us to an attempt to contrast this possible fact, taking the Spanish economy as a case study in relation with the rest of the European Union (E.U.), and at the same time, to study the performance of Spanish regions in this process.

The paper is organised as follows. Section 2 shows the essential questions of methodological type in relation to the data-base used. Section 3 analyses the cyclical profile of the Spanish economy in relation to the evolution of the European economy. Section 4 studies cyclical regional performance. The fifth section shows the results of cyclical performance from a dynamic point of view, in an attempt to demonstrate the hypothesis of a greater cyclical synchronisation among economies in accordance with the extent to which the process of European integration is perfected and intensified. Finally, section 6 deals with the main conclusions reached and suggests, however tentatively, some explicative factors observed in the process, with the aim not of closing these aspects, but as an indication of the lines that could be followed up in future investigation.

2. Methodological aspects and data-base.

Cyclical variations undergone by different regional economies are linked to, and to a large extent, are explained by, the fluctuations and changes in national economies. This is a commonly accepted idea, particularly in the case of mature economies where the

single market is a consolidated fact and regional economies have a sectorial structure which is ever more similar in its basic components[1].

The validity of this affirmation in the Spanish case, and its implications when analysing the economic behaviour of regions and their evolution, compared to the national economy, will be examined in sections 3 and 4. Before this however, it is necessary to emphasise a fact that is very directly linked to the latter and which is imperative for the understanding of the tendencies and cyclical movements of the Spanish economy: its growing integration in the economies formed by the EU (EUR15).

Evidence does in fact exist in favour of the hypothesis concerning the progressive narrowing of this relation (Raymond, 1995; Cuadrado and Garcia Greciano, 1995; Cuadrado, Mancha and Garrido,1998) and, if this is so, it means that the Spanish growth is ever more linked with that of the Community, and that consequently, the majority of regional economies also, thanks to the relations that exist between them and the national economy.

These ideas are evidently important to understand the evolution of the inter-regional convergence. The growth rates of the regions are increasingly conditioned to move within fairly narrow margins. As such, it would perhaps not be easy for the more backward regions to grow above the developed ones in an attempt to reach them, except where a very marked productive specialisation exists in a branch of an especially profitable activity with possibilities of expansion.

So, our analysis turns first towards an attempt to capture the degree of association that exists between the Spanish economy and the other E.U. members, given that these are those who occupy the first position as far as trade and other basic financial relations are concerned between Spain and the rest of the world. This type of analysis is not new as it has already been the object of analysis by some researchers (Raymond, 1993 and 1995; Martin, 1997; Dolado, Sebastian and Vallés, 1993; Andrés and Doménech,1995), although with different approaches and different data-bases.

As a departing point, it must be recognised that the study of the cyclical fluctuations and the inter-relations existing among different economies constitute a rather complex

theme and can be treated from different perspectives. The approach used here, fits well with the objectives pursued, although a more specific analysis referring to the cycle, its evolution, differences and causes would require other approximations and the use of data of a different periodicity (monthly or weekly). On the other hand, the annual availability of data for Spanish regions has forced us to carry out this analysis using annual data.

The data we have used to analyse the cyclical performance of Spain and the European Union (EUR-15) are the annual GDP at market prices for the period 1960-2000. These series are expressed in the national currencies and at current prices that led us to use the deflator of the GDP for an expression in real terms. The information used was published in European Economy (2000) where Eurostat is quoted as a principal source of data, although national and OECD publications are also used. Regional data used are referred to a shorter period (1980-2000) and the basic source is the Spanish Regional Accounts (CRE).

From the methodological perspective, so as to define the cycle, the GDP deviations have been estimated -European, national and regional -from their trend level, so that the difference between the GDP value observed and the estimated trend permits an evaluation of the underlying cyclical components. So, the business cycles have been calculated as an output gap.

As it is known, various procedures exist for extracting the trend, which go from the mere adjustment of lineal trends to the use of structural models. One of the most frequently employed methods is the use of the Hodrick-Prescott filtre[2]. If the variable taken in consideration is "Yt" and the extraction of the tendency "τ_t" is desired for a temporal period with a length of T, the procedure is to minimise the following expression:

$$\Phi = \sum_{t=1}^{T} (Y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \left[(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1}) \right]^2$$

"λ" being the smoothing parameter, which varies according to the periodicity (monthly, quarterly, annually)of the data. The trend therefore will be flatter where the value of "λ" is higher and by difference, between "Y_t" and "τ_t", the estimated cyclical fluctuations

will be greater, or the inverse in the opposite case. A value of "λ" equal to infinite supposes a temporal evolution with a stable trend. So the values "τ_t" will be the same as those obtained when adjusting a simple temporal trend. On the contrary, for "λ"=0, the estimated trend values coincide with those observed.

The election of the λ-value incorporates certain subjectivity. In our case, following the most usual option, the value of "λ" has been established in 100, with the advantage that once this value has been chosen, the filter applies a standard criteria for all the economies considered. The trend obtained "τ_t" is adaptable to the evolution of the series and in a way, shows analogy with the procurement of a moving average centred on the intermediate period. The adaptive trend needs a single series for all period of analysis instead of subdividing it in two for the problems of methodological homogeneity of the aforementioned series to get a true output gap.

3. Cyclical behaviour: growing association between the Spanish and the European cycles.

According to the method described, the cyclical components of GDP in Spain and in the rest of the Community countries has been calculated as a difference between the logarithm of GDP observed and the logarithm of the GDP trend. The results obtained, are those shown in figure 1. Table 1 shows the correlation coefficient between the European and the Spanish cycles and the standard deviation of the Spanish cycle for different sub-periods.

The figure shows the growing adjustment of the Spanish economy fluctuations with those of the EU (EUR15). This is especially notable from the end of the 70s and particularly from the mid 80s coinciding with Spanish integration into the EU. When the period studied (1960-2000), is sub-divided into smaller periods, it can be observed that the correlation between the Spanish and the EU fluctuations was still low in the 60s, but it increased notably during the 1970-1985 phase, characterised by a profound international crisis. The highest correlation corresponds to the sub-periods 1985-92 and 1992-2000. This is in consonance with the greater opening of the Spanish economy and with the advance of its integration with the other European economies. The cyclical

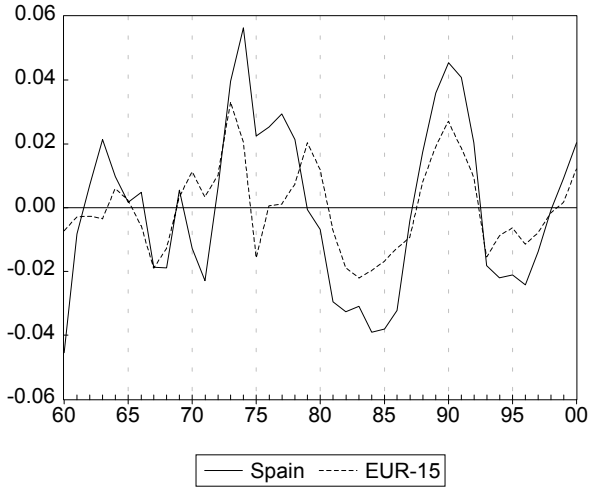
correlation in the latter stage of growth (1996-2000) is in fact, the highest ever reached, with values of 0.98. Raymond (1994 and 1995) emphasised this ever greater link between the phases of recuperation and recession of the Spanish economy and the EU, especially with respect to the core countries.

Table 1.- *Association between the Spanish and the EU business cycles*

	1960-70	1970-85	1985-92	1992-2000
Correlation European – Spanish cycle	0.39	0.66	0.97	0.94
Standard Deviation of European Cycle (1)	0.0085	0.0165	0.0164	0.0093
Standard Deviation of Spanish Cycle (2)	0.0184	0.0303	0.0323	0.0182
Ratio (2) / (1)	2,16	1,84	1,97	1,96

Source: Own elaboration from European Economy (2000) data.

Figure 1.- Spanish cycle - European cycle



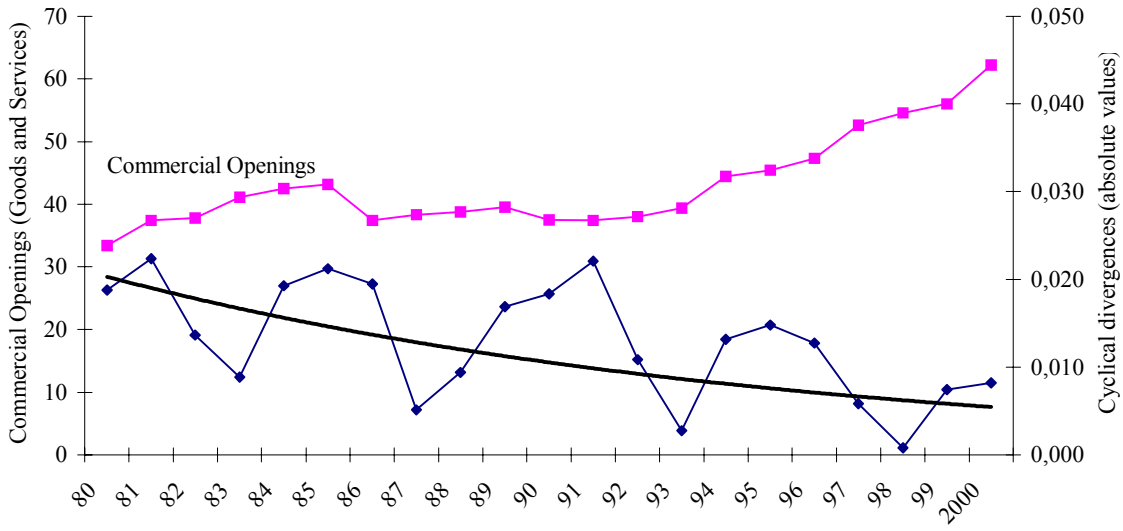
Source: Own elaboration from European Economy (2000) data.

This association has two characteristics. The first is that the Spanish economy reacted with particular intensity both in the expansive and the recession phases. As shown in the last row of table 1, the relation of the Spanish cycle with respect to that of the EU is around 2, which indicates that the Spanish economy has had a little overshooting reaction, both the contra-active waves or phases as well as the expansive. The second characteristic, perhaps more applicable to the past than to recent years, has been the greater instability of growth of the Spanish economy with respect to the rest of the EU, which can largely be attributed to the delay with which Spain adopted corrective policy measures to confront recessions.

It can be clearly noted however, that the Spanish economy behaves in a way closely associated with that of the rest of the EU, which in our opinion, is related to two complementary facts; a greater trade opening in the Spanish economy and the improvement and perfecting of the Single European Market in which Spain has also been participating since the end of the 80s. Figure 2 shows a clear relationship between trade and cyclical divergence.

The divergences of the Spanish cycle with respect to EU (in absolute values) show a clearly decreasing trend which coincides with the contrary evolution in foreign openings[3] - defined as the weight of exportations and importation of goods and services in relation to the GDP-.The growth observed from the beginnings of the 90s is especially significant in this indicator.

Figure 2.- Cyclical Divergences and Commercial openings



Source: Own elaboration from European Economy (2000) and Banco de España data.

4. Regional cycle and national cycle.

The objective of this section is the analysis of cyclical evolution from a regional perspective. So, the analysis will be focused on the kind of relation existing between national growth and the growth of the 17 Spanish regions.

4.1 An increased association and a smaller cyclical dispersion.

Applying analogous methodology to that used to show the evolution of the Spanish and European cycles, an estimation has been made of the cyclical component of the Gross Value Added (GVA) in real terms for the Spanish regions. A complete analysis has been made to show the cyclical profile of each region compared to the Spanish cyclical profile. Nevertheless, in this section we are only going to present a more synthetic information which underlines the most general and outstanding aspects of the cyclical profiles obtained. Table 2 offers the first results of this analysis.

The first column of table 2 shows the correlation which exists between regional cycles and the Spanish cycle for the complete period 1980-2000. The values obtained for the majority of regions are very high and significant. This is indicative of the existence of an important association between the regional cycle and the Spanish cycle.

The division of the complete period into three sub-periods allows a better appreciation of evolution of regional-national association. On average, there is a growing correlation between the regional cycles and the Spanish one, with a value of 34% higher, according to the figure of 0.60 in the first period 1980-85 and 0.81 in the period 1993-2000.

An alternative approach to calibrate the rate association between the Spanish and regional cycles is the standard deviation. Figure 3 clearly shows that regional cyclical performance was notably heterogeneous in the early 80s - as indicated by a relatively high dispersion in relation to the Spanish cycle - and which has evolved not only towards a greater synchrony, but also towards a lesser width between regional and national cycles as shown by a clear trend in the reduction of the dispersion calculated.

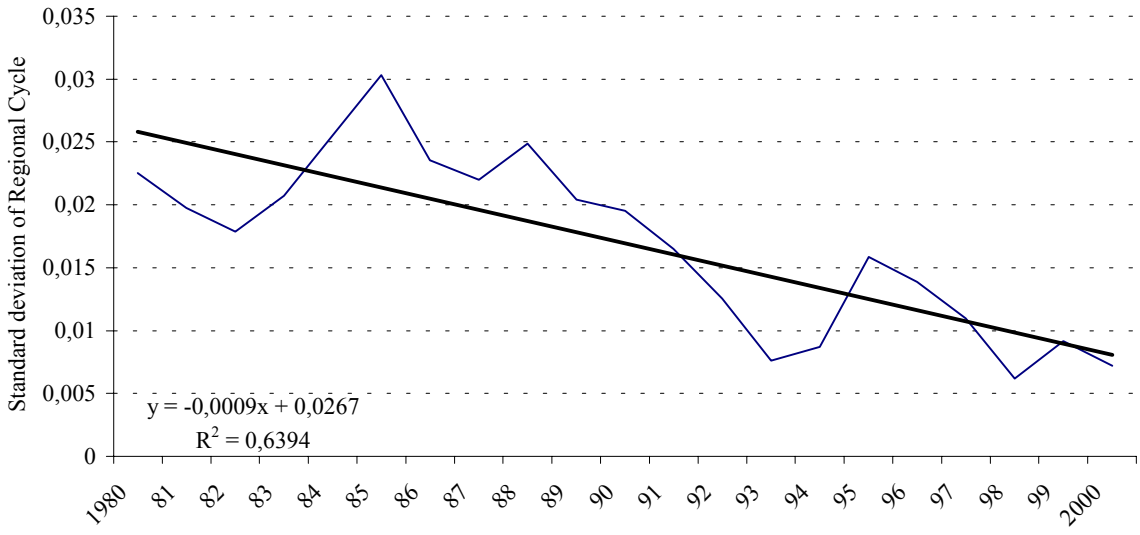
One of the most interesting facts resulting from Figure 3 is the temporal pattern of the regional cycle. In the first period 1980-1985 and in the period 1993-1996, the dispersion shows a clear growth trend coinciding with the negative phases of the Spanish economic cycle. This is indicative that the regional performance is more heterogeneous in recessions than in the expansive phases. In other words, recessions appear to have more unequal spatial effects than recovering phases.

Table 2. Lineal correlation of the Spanish and regional cycles.

	1980-2000	1980-1985 (A)	1986-1992	1993-2000 (B)	B / A
ANDALUCIA	0,948	0,946	0,933	0,948	1,00
ARAGON	0,873	0,669	0,954	0,879	1,31
ASTURIAS	0,630	0,449	0,816	0,931	2,07
BALEARES	0,294	-0,530	0,850	0,542	-1,02
CANARIAS	0,570	0,538	-0,159	0,964	1,79
CANTABRIA	0,853	0,896	0,944	0,947	1,06
CASTILLA - LA MANCHA	0,930	0,934	0,965	0,832	0,89
CASTILLA Y LEON	0,611	0,746	0,557	0,520	0,70
CATALUÑA	0,930	0,975	0,982	0,793	0,81
C. VALENCIANA	0,861	0,553	0,939	0,970	1,76
EXTREMADURA	0,614	0,090	0,806	0,864	9,55
GALICIA	0,895	0,940	0,946	0,953	1,01
MADRID	0,939	0,948	0,885	0,967	1,02
MURCIA	0,878	0,894	0,827	0,918	1,03
NAVARRA	0,929	0,908	0,889	0,984	1,08
PAIS VASCO	0,827	0,737	0,813	0,954	1,29
LA RIOJA	-0,165	-0,382	0,270	-0,102	0,27
Media	0,730	0,607	0,777	0,816	1,34

Source: Prepared by the authors. Data CRE base 86 and 95

Figure 3. - Dispersion in the regional cycle



Source: Prepared by the authors. Data CRE base 86 and 95

In any case, the synthetic evolution shown in Figure 3 does not permit the appreciation of some existing regional differences. Not all regions show the same degree of association nor do they show the trend towards this greater association with the Spanish

cycle. Andalucía, Castilla-La Mancha, Cataluña, Madrid and Navarra show the highest correlations in contrast to the values for La Rioja, the Balearics, Canary Islands or Extremadura.

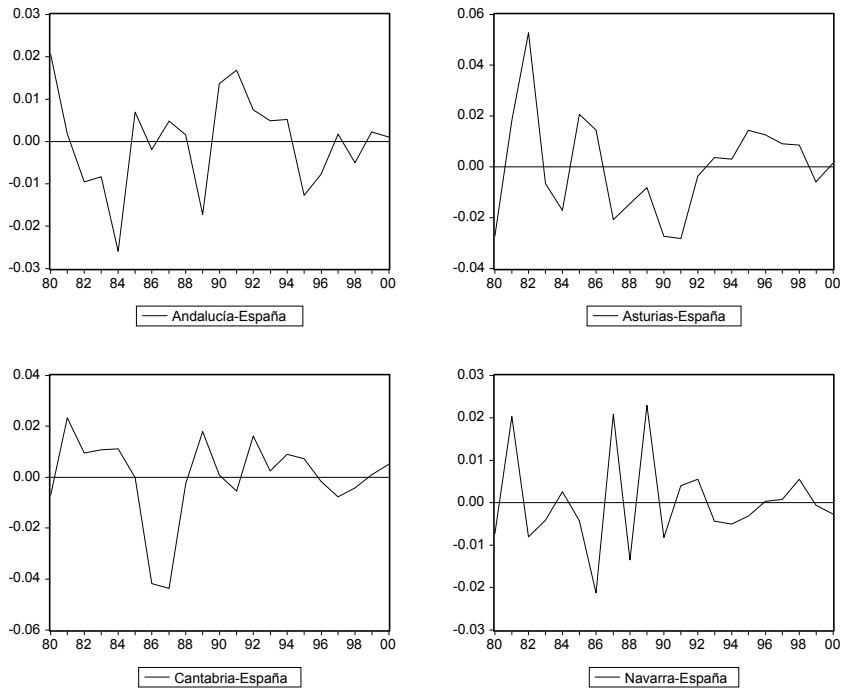
Temporal evolution of the association degree is also unequal. This fact is apparent in the values of the lineal correlations of table 2 for the sub-periods analysed. In general terms, it is certain that a greater cyclical association exists. Only in Castilla-La Mancha, Castilla and León, Cataluña and La Rioja show lower relations between 1993-2000 to those of the early 80s. On the contrary, the degree of association is clearly accentuated at the end of the period (1993-2000), as shown by the values of Andalucía, Aragón, Asturias, Canary Island, Cantabria, the Valencian Community, Galicia, Madrid, Murcia, Navarra and the Basque Country which reach average co-relations which are above 0.90 or very near to it as in the case of Aragón.

The cyclical profiles of the 17 Spanish regions in relation to the Spanish cyclical evolution have been calculated. Figures 4 and 5 show some of the more outstanding results.

In a previous work (Cuadrado, Mancha and Garrido, 1998), an explanation was offered for divergent performance using a sectorially separated analysis. In general, it is well known that the agrarian sector is the one where least adjustment existed between regional and national agriculture. There are two basic reasons to explain this fact. The first is the existence of what has been called “different agricultures” in the Spanish economy, with productions that are less diversified and directed towards markets which are also different. The second is the presence of more uncontrollable factors or random shocks which determine the annual production, particularly, the climate which has a very direct influence on many traditional crops. Castilla-León, Extremadura or La Rioja are regions where the agrarian sector and the food farming industry hold considerable weight, which could offer an explanation for non-convergent behaviour. In the case of Extremadura, climatic variations, especially hydrological ones, have also a great influence on hydro-electrical production, which has a notable weight in regional economy.

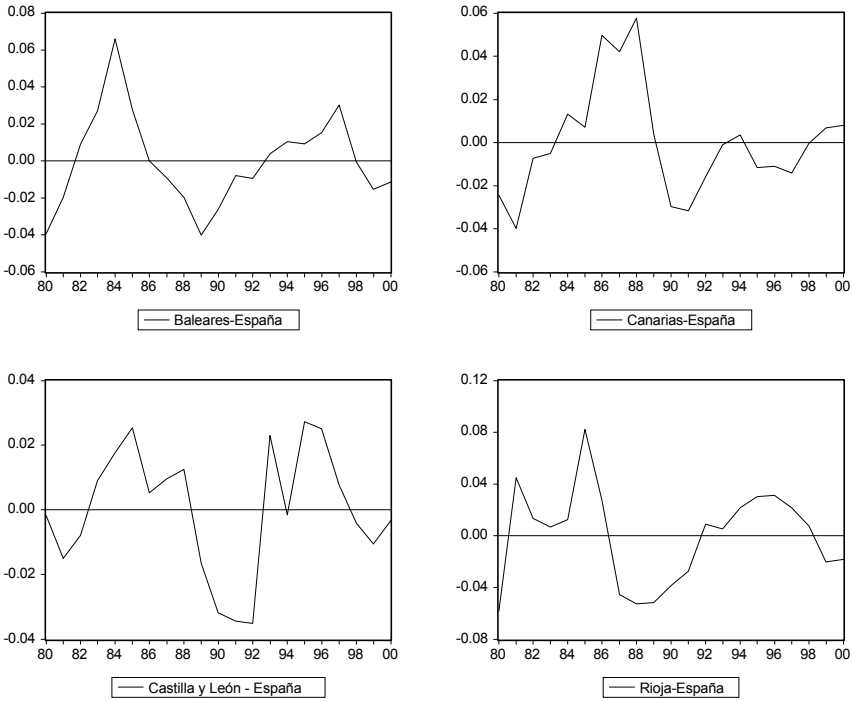
The cases of the Balearics and Canary Islands shown in figure 5, are also worthy of note. In both cases, but especially in the Balearics, their economies are tightly linked to foreign tourism, which explains a large part of their cyclical behaviour, which is also strengthened by the building sector in these regions. The Canary Islands, for example registered a considerable drop in their total production of 1981 (with special incidence in construction) and a strong recovery between 1986-1988, for reasons also associated to the service and construction sectors. However, in 1989 and 1990, Canaries suffered a marked drop in relation to the rest of Spain which was enjoying strong expansion. The case of the Balearics has a similar explanation, although not coinciding in time with the former. The high growth of the Balearic economy in 1983 and 1984 is explained by the growth in tourism and in construction and likewise its subsequent fall. In this way, the delay with which the Balearics joined the expansive national cycle of 1986-90 is directly related to the behaviour of these two industries in the archipelago. In both cases - the Canaries and the Balearics- the evolution of the tourist sector is more linked to the foreign tourists although their origin by countries is not identical. This in part explains the difference in behaviour between the two insular economies

Figure 4.- Regions with a convergent behaviour.
Regional cycle- Spanish cycle



Source: Own elaboration from CRE data base.

Figure 5.- Regions with a non-convergent behaviour.
Regional cycle- Spanish cycle



Source: Own elaboration from CRE data base.

4.2 Regional sensitivity to the Spanish cycle

A complementary aspect which we have also studied is the sensitivity shown by different regional economies faced with *the different cyclical phases of the Spanish economy* considered as a whole. To do this, we have carried out a least square regression of the following type:

$$Y_{it} = \alpha_i + \varphi_i X_t \qquad [1]$$

with Y_{it} the cyclical component estimated for the region i, X_t the cyclical component estimated for the whole of Spain. The estimations were carried out for ordinary least square (OLS) and for generalised least square (GLS) to capture autoregressive or moving average structures in the errors.

The results are shown in table 3. The data indicates a strong contrast in regional behaviour. Whilst a large number of regional economies offer a high level of sensitivity to the changes in behaviour of the Spanish economy, others appear to be rather less

linked to these changes, when they do not present behaviour that could be termed "independent".

Table 3.- Sensitivity of the regional cycle to the Spanish cycle

	MCO Estimation		MCG Estimation	
	OLS Estimation		GLS Estimation	
	φ_i (Prob.)	F-Snedecor (Prob.)	φ_i (Prob.)	F-Snedecor (Prob.)
ANDALUCIA	1,21 (0,00)	169,88 (0,00)	1,23 (0,00)	125,71 (0,00)
ARAGON	0,81 (0,00)	60,81 (0,00)	0,86 (0,00)	80,60 (0,00)
ASTURIAS	0,53 (0,00)	12,00 (0,00)	0,46 (0,00)	19,97 (0,00)
BALEARES	0,19 (0,19)	1,79 (0,19)	0,13 (0,47)	12,49 (0,00)
CANARIAS	0,68 (0,00)	9,15 (0,00)	0,98 (0,02)	26,43 (0,00)
CANTABRIA	1,09 (0,00)	50,78 (0,00)	1,30 (0,00)	46,43 (0,00)
CASTILLA - LA MANCHA	1,37 (0,00)	122 (0,00)	1,37 (0,00)	122 (0,00)
CASTILLA Y LEON	0,38 (0,00)	11,31 (0,00)	0,38 (0,00)	11,31 (0,00)
CATALUÑA	1,07 (0,00)	120,72 (0,00)	1,06 (0,00)	100,43 (0,00)
C. VALENCIANA	0,76 (0,00)	54,47 (0,00)	0,76 (0,00)	31,94 (0,00)
EXTREMADURA	0,87 (0,00)	11,47 (0,00)	0,99 (0,00)	12,32 (0,00)
GALICIA	0,74 (0,00)	76,19 (0,00)	0,73 (0,00)	54,26 (0,00)
MADRID	0,96 (0,00)	141,41 (0,00)	0,95 (0,00)	93,76 (0,00)
MURCIA	1,15 (0,00)	63,74 (0,00)	1,22 (0,00)	67,60 (0,00)
NAVARRA	1,10 (0,00)	120 (0,00)	1,11 (0,00)	147,83 (0,00)
PAIS VASCO	0,76 (0,00)	41,23 (0,00)	0,73 (0,00)	40,65 (0,00)
LA RIOJA	-0,16 (0,47)	0,53 (0,47)	-0,14 (0,45)	5,33 (0,01)

In Castilla-La Mancha and Castilla y León cases, OLS estimations do not show any type of pattern in the residual

Source: Own elaboration from CRE data base.

From a general perspective, the regional economies that show greater sensitivity to economic changes (either recessions or expansions) are; Castilla-La Mancha, Cantabria, Andalucía, Murcia and Navarra.

In an intermediate group we find the economies of Cataluña, Extremadura, Madrid and the Canaries - in GLS estimation, with sensitivities near 1, which indicate a relatively proportional reaction to the Spanish cycle. A greater cyclical sensitivity is shown by Aragón, Galicia, the Basque country and Castille and León, with values going from 0.86 to 0.38. Finally, the Balearics and La Rioja show a clearly independent profile as their cyclical behaviour does not adjust to the Spanish profile.

Additionally, we have contrasted whether the regions show the same values of sensitivity according to the phases of the cycle of the Spanish economy. To carry out this contrast, an alternative specification of equation (1) has been estimated by GLS:

$$Y_{it} = \alpha_i + \beta_{1i}(F_1 X_t) + \beta_{2i}(F_2 X_t) \qquad [2]$$

F1 and F2 are two dummy variables that cover the years of recession or crisis (F1) and expansion or recovery (F2)[4]. Figure 4 synthesises the results obtained. Despite the fact that the estimated values show certain peculiarities and it is difficult to establish clear patterns, some regions have shown a notably unequal cyclical profile in comparison with the corresponding cyclical phase of the Spanish economy. Regions with a special sensitivity in the phases of crisis are Andalucía, Cataluña, Murcia and Navarra, whilst on the contrary there are scarcely any regions with a more sensitive growth cycle if we exclude the case of Cantabria or Castilla-La Mancha where the latter shows the same sensitivity as Andalucía in both phases. The rest of regions do not present significative differences between their values in crisis and recovery phases with the exception of Asturias, with a cyclical profile marked by crisis and not by recuperation, and the Valencia Community and the Basque Country with a clearly contrary behaviour.

However, the results of this analysis must be taken with caution. The crisis of the early 80s does not have the intensity or the nature of that experienced by the Spanish economy in the 90s. Similarly, the recovery in the mid-80s does not have the same macro-economic foundations as that experienced from the mid-90s but it is analysed jointly. Perhaps it would have been better to divide the period in four - two crises and two periods of recuperation-, but the loss of degrees of freedom causes the estimations obtained to have a more limited validity than those shown by Figure 4.

Table 4.- Cyclical sensitivity in times of crisis and recovery

	Crisis	Recovery
ANDALUCIA	1,34	1,12
ARAGON	0,78	0,89
ASTURIAS	0,82	0,34
BALEARES	--	--
CANARIAS	1,07	0,96
CANTABRIA	0,75	1,32
CASTILLA - LA MANCHA	1,37	1,37
CASTILLA Y LEON	0,47	0,33
CATALUÑA	1,21	0,86
C. VALENCIANA	0,44	0,96
EXTREMADURA	1,22	0,90
GALICIA	0,94	0,62
MADRID	1,07	0,91
MURCIA	1,43	1,09
NAVARRA	1,24	1,06
PAIS VASCO	0,55	0,79
LA RIOJA	--	--

Source. Own elaboration.

5. Stability of regional cycles: does integration produce a greater cyclical stability?

As we have just underlined, the estimated parameters for sub-periods have to be taken into consideration with certain precaution. Although this allows us to focus the analysis on certain interesting aspects of the Spanish regional reality, it should not be used to establish categorical conclusions.

The question of whether integration favours a greater cyclical stability has already been partly answered by the previous results. A greater association between the Spanish cycle and regional cycles exists and a lesser dispersion. The interest of this section is to complement these results from the perspective of sensitivity to the cycle observing the dynamics of change.

The process of integration of the Spanish economy in the EU speeded up after 1986 but its possible effects were not seen instantaneously in the Spanish economy as well as in the regional evolution. Likewise, 1993 with the formation of the Single European Market did not necessarily suppose a radical change in behaviour but, as is reasonable to expect, in much more gradual changes.

With this approach, recursive least squares estimations of the equation (1) have been carried out for each of the Spanish regions. These recursive regressions stem from a first estimation with a sub-sample of the first k data and realise T-k new estimations increasing the sample in one year in each until the last, which uses the complete period. In our case, a first estimation has been made with the data of 1980 and 1985, a second with a sample 1980 to 1986 and so on until all the samples available are used until 2000. The recursive residuals have been used to test structural change in the model. We have used the CUMSUM test. This test shows the cumulative sum of the residuals. In the plot produced with this test, the cumulative sum is plotted against time. Two critical lines are shown. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines (see annex).

The results obtained are indicative of the absence of stability in practically all the Spanish regions with reference to sensitivity to the Spanish cycle. The profiles shown by the estimated parameters for each region are changeable both in the ordenate in the original and in the parameter of sensitivity to the Spanish cycle φ_i and its values only show a clear stabilisation when the observations corresponding to the 90s are incorporated.

Figure 6 shows the evolution of the average values of the estimated parameters φ_i using the most reduced sample (1980-1982), to the most complete. The averages have been calculated for all regions excluding the Balearics and La Rioja, which according to the results presented in previous sections do not present a significant relation with the Spanish cycle.

The sensitivity of the regional cycle to the Spanish cycle is not stable until the beginning of the 90s. However, for some specific regions, the sensitivity to the cycle does not show this profile, as in the case of the Valencian Community- with growing sensitivity- or Cataluña with a contrary evolution. Nevertheless, on average, regional cyclical sensitivity to the Spanish cycle is more stable in the 90s.

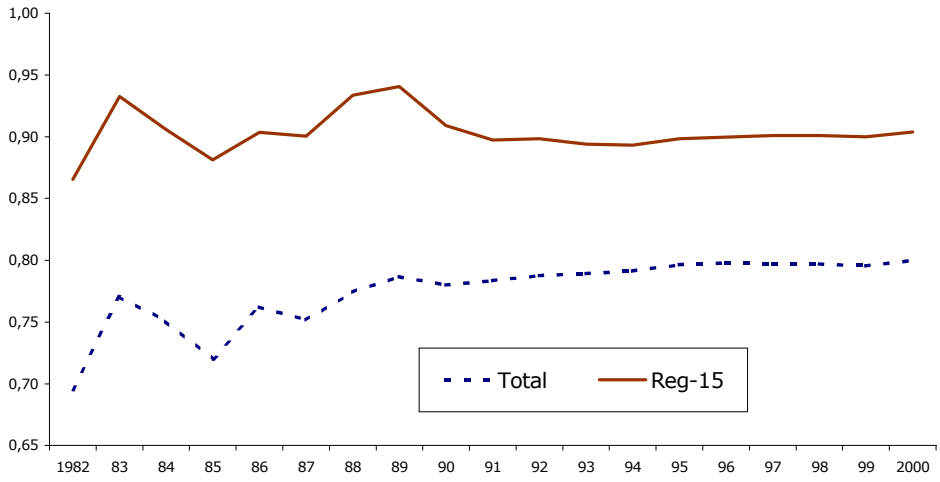
This average evolution is the result of patterns of change which are different according to the region. We have already made certain punctual comments and the detailed results are in the annex, but it is convenient to analyse whether this average evolution

necessarily supposes that the regional cycle has a similar extension as the Spanish cycle, or if on the contrary, this increase in sensitivity is the result of punctual regional behaviour. This growing average evolution does not allow us to conclude that the least sensitive regions (with parameters inferior to the unit) have increased more than those regions showing higher than the unit values. The growth of the average value near to 1 would be an indication of this fact if at the same time we observed a reduction in the dispersion of the sensitivity to the cycle as it has been shown in figure 7.

Dispersion is clearly decreasing and it is indicative that those regions with a high sensitivity to the cycle (parameters higher than the unit) have evolved towards values near to one. On the other hand, some regions that had shown little sensitivity to the Spanish cycle, now showed a greater sensitivity. The reduction of dispersion has been more important in the first than in the second, and the dispersion has also undergone a clear stabilisation in the decade of the 90s.

Figure 6.- Evolution of regional cyclical sensitivity

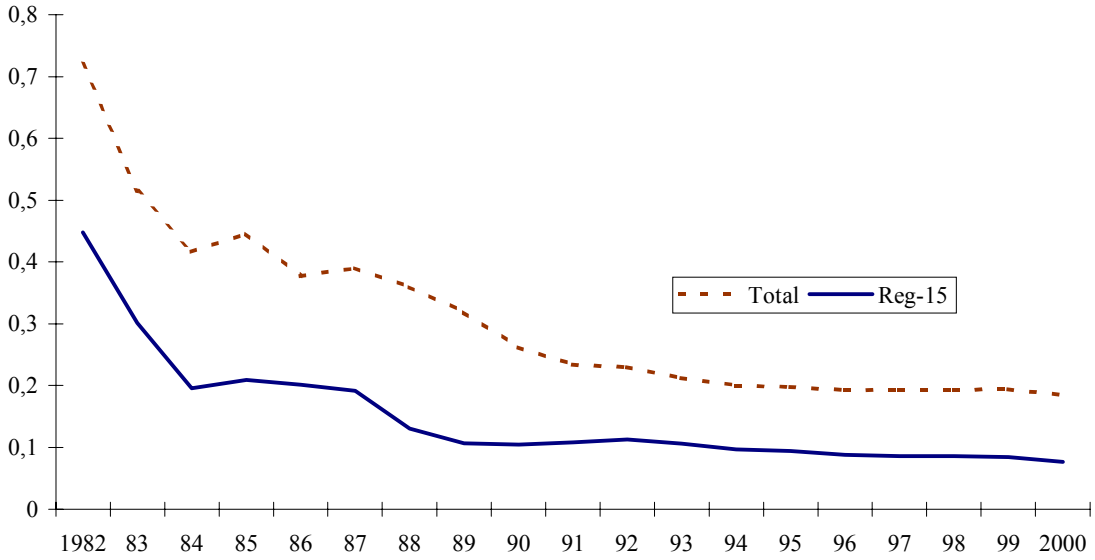
Average of the estimated values φ_i in the recursive estimations of the equation (1)



Reg-15 Average of all the regions excluding the Balearics and La Rioja.

Source: Own elaboration.

Figure 7.- Evolution of the dispersion in regional cyclical sensitivity



Reg-15: Average of all the regions excluding the Balearics and La Rioja.

Source: Own elaboration.

6. Final remarks.

Several conclusions can be drawn from our analysis. Some of them appear to be rather clear. Others however, are the result of the analysis of patterns of regional behaviour and have the virtue to serve not so much as a definitive answer to a particular question but rather as a marker for future *research agenda.*

What is more evident is that a clear and progressive adjustment of the Spanish economy is being produced to the evolution of the EU (EUR-15) and that this adjustment has been reinforced since the real integration of Spain in the EU and as a consequence of the ever greater opening of the national economy. It is possible to establish that the Spanish economy is ever more associated to the evolution in the EU and most particularly, by some central countries. However this does not prevent our economy from showing a tendency to overtake the European cycle in both the recessive stages and in those of economic expansion.

A clear association can also be appreciated between the cycle of the regional economies and the Spanish cycle. This association was weaker in the past than in recent years and could be a regional reflection of the opening up of Spanish economy in general. The

disparity of the regional productive structures can also explain this process. In the weight of the large sectors, the Spanish regions show an ever smaller divergence. Especially important is the agrarian sector within regional economic structures, which significantly reduces a very important source of cyclical perturbation. The productive specialisation also helps to explain the more diachronic performances, as in the case of the Balearics and La Rioja.

Empirical evidence seems to suggest that both the association and the sensitivity of the regional cycle has increased in the period 1980-2000, but that above all it presents a pattern of stability in the decade of the 90s, coinciding with the most important period in the process of integration of the Spanish economy. The regional cycle is, in general terms, more similar to the Spanish and also the regional cyclical sensitivity tends to converge clearly towards the unit.

These results could indicate a growing link between Spanish regions and the rest of the EU but would merit a deeper analysis. The study of commercial flows among the actual Spanish regions, the relations of foreign trade (external opening) or the direct foreign investment and investment abroad by regions, can offer reasonable explanations for the evolution of the degree of regional sensitivity to the cycle among other equally relevant aspects. However, as happens in other areas, the difficulty of having de-aggregate statistics by regions makes empirical progress very difficult.

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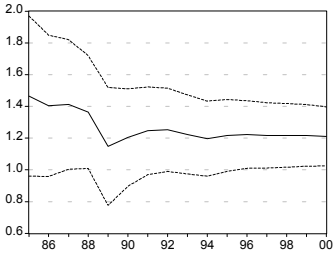
ANNEX

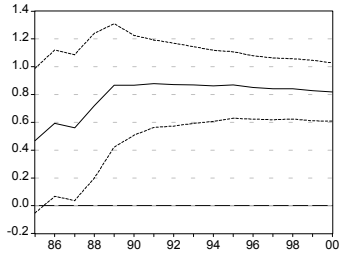
Recursive Least Squares Regression (Selected regions)

PARAMETER φ_i

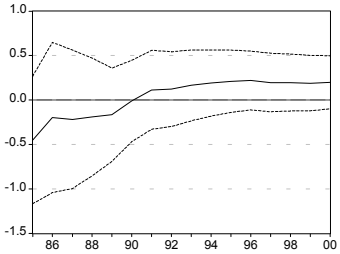
ANDALUCÍA



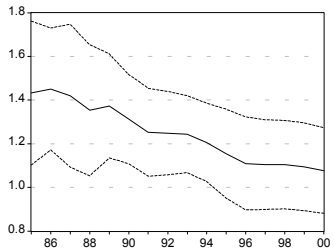
ARAGÓN



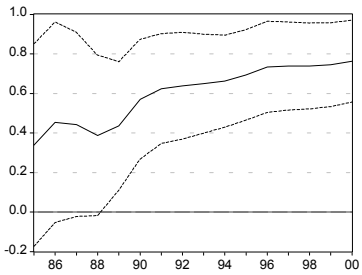
BALEARIC ISLAND



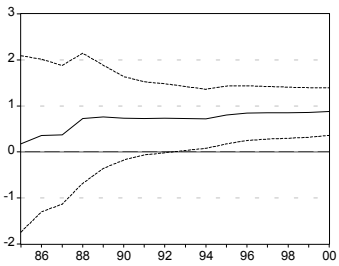
CATALUÑA



C.VALENCIANA



EXTREMADURA



INSTABILITY TEST

CUSUM TEST:

Greene (1999; 308)

Using recursive residual (w_r), the CUSUM test can be calculated following this expresion:

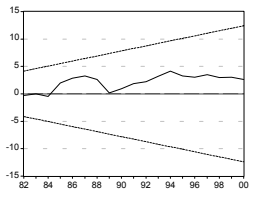
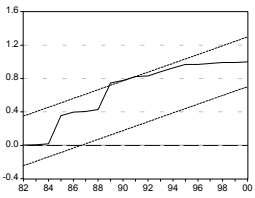
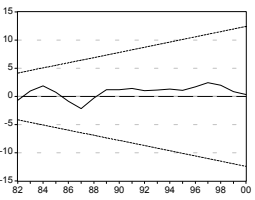
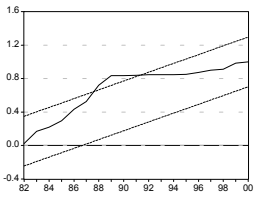
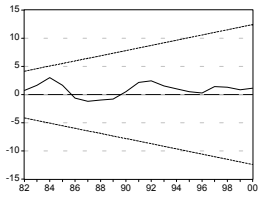
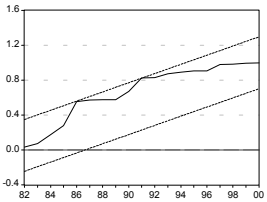
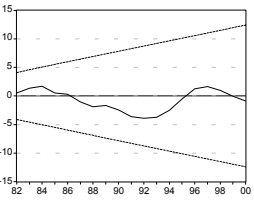
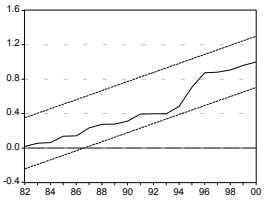
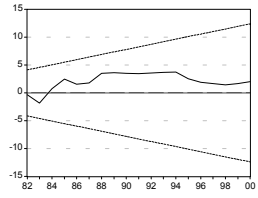
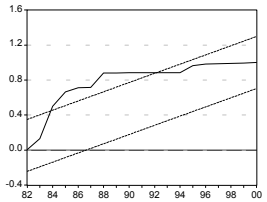
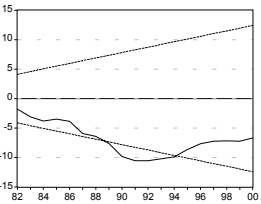
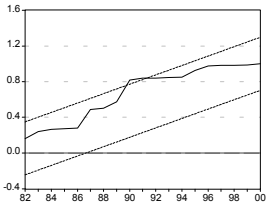
$$W_t = \sum_{r=K+1}^{r=T} \frac{w_r}{\hat{\sigma}^2} \quad \text{and} \quad \hat{\sigma}^2 = \frac{\sum_{r=K+1}^{T} (w_r - \overline{w})^2}{T-K-1} \text{ y } \overline{w} = \frac{\sum_{r=K+1}^{T} w_r}{T-K}$$

The significance of any departure from the zero line is assessed by reference to a pair of straight lines, the distance between which increases with t. The CUSUM test produces a plot of against t and also shows the 5 percent critical lines. Movement of outside the critical lines is suggestive of parameter instability. The critical lines are defined by $[K,\pm a(T-K)^{1/2}]$ and $[T,\pm 3a(T-K)^{1/2}]$. T: observations; K: no. Regressors. a= 0,948 at 95%.

CUSUM OF SQUARES TEST (CUSUMQ):

$$S_t = \frac{\sum_{r=K+1}^{r=t} w_r^2}{\sum_{r=K+1}^{r=T} w_r^2}$$

The mean value line giving the expected value of this test statistic under the hypothesis of parameter constancy is $E(S_t)=(t-K)/(T-K)$

CUSUM Test	CUSUMQ Test	CUSUM Test	CUSUMQ Test
ANDALUCIA		ARAGON	
			
BALEARIC ISLAND		CATALUÑA	
			
EXTREMADURA		GALICIA	
			

Footnotes

[1] This does not mean that in some cases there may be a high level of sectoral specialization and that a regional economy can be specially sensitive to "shocks" and specific changes that affect positively and negatively, a particular branch of an activity.

[2] We follow on in this line, which is also used by Cuadrado, Mancha and Garrido (1998). For discussion at greater length, concerning the use of this filtre and other alternatives, Cooper (1998), Gomez (2001)or Pederson (2001)can be consulted.

[3] A lineal adjustment of the external opening of the Spanish economy and it cyclical discrepancy shows a negative and significant relation of 95%. The sample used begins in 1980 as it is from this moment when the Bank of Spain offers homogeneous statistics on the balance of services.

[4] For crisis years, the period 1980-85 and 1993-95 have been fixed. The other years have been considered as years of recuperation.