PATTERNS OF REGIONAL SERVICE SECTOR CONVERGENCE IN THE SPANISH ECONOMY.

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ABSTRACT

The intense growth sustained over the last few decades by the service sector in Spain, even greater when measured in terms of employment, does not conceal the existence of differentiated degrees and rates of such growth across the regions. Accepting that public services are evenly distributed throughout the national territory, these differences may be caused by a certain tertiary specialisation (in tourism services, for example), or else by the existence of different levels of regional production of advanced services (basically, business services). The latter case may have negative consequences for regional development given the importance of such activities in the competitiveness and economic appeal of a territory. Therefore, a study of the patterns of tertiary convergence of the Spanish regions using cointegration is proposed. The use of this technique enables the behaviour of each economy to be individually analysed. The main results reveal the existence of clearly differentiated regional patterns of tertiary growth, identifying a set of not very developed regions with a low degree of tertiary development and scarce endowment of certain services fundamental for their growth.

Key words: Regional development, services, convergence, co-integration.

JEL classification: C22, L80.

1. Introduction.

The intense growth sustained by the service sector in developed economies, especially in terms of employment, does not conceal the existence of important interregional differences. These disparities may be the consequence of sector specialisation -a result of the different factor endowments- or of the insufficient development of advanced service activities. Insufficient provision of the latter activities may result in an important disadvantage for the economic appeal and competitiveness of such economies.

This work proposes a convergence analysis of services applied to the Spanish regions in the search of a twofold objective: firstly, we attempt to analyse the regional patterns of growth in the Spanish service sector and to establish possible limits to this growth;

secondly, we aim to identify the existence of a relation between the growth patterns of services and sector specialisation in tertiary activities.

These objectives will be pursued by means of a convergence study of the number of service employees applying the cointegration technique to the time series of regional employment in services. This analysis will enable the dynamics of the regional models of service growth in Spain to be identified, and is complemented by the study of the regional evolution of disaggregate Gross Added Value in services.

2. Effects of service sector behaviour on regional growth.

The existence of regional differences in factor endowment and the exploitation of increasing returns in certain services where user proximity is not necessary is an initial explanation for the different levels of sector specialisation attained by the regions. In principle, this should not have negative effects as specialisation is one of the basic laws of economic efficiency, and all the regions could benefit from this. Nevertheless, specialisation may be a source of disadvantages for those economies which are trapped in a sectorial equilibrium with low service growth, especially if the services which are not available are those which most influence the overall progress and development of the regional economy (new services, high tech services, business services, among others).

Llorca Vivero *et al.* (1996) pointed out that services may contribute to the growth and welfare of societies by at least three ways or routes. Firstly, by exporting those services in which the nation or region has become specialised due to having a greater factor endowment or presenting a technical-organisational advantage. Secondly, by meeting a demand for highly diverse service activities arising in the population as societies progress. And finally, decisively affecting the improvement in productivity of the total economic activities due to the intense interrelation between services and other activities, especially manufacturing.

The first route is the most important economic activity of many Spanish regions because of the considerable growth achieved by the tourism sector here. The welfare of societies depends to a large extent on the development attained in the activities of the second route. Finally, the third route is fundamental to ensure balanced, consistent regional growth. On the other hand, industrial competitiveness depends on direct production activities as well as production-related services, the connection between these not only lies in the production process itself but also in pre and post-production phases (Mas, 1992). However, the support functions for production activities may be available to the company internally or in its external setting, that is to say, in the surrounding market. This ties in with *Marshall* ´s idea of territory, understood as something more than an inert or passive element in which economic activities take place. In actual fact, this is the source of a set of comparative advantages such as qualified personnel, business culture, developed industrial framework, broad infraestructures, market proximity, among others. This is what makes some regions more appealing compared to others and stimulates or holds up their growth. The availability of a wide offer of efficient business services can be considered as part of this regional economic infrastructure which promotes growth (Begg, 1993).

Therefore, if cross-regional differences are a consequence of the fact that some regions exploit first-route services and others have not been able to do so, or do not dispose of the adequate factor endowment to be competitive in these services, the existence of different levels of service growth does not prove to be a key factor. But if some regions are unable to develop a tertiary network in their territory capable of guaranteeing a wide and competitive set of services which, at least in part, is the cause of lower service growth, there is no doubt that this will lead to regional development delay. In this second case, public action is advisable to stimulate the regional offer as well as the demand for business services and escape the trap of low tertiary growth into which the region had fallen (Martínez and Argüelles, 1997).

3. The model: convergence analysis with cointegration.

It is said that a certain variable y_t is integrated of order d, I(d), when it is necessary to difference it d times for it to become stationary. The concept of cointegration, which was conceived by Engle and Granger (1987), consists in the existence of a stable linear relation over time between two or more variables. Hence, given a vector x_t composed of n variables all of which are integrated of the same order d, they are said to be cointegrated if there exists a vector a which originates a linear combination of the variables of χ_t in such a way that this value is integrated of order *h* where *h=d-b*, being *b>0*. This vector α is termed cointegration vector.

The existence of this cointegration vector between two or more variables therefore implies the presence of a long-run relationship between them, in such a way that although there may exist deviations from period to period, in the long run there is a stable equilibrium between the variables forming part of this vector. This twofold relation between the short and long run can be combined with the use of the nonstationary VAR models and the models with Error Correction Mechanism (ECM), giving rise to the Vector Error Correction Mechanism (VECM or a VAR model with ECM). Nevertheless, the concept of statistical equilibrium does not necessarily have to coincide with the economic concept (see, for example, Achuelo, 1993). Equilibrium in statistical terms only means that an intervariable linear relation is observed which has been maintained over a long period of time; but the economic significance of this equilibrium depends on the theory which is being applied. Hence, adequately adapted, the cointegration technique can be an excellent instrument for studying convergence patterns between variables for which sufficient time observations are available.

Button and Pentecost (1993) applied cointegration techniques, considered novel at the time, in order to analyse the existence of convergence between the time series of tertiary employment share in all the British regions. Their study analyses whether or not convergence exists simultaneously between all of the regions; but it does not enable the possible existence of convergence at different levels to be identified. Furthermore, the use of data on the share of service employment out of the total instead of using absolute data on employment in the service sector can lead to errors as an apparent growth in the share of services may possibly conceal an actual profound economic crisis involving an intense loss of industrial and/or primary employment which artificially raises the percentage of tertiary employment.

Suriñach *et al.* (1995) propose an alternative method which enables a simultaneous study to be made between many economies comparing each of them with an aggregate of the rest. This procedure also allows the researcher to work with time series of tertiary employment in absolute terms and not with the series of service employment share out of total employment. For this reason, the authors first propose testing the existence of common trends in the regional evolution of an economic variable using a static relationship between economy *i* and the rest of the economies being compared. This relationship is purely empirical and does not have the backing of a causal model. However, its meeting the conditions referred to throughout this work enables us to interpret the relationship between the region and the rest of the economy under comparison. If common trajectories are identified, by analysing the coefficients of the cointegration vector their convergent, divergent, or neutral character can be studied.

It is therefore possible to adapt this method to the specific objectives of this paper. Let $SS_{i,t}$ and $SS_{n,t}$ be the employees in the service sector in economy *i* and in the rest of the national economy (national total less the employees in economy *i*), respectively, at the moment in time *t*. It may be supposed that between the service sector growth in economy *i* and the growth of the same sector in the rest of the economies there is an empirical-type static relationship such as that compiled in the following expression:

$$SS_{i,t} = A_i SS_{n,t}^{a_i} e^{e_{i,t}}$$

where $A_i = e^{m_i}$, being a different deterministic term for each economy which measures the proportion of balance in the long run between the value of the variable for the specific case and the total.

In effect, it may be considered that service employment growth in an economy *i* is related to external factors such as, for example income growth in the rest of the economies since the latter growth would take the form of the increase in tertiary employment itself upon stimulating the demand for services offered in *i* (for example, tourism). Similarly, if we suppose that the economies are open and that consumers have perfect information, the development of new business services or social services in the rest of the economies produces a demand for these in *i* which would result in increases in tertiary employment in this economy until the disappearance of the excess profits to be obtained by the companies providing these services.

Putting the previous expression into logarithm form, this becomes:

$$LnSS_{i,t} = m_i + a_i LnSS_{n,t} + e_{i,t}$$

Based on this equation, the estimation and analysis of parameter a_i is especially interesting since it compiles the elasticity of tertiary employment in economy i faced with a change in service employees of the total aggregate. Negative elasticity means that the behaviour of economy i goes in the opposite direction to the economies as a whole; a nil value, in turn, would mean that such a relation does not exist. Therefore, in order to be able to accept the above equation it is enough to obtain values of a_i significantly greater than zero. Once this test has been passed, the long-run behaviour of tertiary employment in the open economies analysed will be given by the value assumed by this parameter, the interpretation of which in a context of service growth is summarised in Table 1.

On the other hand, it should be pointed out that m_i corrects for the size of each economy the response of its tertiary employment to the evolution of the rest.

Due to the fact that it is highly likely that the time series considered are nonstationary, as occurs with most economic time series, an important problem arises when estimating the above notation. If, effectively, the series are nonstationary, the simple estimation of this notation would produce spurious regressions. Given that the aim of this work is to test the presence of common long-run trends in the regional evolution of tertiary employment in order to then interpret its convergent or divergent behaviour, we must necessarily use the relationship in levels as a starting-point. Therefore, differencing cannot be used to avoid the problem of nonstationarity of the series.

However, a static relationship in levels of variables with stochastic trends providing a linear combination (residuals of the model) which does not present this type of trend (existence of cointegration) would be the basis for affirming that such variables maintain a long-run relationship. Consequently, in our case, we can confirm the presence of common trends in the evolution of tertiary employment in the region and the nation based on which convergence patterns are studied. Furthermore, the danger of establishing relationships of a spurious nature due to working with this class of variables is discarded as the residuals of this type of relationship present stochastic trends, and so the existence of common trends will be rejected.

It is for all of these reasons that the above relationship is estimated as a cointegration vector which acts as an Error Correction Mechanism in a complete VECM model (VAR with ECM) for each economy:

$$\Delta LnSS_{i,t} = \sum_{\rho 1=1}^{P1} \Gamma_{\rho 1} \Delta LnSS_{i,t-\rho} + \sum_{\omega 1=1}^{\Omega 1} \Phi_{\omega 1} \Delta LnSS_{n,t-\omega} + \gamma_i (LnSS_{i,t-1} - \mu_i - \alpha_i LnSS_{n,t-1}) + \varepsilon_{1i,t}$$

$$\Delta LnSS_{n,t} = \sum_{\rho 2=1}^{P2} \Gamma_{\rho 2} \Delta LnSS_{i,t-\rho} + \sum_{\omega 2=1}^{\Omega 2} \Phi_{\omega 2} \Delta LnSS_{n,t-\omega} + \gamma_n (LnSS_{i,t-1} - \mu_i - \alpha_i LnSS_{n,t-1}) + \varepsilon_{2i,t}$$

where we are exclusively interested in the parameters of the cointegration vector itself (m_i and a_i). Exploiting the analysis performed, it may be interesting to record the value assumed by the estimation of parameter g_i, which compiles the speed of return to equilibrium, since it indicates the speed with which region *i* returns to its stable relation with the rest when for some reason this region undergoes a deviation. Elements $\sum_{\rho=1}^{P} \Gamma_{\rho} \Delta LnSS_{i,t-\rho}$, $\sum_{\omega=1}^{\Omega} \Phi_{\omega} \Delta LnSS_{n,t-\omega}$ do not prove to be relevant in this study as they show short-run relationships rather than the required long-run relationships.

4. Empirical results.

4.1. Data.

The data used in this research work correspond to the number of employees in services in the Spanish Regions (17 Autonomous Regions) and to the result of subtracting service employment in each of these 17 regions from the national total. The time series of tertiary employment by regions have been extracted from the TEMPUS database constructed by the Instituto Nacional de Estadística (I.N.E.) which was initiated in the first quarter 1977 and ends in the second quarter 1997. Data from the 1990 Contabilidad Regional de España performed by the I.N.E. are also used.

This database is characterised by the high sector heterogeneity presented by the different Spanish regional economies. It embraces a spectrum of regions which vary from very high degrees of service growth due to economies fundamentally based on the tourism sector (Balearics, Canaries, etc.) to those in which economic activity still depends on primary sectors (Galicia, La Rioja, etc.) including those which are mainly industrial (Basque Country, Asturias, etc.) or sectorially balanced (Catalonia, Valencia, etc.).

Table 2 presents synthesised information on the evolution of service employees in the Spanish regions over a period of time from the first quarter 1977 to the second quarter 1997, revealing the important growth of employees in these activities as well as the existence of this previously mentioned high interregional heterogeneity. Similarly, Graph 1 and Graph 2 represent the time evolution in the Spanish regions of the share of service employee out of the total employees and the number of employees in tertiary work, respectively. These graphs point to the possibility that the rates of service employees as well as the number of people in work in these activities converge towards more than one level.

4.2. Main results.

In order to be able to apply the proposed approach, based on an analysis of the common trends between the regional evolution of service employment and the evolution of this same variable in the rest of the nation, it is first necessary to ascertain the order of integration of the quarterly series of tertiary employment of each region and the series resulting before subtracting employment in each of the 17 regions from the national total. That is to say, we must test the unit roots to detect whether such time series have trend or not, and in the foreseeable case that trend is present as is to be expected from their graphical representation, determine whether this trend is deterministic or stochastic.

The test used to this end was the ADF (Dikey and Fuller, 1981), based on the DF proposed by these authors (Dikey and Fuller, 1979). The DF takes as a null hypothesis the fact that the process is a random walk and as an alternative hypothesis the fact that this is a stationary AR(1). This test can be performed according to three different specifications: with constant term and deterministic trend; only with constant term, without deterministic trend; or without either deterministic trend or constant. Due to the different implications of each of these three possible forms of calculating the DF test on the behaviour of the variables, and in an attempt to identify the data generation process which best characterises the series, the most commonly accepted strategy will be followed. This consists in going from the most general model (with deterministic trend and constant term) to the most specific (without deterministic trend or constant) eliminating the deterministic trend or constant term according to its statistical significance, provided that the null hypothesis is not rejected. The ADF only adds to the DF a structure of lags of the dependent variable which enables us to capture its autoregressive structure, the autocorrrelation becoming as uncorrelated as possible. The choice of the number of lags to be used is made applying the criterion of Schwert (1989) which in each case, taking a sample size of 81 four-monthly observations entails the use of three lags.

The results obtained upon applying the three lagged ADF test to the time series in levels allow the absence of unit roots to be rejected at 1 per cent in all the time series (in Table 3 it can be seen that the value of the ADF statistic is always greater than the critical values and so we cannot reject the null hypothesis of nonstationarity of the time series in levels). Following the application of this test to the series in first differences again taking three lags, the null hypothesis of nonstationarity can be rejected at 1 per cent in most cases; except in the Balearics, Canaries, Catalonia, Castille and León and Valencia in which it is rejected at 5 per cent; in turn, in Andalusia this rejection is produced at a level close to 10 per cent (see Table 4 for the value of the ADF statistic which assumes values lower than the critical values and so we can reject the presence of unit roots in the time series in first differences). Therefore, it can be concluded that the series of tertiary employment of the 17 Spanish regions are integrated of order one, denoting this by I(1). Table 3 and Table 4 depict the test for the national total obtaining the same results, that is to say, the null hypothesis cannot be rejected in levels whereas it is possible to do so when first differencing at a level of 5 per cent. This behaviour is repeated with slight changes for the 17 time series resulting from subtracting the number of service employees of each region from the national total. In other words, the series arising from this difference are also I(1). Definitively, and as a conclusion to this initial analysis of the series, of those corresponding to each region as well as those corresponding to the national total less each region, it is found that all of them are integrated of order one.

After testing that all the time series are integrated of order one, the cointegration tests in the strict sense can be applied, estimating with these the coefficients of economic interest, especially the value assumed by parameter a in each region. The two most commonly used methods for estimating cointegration relations are Engle and Granger´s two-stage method (Engle and Granger, 1987) and Johansen´s approach (Johansen, 1988).

Engle and Granger´s two-stage method (1987) consists in firstly estimating the cointegration by Ordinary Least Squares (OLS) and then estimating the ECM introducing the residuals of the cointegration relation. Despite being a very simple and intuitive procedure it is not free of drawbacks. On the one hand, when relations between more than two variables are studied, there may exist more than one cointegration vector, that obtained by this method being a linear combination of these. This problem, however, does not affect the present work in which only two variables are used (tertiary employment in region i and tertiary employment in the other regions). Nevertheless, another problem, which does affect this research work, lies in the absence of well-defined limit distributions for the statistics provided by this method. The residuals of the regression performed in the first stage can be used to test the existence of cointegration between the variables; if they are cointegrated, the errors must be stationary, which is tested by means of the DF or ADF. But the estimate by OLS when choosing the estimators causing the least sample variance makes the residuals seem the most stationary possible and so the previously mentioned tests will tend to reject nonstationarity too frequently.

These difficulties recommend making the estimate by Johansen´s approach (Johansen, 1988) which enables all the cointegration vectors to be estimated without *a priori* requiring the existence of a single vector and not being affected by the endogenous nature of the variables involved in the cointegration relation. Furthermore, this method enables the cointegration to be tested at the same time as it is being estimated[1].

The results of the cointegration test using Johansen´s approach are presented in Table 5. According to this, the existence of cointegration can be accepted in the amount of tertiary employment among all the regions and this same variable in the rest of the nation, except in the cases of Galicia and La Rioja (see Table 5). This result can be explained by the fact that the economy of these two regions is still based on primary activities, a sufficiently broad service sector not having been developed. Such an economic pattern is statistically reflected in the rejection of common trends between the series of tertiary employment of these two regions and those of the rest. In the cases of Andalusia, Cantabria, Balearics and Castille La Mancha, the existence of cointegration is accepted at a level of 5 per cent, unlike the other regions where acceptance is at 1 per cent.

Table 6 shows the results of the cointegration relation estimate in the regions in which its existence has been accepted. Regarding the parameter of speed of return to equilibrium, γ_i; as was to be expected this takes negative values in all cases, indicating that the ECM introduced in the VAR notation acts as a short run deviation corrector. In general, the values of this parameter are very similar among the different regions although it is necessary to point out the greater slowness of Asturias, Estremedura and Murcia in their return to equilibrium with the rest of the regions when for any reason they deviate from this. In the same way, the high speed of return to long-run equilibrium is noteworthy in Navarre.

4.3. Interpretation of Results.

In order to facilitate the economic interpretation of the results of the estimate of a_i by Johansen´s approach, these results have been grouped applying as a classification criterion the degree of service growth of each region, obtained from the following expression and the specific results of which are presented in Table 7.

$$GT_i = \frac{\overline{SS_i} / \overline{O_i}}{(\overline{SS_n} - \overline{SS_i}) / (\overline{O_n} - \overline{O_i})}$$

Where $\overline{SS_i}$ is the mean of service employees in region i in the period from first quarter 1977 to second quarter 1997, $\overline{SS_n}$ the mean of service employees in the national total in this period, $\overline{O_i}$ the mean of total employees in region i for the same time range and $\overline{O_n}$ total employees in all the nation in the period analysed.

It has been considered that the regions assuming a value greater than or equal to 1.05 can be considered as undergoing relatively high service growth; whereas those with a value lower than or equal to 0.95 will be considered as experiencing relatively little service growth and the rest, lying between 0.95 and 1.05, will be considered as those having a relative degree of intermediate service growth.

Table 8 combines this criterion with the estimated value of a_i, obtaining nine potential groups which ease the interpretation of results. As can be seen in this table, tertiary employment in the Balearics, Canaries, Catalonia, Andalusia and Murcia grow at a greater rate than in the rest of the regions. Catalonia and Murcia start out with an average degree of service growth and, therefore, will not take long to catch up with regions with highest service growth. The Balearics, Canaries and Andalusia already being in a position of relatively high levels of service growth increase their difference from the rest of the regions. Valencia, Castille la Mancha, Navarre and Cantabria maintain their steady growth rate with respect to the aggregate of the rest of the regions. The first region in this second group (Valencia) initially has an average degree of service growth which it tends to maintain, but the other three regions (Castille La Mancha, Navarre and Cantabria), start with low relative levels of service growth, not undergoing more intense growth convergent with the medium or high levels, but do not diverge from these. Finally, Madrid, the Basque Country, Castille and León, Aragon, Estremadura and Asturias see their tertiary employment grow at a lower rate than the national total. Madrid is the region with the highest initial level of service growth, showing signs of depletion in this growth. The Basque Counry starts out with an average situation from which it tends to move away in a negative direction. The other four regions undergo a process of divergence with respect to the national aggregate, although they converge together at a low level. These last four regions are those which cause greatest concern, as having relatively low levels of service growth they tend towards divergence with respect to the aggregate of the rest.

In order to determine the causes of the different regional tertiary growth rates a more broken down study of services will be necessary in order to determine the different tertiary structures, identifying the branches of activity which invigorate or brake the tertiary development of each region. The correct procedure would be to continue using service employment as a reference variable in this analysis, the problem lies in the scarce level of data break down on tertiary employment in Spain. For this reason, we used data on the tertiary Gross Added Value by regions for 1990 facilitated by the I.N.E. divided into wide branches of activity (market and non-market services; dividing the former into: transport and communication services, restaurants, repairs and improvements, banking and financial services and other market services). Comparing the results of the estimate of a_i with the percentage share of Gross Added Value of each branch of service activity in the total tertiary Gross Added Value (Graph 3 to Graph 5) an approximation can be made of some of the causes of the different service dynamics of the Spanish regions.

In Graph 3 it can be seen that the regions with greater tertiary growth are those which have a larger tourism sector (Balearics, Canaries and although to a lesser extent Andalusia,Valencia, Catalonia and Murcia). The regions which witness least growth in their tertiary employment are those with a lower tourism component (Madrid, Asturias, Castille and León and Estremadura). That is to say, the main cause of differences in service growth among regions is the varying degree of specialisation in tourism activities (first-route services as defined in Section two of this work).

Nevertheless, as can be seen in Graph 4 and Graph 5, some of the regions with lower service growth (Estremedura, Aragon and Asturias in particular) start out with a below average endowment of financial and other services, which we can consider as corresponding to the third route. That is to say, in those cases not only is tourism the branch which differentiates between regions. The services of Madrid, the Basque Country and Navarre grow at a lower rate than the rest of the regions but start from very high levels of financial and other services; whereas in the previously mentioned cases the weak presence of the regional service sector lies in the low presence of tourism activities as well as the low initial level of tertiary activities as well as the low endowment of services which are fundamental for the economic appeal of the regions.

5. Summary and Conclusions.

The aim of this paper was to analyse the regional patterns of service growth developed in Spain based on applying the cointegration technique to the employment time series available for the period 1977 to 1997. In order to ease interpretation of the results, nine potential groups of regions have been identified based on the combination of the relative growth rate of services with the degree of service growth in each of them. The results attained have enabled us to affirm the existence of perfectly differentiated regional growth rates which can be divided into four main groups: regions with relatively high service growth in which great intensity is observed in employment growth; regions with relatively high tertiary growth in which an appreciable deceleration is noted in the service employment growth rate; stabilised regions which present an average degree of service growth and a growth path similar to the remaining regions; and, finally, regions undergoing little service growth in which the sector grows more slowly than in the other regions.

Comparing these results with the disaggregate structure of the service sector in each region identified from the tertiary Gross Added Value composition has enabled us to make a more accurate estimate of the possible causes and consequences of the existence of diverse growth patterns. Hence, tourism plays a key role, as it does not only account for the strong growth rates in the regions with highest service growth, but also the slowness in the service growth rate of other regions.

The relative deceleration of service employment growth observed in some regions has different consequences in terms of the initial composition of the service sector. In this sense, of particular note are the situations of Estremadura, Aragon and Asturias, as these are characterised by simultaneously having a relative low service growth rate, a low presence of financial and other services, as well as a tertiary activity growth rate clearly lower than that presented by the sector in the rest of Spain. These circumstances may have a negative impact on the potential of future regional growth.

Finally, we wish to draw attention to the case of Madrid. This is the non-tourist oriented region with the highest degree of service growth in Spain which, however, presents a certain relative stagnation in service employment growth. This fact may suggest the hypothesis that there exists an equilibrium between the advanced tertiary sector and the rest of the economic activities which acts as a limit to the service growth of economies.

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TABLES AND GRAPHS

Table 1: Interpretation of different values of elasticity α_i according to the initial situations (*).

	The service sector of the economy analysed is greater than the mean of the rest	The service sector of the economy analysed is lower than the mean of the rest
$0<\alpha_i<1$	Convergence	Divergence
$\alpha_i=1$	Current situation is maintained	Current situation is maintained
$\alpha_i>1$	Divergence	Convergence

(*) Always supposing a text of growth in the tertiary sector.

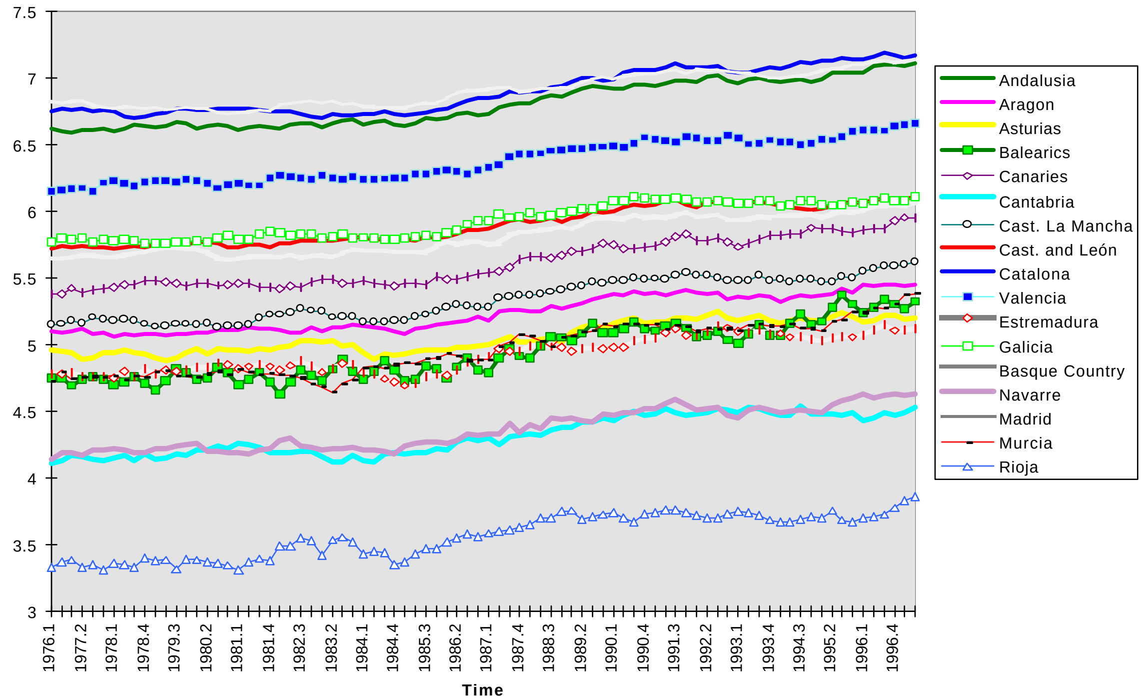
Source: Own.

Table 2: Evolution of service employment in Spain (1977.1- 1997.2).

Region	Share of service employees out of total employees		Service employees in 1997	Annual average growth rate	Share in total national service employees
	1977	1997	(1977=100)		(1997)
Andalusia	42,13%	63,05%	164,75	2,53%	15,63%
Aragon	38,92%	56,64%	141,36	1,75%	3,02%
Asturias	34,28%	57,84%	129,20	1,29%	2,34%
Balearics	49,95%	71,22%	178,31	2,93%	2,53%
Canaries	57,47%	73,52%	169,68	2,68%	5,01%
Cantabria	36,12%	57,84%	136,88	1,58%	1,15%
Cast. la Mancha	34,21%	53,62%	152,35	1,87%	5,79%
Castille and León	35,57%	57,57%	144,95	2,13%	3,52%
Catalonia	41,75%	58,98%	147,18	1,95%	16,62%
Estremadura	37,32%	60,15%	137,78	1,62%	2,16%
Galicia	27,46%	49,60%	133,48	1,45%	5,70%
Madrid	61,39%	72,00%	134,94	1,51%	16,21%
Murcia	40,01%	64,04%	187,34	3,19%	2,80%
Navarre	37,59%	52,59%	154,79	2,21%	1,32%
Basque Country	38,55%	60,23%	147,25	1,95%	5,48%
Rioja	31,60%	51,29%	156,45	2,26%	0,60%
Valencia	39,68%	59,90%	161,93	2,44%	10,11%
Spain average	**40,72%**	**61,36%**	**149,71**	**2,04%**	**100,00%**

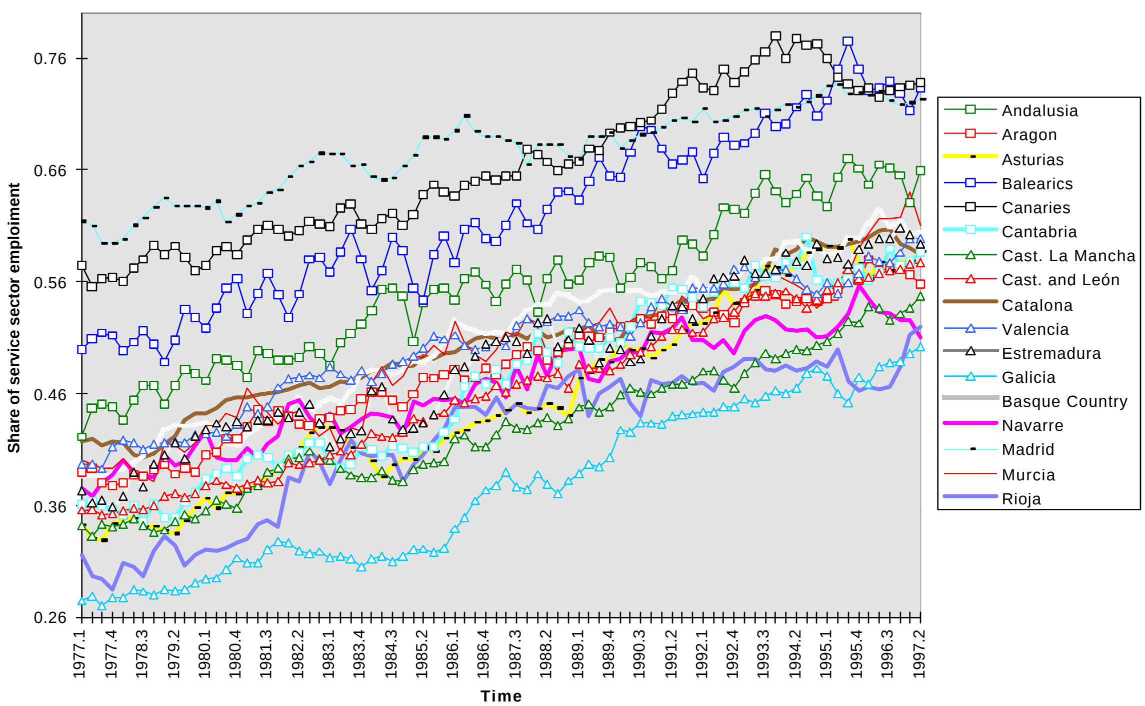
Source: Own based on I.N.E, data.

Graph 1: Evolution of number of service employees by regions (1977.1-1997.2). Logarithm series.



Source: Own based on I.N.E, data.

Graph 2: Evolution of share of tertiary employment out of total by regions (1977.1-1997.2). In percentages.



Source: Own based on I.N.E, data.

Table 3: Results of applying the ADF test to the series of tertiary employment in levels by regions (1977.1-1997.1) (*).

Region	Statistical significance of: Deterministic trend	Constant	ADF Statistics	Critical values
Andalusia	-	-	3.5255	-2.5926 (1%) -1.9444 (5%)
Aragon	0.1568 (0.8%)	19.1159 (1.8%)	-2.4405	-4.0787 (1%) -3.4673 (5%)
Asturias	-	-	1.8119	-2.5926 (1%) -1.9444 (5%)
Balearics	-	-	2.6821	-2.5926 (1%) -1.9444 (5%)
Canaries	-	-	2.8044	-2.5926 (1%) -1.9444 (5%)
Cantabria	-	-	1.7909	-2.5926 (1%) -1.9444 (5%)
Cast, la Mancha	0.6537 (0.8%)	49.9331 (4.2%)	-2.1625	-4.0787 (1%) -3.4673 (5%)
Castille and León	0.1535 (1.9%)	16.6809 (3%)	-2.1982	-4.0787 (1%) -3.4673 (5%)
Catalonia	0.2091 (3.6%)	26.2450 (3.6%)	-1.9824	-4.0787 (1%) -3.4673 (5%)
Estremadura	-	-	1.4253	-2.5926 (1%) -1.9444 (5%)
Galicia	0.1907 (5%)	27.3060 (5.6%)	-1.9335	-4.0787 (1%) -3.4673 (5%)
Madrid	0.8606 (0%)	117.6330 (1.7%)	-3.4559	-4.0787 (1%) -3.4673 (5%)
Murcia	0.1481 (2.4%)	11.6884 (4.5)	-1.9997	-4.0742 (1%) -3.4652 (5%)
Navarre	0.0865 (2.2%)	8.5404 (4.2%)	-2.0626	-4.0787 (1%) -3.4673 (5%)
Basque Country	0.2202 (2.5%)	25.5156 (4.9%)	-2.0032	-4.0787 (1%) -3.4673 (5%)
Rioja	0.0377 (3.6%)	4.8431 (1.8%)	-2.3144	-4.0787 (10%) -3.4673 (5%)
Valencia	-	-	2.8537	-2.5926 (1%) -1.9444 (5%)
Total	**2.2929 (1.3%)**	**228.7366 (3%)**	**-2.2013**	**-4.0887 (1%) -3.4673 (5%)**

(*) Taking three lags on all occasions in agreement with the criterion of Schwert (1989).

Source: Own based on I.N.E, data.

Table 4: Results of applying the ADF test to the series of tertiary employment in main differences by regions (1977.1-1997.1) (*).

	Statistical significance of:		ADF	Critical
Region	**Deterministic trend**	**Constant**	**Statistics**	**values**
Andalusia	-	-	-1.4676	-2.5929 (1%) -1.9445 (5%)
Aragón	-	-	-3.0601	-2.5929 (1%) -1.9445 (5%)
Asturias	-	-	-3.6621	-2.5929 (1%) -1.9445 (5%)
Balearics	-	-	-2.3986	-2.5929 (1%) -1.9445 (5%)
Canaries	-	1.8508 (2.4%)	-3.8660	-3.5164 (1%) -2.8991 (5%)
Cantabria	-	-	-4.1169	-2.5929 (1%) -1.9445 (5%)
Cast, la Mancha	-	-	-2.5549	-2.5929 (1%) -1.9445 (5%)
Castille and León	-	-	-3.2493	-2.5929 (1%) -1.9445 (5%)
Catalonia	-	-	-2.4878	-2.5929 (1%) -1.9445 (5%)
Estremadura	-	-	-3.0787	-2.5929 (1%) -1.9445 (5%)
Galicia	-	-	-3.1886	-2.5929 (1%) -1.9445 (5%)
Madrid	-	-	-3.0319	-2.5929 (1%) -1.9445 (5%)
Murcia	-	1.1871 (3.5%)	-4.9732	-3.5164 (1%) -2.8991 (5%)
Navarre	-	-	-4.0554	-2.5929 (1%) -1.9445 (5%)
Basque Country	-	1.8632 (4.3%)	-4.1230	-3.5164 (1%) -2.8991 (5%)
Rioja	-	-	-4.4633	-2.5929 (1%) -1.9445 (5%)
Valencia	-	3.1704 (4.7%)	-3.3122	-3.5164 (1%) -2.8991 (5%)
Total	**-**	**-**	**-2.3295**	**-2.5929 (1%)** **-1.9445 (5%)**

(*) Taking three lags on all occasions in agreement with the criterion of Schwert (1989).

Source: Own based on I.N.E, data.

Table 5: Test of the number of cointegration relations by Johansen´s approach (1977.1-1997.2) (*).

Region	Contrast of number of cointegration relations			
	Hypothesis	**Autovalues**	**Likelihood logarithm**	**N° of cointegration relations**
Andalusia	H_0: r=0 H_1: r≥1	0.1566	20.1909	1*
	H_0: r≤1 H_1: r=2	0.0147	1.1902	
Aragon	H_0: r=0 H_1: r≥1	0.2121	26.8274	1
	H_0: r≤1 H_1: r=2	0.0962	7.9936	
Asturias	H_0: r=0 H_1: r≥1	0.2796	30.4526	1
	H_0: r≤1 H_1: r=2	0.0557	4.5343	
Balearics	H_0: r=0 H_1: r≥1	0.2010	20.6053	1*
	H_0: r≤1 H_1: r=2	0.0422	3.3212	
Canaries	H_0: r=0 H_1: r≥1	0.2909	32.5054	1
	H_0: r≤1 H_1: r=2	0.0654	3.3454	
Cantabria	H_0: r=0 H_1: r≥1	0.1960	24.5348	1*
	H_0: r≤1 H_1: r=2	0.0846	7.0798	
Cast, la Mancha	H_0: r=0 H_1: r≥1	0.1950	23.7585	1*
	H_0: r≤1 H_1: r=2	0.0769	6.4043	
Castille and León	H_0: r=0 H_1: r≥1	0.2703	33.4360	1
	H_0: r≤1 H_1: r=2	0.0976	8.2182	
Catalonia	H_0: r=0 H_1: r≥1	0.3182	36.4942	1
	H_0: r≤1 H_1: r=2	0.0699	5.7993	
Estremadura	H_0: r=0 H_1: r≥1	0.2611	27.9340	1
	H_0: r≤1	0.0496	4.0223	

Region	Contrast of number of cointegration relations			
	Hypothesis	**Autovalues**	**Likelihood logarithm**	**N° of cointegration relations**
	H_1: r=2			
Galicia	H_0: r=0 H_1: r≥1	0.1527	19.2529	0
	H_0: r≤1 H_1: r=2	0.0721	5.9882	
Madrid	H_0: r=0 H_1: r≥1	0.2155	26.4234	1
	H_0: r≤1 H_1: r=2	0.0837	6.9997	
Murcia	H_0: r=0 H_1: r≥1	0.2258	28.5450	1
	H_0: r≤1 H_1: r=2	0.0958	8.0665	
Navarre	H_0: r=0 H_1: r≥1	0.3811	46.6322	1
	H_0: r≤1 H_1: r=2	0.1045	8.7205	
Basque Country	H_0: r=0 H_1: r≥1	0.2077	25.0522	1
	H_0: r≤1 H_1: r=2	0.0807	6.6533	
Rioja	H_0: r=0 H_1: r≥1	0.1197	17.4906	0
	H_0: r≤1 H_1: r=2	0.0889	7.4478	
Valencia	H_0: r=0 H_1: r≥1	0.2694	33.4645	1
	H_0: r≤1 H_1: r=2	0.1037	8.6551	

(*) The critical values are 1 per cent 24.60 and 5 per cent 19.60 for H_0: r=0, H_1: r≥1 and 1 per cent 12.97, 5 per cent 9.24 for H_0: r≤1, H_1: r=2. r being the number of cointegration relations between the tertiary employment in each region and the tertiary employment in the rest of the regions.
* At a significance level of 5%.

Source: Own based on I.N.E, data.

Table 6: Estimation by Johansen´s approach of the normalised cointegration vector and of the speed of return to equilibrium parameter (1977.1-1997.2) (*).

Region	Cointegration Vector		Estimate of the speed of return to equilibrium parameter: γ (Stand. Dev.)	Number of lags included in the complete VECM
	μ Estimate (Stand. Dev.)	α Estimate (Stand. Dev.)		
Andalusia	-3.1105 (0.2459)	1.1675 (0.0289)	-2.2689 (0.0842)	4
Aragon	-2.4853 (0.2281)	0.8912 (0.0263)	-0.3779 (0.0984)	2
Asturias	-1.7505 (0.3844)	0.7882 (0.0445)	-0.1181 (0.0718)	2
Balearics	-6.1469 (0.5637)	1.2765 (0.0652)	-.0.3160 (0.0810)	4
Canaries	-4.8603 (0.4617)	1.2132 (0.0537)	-0.2638 (0.0547)	2
Cantabria	-4.1779 (0.7748)	0.9818 (0.0825)	-0.2329 (0.0578)	1
Catalonia	-3.1916 (0.4004)	1.1856 (0.0472)	-0.2400 (0.0433)	1
Cast. La Mancha	-3.5386 (0.3958)	1.0249 (0.0570)	-0.3070 (0.0730)	1
Castille and León	-2.1480 (0.2764)	0.9326 (0.0321)	-0.3019 (0.0625)	1
Estremadura	-2.7287 (0.5050)	0.8860 (0.0584)	-0.1012 (0.06846)	2
Madrid	-0.2237 (0.3786)	0.8393 (0.0446)	-0.2458 (0.0585)	1
Murcia	-5.1700 (0.5622)	1.1630 (0.0640)	-0.1482 (0.0781)	1
Navarre	-4.2702 (0.1737)	0.9939 (0.0200)	-0.7399 (0.1358)	2
Basque Country	-2.2300 (0.3142)	0.9223 (0.0365)	-0.3194 (0.0830)	2
Valencia	-2.44037 (0.03600)	1.0271 (0.30801)	-0.3727 (0.0753)	2

(*) The Regions of La Rioja and Galicia are not included as they do not pass the Johansen cointegration test.

Source: Own based on I.N.E, data.

Table 7: Classification of Spanish regions according to the degree of service growth (1977.1-1997.2).

Region	$GT_i = \dfrac{\overline{SS_i} / \overline{O_i}}{(\overline{SS_n} - \overline{SS_i}) / (\overline{O_n} - \overline{O_i})}$	Relative degree of service growth HIGH/MEDIUM/LOW
Madrid	1.3651	
Canaries	1.2960	ALTO
Balearics	1.2053	$GT_i > 1.05$
Andalusia	1.0808	
Basque Country	0.9753	
Catalona	0.9724	MEDIO
Valencia	0.9666	$1.05 \geq GT_i \geq 0.95$
Murcia	0.9568	
Estremadura	0.9343	
Aragon	0.9251	
Cantabria	0.8980	
Navarre	0.8972	
Castille and León	0.8733	BAJO
Asturias	0.8631	$0.95 > GT_i$
Cast. la Mancha	0.8185	
Rioja	0.8027	
Galicia	0.6914	

Source: Own based on I.N.E. data.

Table 8: Analysis of behaviour of the Spanish regions based on the α estimated by Johansen´s approach (*).

	Regions with a high relative degree of service growth	Regions with a medium relative degree of service growth	Regions with a low relative degree of service growth
$\alpha_i > 1$	Balearics (1.2765) Canaries (1.2132) Andalusia (1.1634)	Catalonia (1.1865) Murcia (1.1630)	-
$\alpha_i \approx 1$	-	Valencia (1.0271)	Cast. La Mancha (1.0249) Navarre (0.9933) Cantabria (0.9818)
$0 < \alpha_i < 1$	Madrid (0.8393)	Basque Country (0.9323)	Castille and León (0.9326) Aragon (0.8912) Estremadura (0.8860) Asturias (0.7882)

(*) The AC of La Rioja and Galicia are not included as they do not pass the *Johansen* cointegration test.

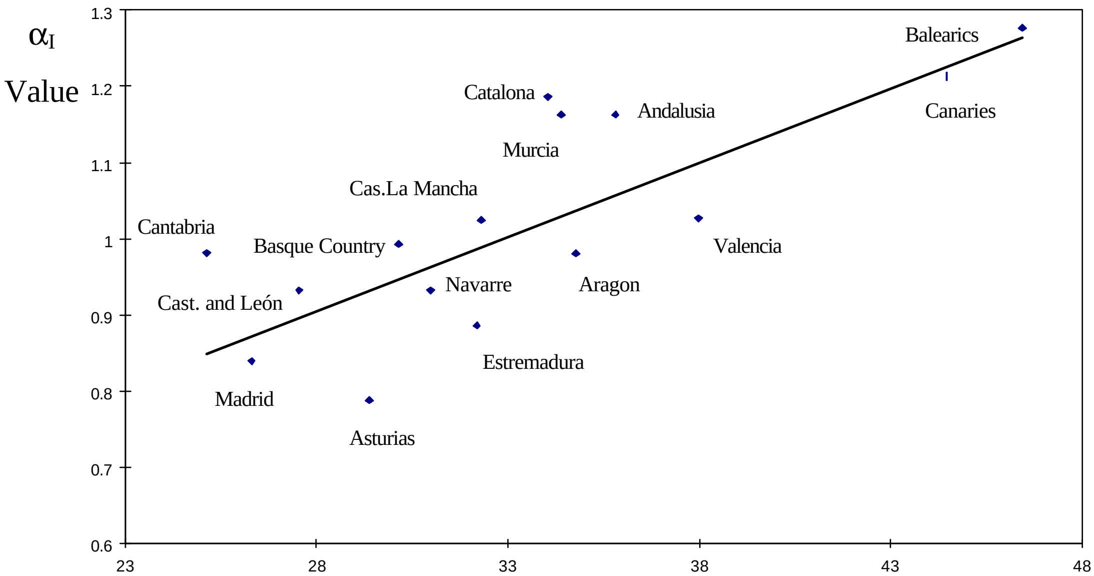
Source: Own based on Table 6 and Table 7.

Table 9: Sector composition of tertiary Gross Added Value (G.A.V) by regions (1990). In percentages.

Regions	% tertiary G.A.V. of total G.A.V.	% of the different branches of tertiary Gross Added Values.				
		Non-market services	Hotels, bars, restaurants and tourism	Transport and commun-ications	Credit and insurance institutions	Other market services
Andalusia	63.67	25.51	34.40	8.28	8.47	23.34
Aragon	61.02	23.85	33.31	7.08	10.38	25.38
Asturias	59.82	24.12	29.40	10.46	9.35	26.67
Balearics	84.32	14.39	46.43	10.14	7.78	21.26
Canaries	79.74	20.93	44.46	10.01	5.97	18.63
Cantabria	63.29	20.97	25.15	9.13	9.80	34.95
Cast. and Leon	58.86	29.86	27.56	6.66	11.14	24.79
Cas. La Mancha	53.64	26.62	32.32	7.66	10.03	23.36
Catalona	59.12	15.32	34.05	9.56	12.77	28.29
Valencia	63.36	17.76	37.99	9.75	9.38	25.12
Estremadura	62.86	33.23	32.20	5.66	8.18	20.73
Galicia	57.72	26.02	29.79	8.23	10.61	25.34
Madrid	80.00	21.69	26.31	10.44	14.19	27.37
Murcia	60.23	24.88	35.81	9.40	8.38	21.53
Navarre	53.82	21.07	30.15	10.10	12.20	26.48
Basque Country	53.89	17.90	31.00	9.22	15.61	26.27
Rioja	46.23	23.89	34.79	6.94	12.39	22.00
Total	**63.91**	**21.47**	**32.82**	**9.14**	**11.11**	**25.45**

Source: Own based on I.N.E. data.

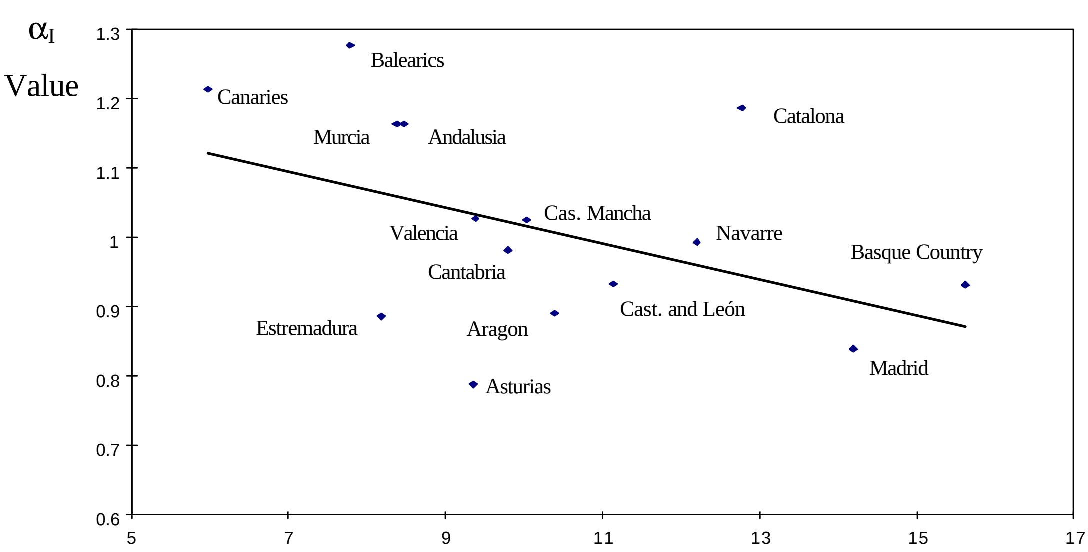
Graph 3: Relation between the convergence patterns in regional service employees and the percentage share of Gross Added Value in Bars, hotels and restaurants services out of the total tertiary Gross Added Value in 1990.



% of tourism activities G.A.V. on tertiary G.A.V.

Source: Own based on I.N.E. data.

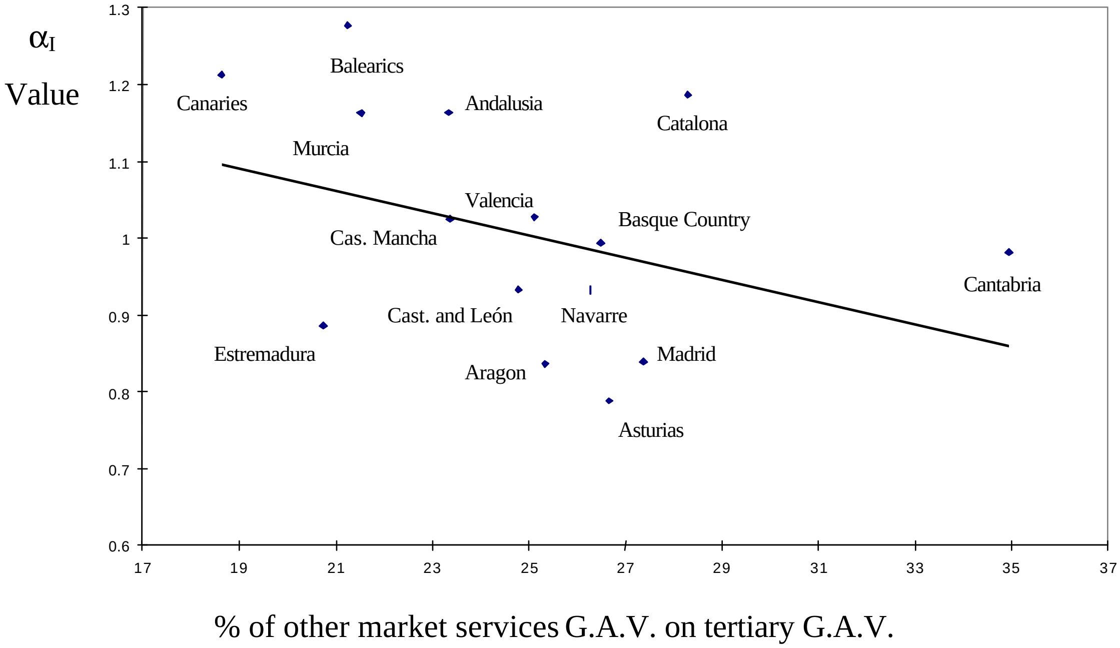
Graph 4: Relation between convergence patterns in regional service employees and the percentage share of Gross Added Value in *financial and banking services out of* the total tertiary Gross Added Value in 1990.



% of credit and insurance institutions G.A.V. on tertiary G.A.V.

Source: Own based on I.N.E. data.

Graph 5: Relation between the convergence patterns in regional service employees and the percentage share of Gross Added Value in o*ther market services* out of the total tertiary Gross Added Value in 1990.



Source: Own based on I.N.E. data.

NOTES

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[1] The authors have also applied Engle and Granger´s two-stage method obtaining results very similar to those attained by Johansen´s approach. In order not to redound excessively to the same estimate, although by different procedures, we have chosen not to include such results in this work. Nevertheless, these are at the reader´s disposal, should he be interested.