Internal Migration and Spanish Regional Convergence (1972-1998)

ABSTRACT

The aim of this paper is to study the relationship between internal migration and Spanish regional convergence between 1972 and 1998, a period between the mass emigration prior to the 1970s and the mass immigration of the end of the twentieth century. The main results indicate that internal migration led to a fall in Spanish regional development gaps. However, internal migration did not lead to the disappearance of these gaps in the long term. Some regions will always receive workers, others will send them out, and a third group will experience a sequence of migration reversals. The econometric methodology used allows us to identify structural breaks and to differentiate between long- and short-term effects. This approach enables predictions to be made for internal migration flows in the long term in the absence of shocks.

JEL classification: F22; J61; O15; O40

1. Introduction

From the theoretical perspective originally provided by exogenous growth models, factor mobility leads to wage and capital return convergence and the disappearance of labor and capital flows in the long term. Nevertheless, this trend is not corroborated by the empirical research, which provides no evidence of absolute convergence. We can predict convergence only if we limit ourselves to considering economies where tastes, technologies and institutions are similar, as Barro and Sala-i-Martín (1995) demonstrate in a regional analysis of various European countries, the USA, and Japan. We are speaking, therefore, of conditional convergence.

From the perspective adopted by the first type of endogenous growth models, the conclusion is that there is no convergence as a consequence of labor mobility: migration, on the contrary, increases the divergence between the countries involved, as Bertola (1992) and Rauch (1993) demonstrated.

Current the results soften these trends that once seemed so categorical. Rappaport (2005), through simulations in a neo-classical model of exogenous growth, concludes that, although it is true that convergence exists, emigration decreases the rate of convergence because it reduces the incentives to invest capital in the country of origin. Other works on endogenous growth, such as Faini (1996) and Reichlin and Rustichini (1998), admit the possibility of convergence. Larramona and Sanso (2006) also recognize convergence, but from a conditional perspective. Using a theoretical framework of endogenous growth, they deduce that migration generates convergence in income, capital/labor or wages, but not to the same level. The differences between countries do not necessarily disappear and this generates continuous migratory flows.

The empirical results concerning the impact of migration on convergence and growth are also inconclusive. On the one hand, works such as Barro and Sala-i-Martín (1991, 1992b) and Cárdenas and Pontón (1995) find no relationship between migration and convergence in the US, Japan, and Colombia, respectively. Shioji (2001) tries to explain this absence of a relationship for the Japanese case through the effect that migration has on the human capital of the receiving regions, which, in turn, decreases the rate of convergence. Persson (1994) does find a positive, though modest, effect of migration on the rate of convergence in the Swedish regions.

The majority of papers on Spanish internal migration focus on determining the variables that affect the migratory phenomena, and only a few analyze the relationship between migration and convergence. An early article on the internal migration process in Spain, García Ferrer (1980), concluded that it does not help the convergence process. Other papers suggest that certain barriers to migration exist that do not allow for absolute convergence. Ródenas (1994) established that some barriers to emigration impeded the migrations needed to eliminate the regional differences. Bentolilla (1997) found an end of the convergence process, in the sense that migration and income dispersion had fallen significantly across the Spanish regions. These differing conclusions probably arise from the heterogeneous periods considered. There are more recent papers: Maza (2006) examines the role of migration in convergence for the period 1995-2002 and concludes that internal migration has a positive effect on regional convergence; Maza and Hierro (2010) tried to ascertain whether internal migration of foreign-born residents contributed to the reduction of provincial per capita income differences in Spain for the same period. The period, from 1960 to 1994, was analyzed by Raymon and García (1996), who suggested that the increase in unemployment from 1979 is a plausible explanatory cause of the stagnation of migration and convergence.

In this paper, our aim is to study the relationship between internal migration, of both nationals and non-nationals, and the process of convergence for the Spanish regions, extending the literature in several ways. First, we focus on the conditional convergence of the physical capital of each region, since it is a stock rather than a flow variable (like income or GDP) and it is a more reliable indicator of the state of convergence. Second, we study the data with a technique that identifies the differences between the regions, the structural breaks, the effects in the short run, and the effects in the long run. And third, our period of analysis will be from 1972 to 1998 to avoid the effect of "mass" Spanish international emigration prior to 1972, and the "mass" foreign immigration after 1998.

We define internal migration in a different way from Maza (2006) and Maza and Hierro (2010). While they consider inter-provincial movements, we consider inter-Autonomous Community (or inter-regional) movements, that is, we consider as internal migration changes of residence from one Spanish region to another. (This is the same approach as that of Raymond and García, 1996.) We select regions, since they are the first

level of political division of Spain as a country (the second level for European Statistics, NUTS 2 following the Eurostat definition). After the Spanish Constitution took effect in 1978, the country was divided into 17 regions, or autonomous communities, and two autonomous cities, Ceuta and Melilla. The regions are:

- Two or more adjacent provinces (NUTS3) with common historical, cultural and economic characteristics (Catalonia, Basque Country, Galicia, Andalusia, Aragon, Castilla y Leon, Castilla-La Mancha, Extremadura, Valencia).
- Insular territories (Canary and Balearic Islands).
- A single province with historical identity or status (Cantabria, Asturias, La Rioja, Murcia, Navarra) or national interest (Madrid).

The Spanish regions have the right of self-government in many public services, which creates an extraordinarily decentralized country. The regional governments are responsible for the administration of schools, universities, health, social services, culture, urban and rural development and, in some cases, policing. Public spending by the central government on the social security system is approximately 50% of the total public expenditure, while almost 40% goes to the regional governments and around 10% for the local councils. Thus, these territorial entities are significant enough to undergo an analysis of convergence. Spain took advantage of the European Regional Development Fund (ERDF) after its incorporation to the European Union in 1986. Another important effect of the European Union integration is the loss of regional commercial transactions in favor of external transactions, as is pointed out in Oliver (2002).

The first extension of the literature is the analysis of the capital/labor ratio, rather than GDP. We use the capital variable since it is a stock variable and we are taking a theoretical framework as our methodological reference. As we summarize in the first paragraph of this section, there are several theoretical models that attempt to explain the relation between migration and convergence. Those with categorical conclusions such as absolute convergence or divergence have not been empirically demonstrated. Spanish data, as we will show in the following section, fits the main implications of the model of Larramona and Sanso (2006) and this theoretical model will serve as the basis for our empirical estimations.

The second extension proposed is the use of a somewhat different mechanism to analyze the data. The Error Correction Mechanism provides for the possibility of testing the effects in the short and the long run, and allows us to consider disparities between the seventeen Spanish regions through structural breaks and different estimations.

The reasons to opt for the period 1972-1998 are historical, political and practical. We chose 1972 as the starting point because Spain was a net emigration country from 1900 to the early 1970s. From 1900 to 1950, the principal destination was South America, while the majority of Spanish emigrants went to Europe for the remainder of that period. Internal migration was an important variable in the years before the period considered, but it largely consisted of rural to urban labor movements within the regions (Bover and Velilla, 2002). These movements represent a structural change in the economy and we wish to exclude the effect of this transformation of the economy from the analysis of convergence. We also chose 1972 for the homogeneity of the data from a long-term series of the labor market that we use for our econometric estimations.

The end year is 1998, since, as Figure 1 shows, it is the year after which international immigration began to be an extremely important phenomenon in Spain and their spatial concentration inside the country has had a significant effect on internal movements, as Figures 2, 3, 4 and 5 show. After 1998, these internal migrations experienced an extraordinary change.

Figure 1. *In flow of international migration to Spain, 1988-2009.*

[Insert Figure 1]

Source: INE (Spanish National statistics)

Figure 1 shows a slight increase in the international immigration of people born abroad to Spain after 1991, and an additional but moderated increase of international inflows after 1996, but the mass immigration was after 1998. After this year, international inflows exceeded one hundred thousand per year. These magnitudes affected internal movements, as can be seen in Figure 2 showing the internal migrations from one Spanish region to another for the period 1988-2009.

Figure 2. Internal migrations at a regional level, 1988-2009

[Insert Figure 2]

Source: EVR, INE (Spanish National statistics).

Figure 2 shows two clearly differentiated patterns highlighted by the dotted line: a quite stable level of internal migrations from 1988 to 1998 and an increasing trend from 1999 to 2009[1]. The literature on internal migration shows that non-natives have a higher propensity to move than natives (see Chiswick and Miller, 2004). Additionally, one of the most important determinants of internal migration is earlier immigration from the same origin, usually called networks, which reduce the cost of migration, while the networks of the home region are an opportunity cost of moving for natives. These costs determine the differences between the internal migration of natives and non-natives. Moreover, as Borjas (1994) notes: "As long as native workers and firms respond to the entry of immigrants by moving to areas offering better opportunities, there is no reason to expect a correlation between the wage of natives and the presence of immigrants". This fact makes it more difficult to establish the effect of the localization of non-natives on the natives' internal migration patterns. As the quality of the available data for the period 1988-2009 allows us to differentiate the nationality of the immigrants, Figure 3 shows the evolution of the internal migration of non-native residents in Spain, to show the extent to which international immigration affected the internal migration figures since 1999.

Figure 3. Internal migrations of non-natives, 1988-2009

[Insert Figure 3]

Source: EVR, INE (Spanish National statistics)

[1] The LWZ test detects the number of breaks of a trend and the time when they happen. In this case, it finds a break and the year selected is 1999. This test makes a regression of the variable and a constant term plus the tendency ($y=a+b*t+u_i$). See Liu, Wu, Zidek (1997) for more details.

Figure 3 shows a quite similar evolution of international immigration to Spain and internal movements of non-natives, which is also confirmed by Maza and Hierro (2010). In 1988, 2.5% of the internal movements were made by non-natives, while in 2009 this figure reached 36%. It is clear that internal migration patterns are affected by the different behaviour of non-native migrants, but we must also see if the pattern of native migrants is also affected. Figures 4 and figure 5 show the evolution of the internal migration that reflects a return of previous native migrants (returned internal migration) and the evolution of internal native migrants who are not returnees, respectively.

Figure 4. Internal migrations of returned natives, 1988-2009

[Insert Figure 4]

Figure 5. Internal migrations of non-returned natives, 1988-2009

[Insert Figure 5]

Both figures show a quite stable evolution of the number of internal movements until 1998, and an increasing tendency from then onward. That is to say, both figures show a behavior similar to Figure 2.

All of this leads us to consider the period 1972-1998 for our analysis. Although the internal movements of non-natives can be controlled for after 1988, the effect of their spatial concentration on native movements cannot be isolated when mass foreign immigration occurs.

In order to properly place the historical and social time period being studied, we will briefly describe some of the most important political and economic events in Spain from 1972 to 1998. The autarchy that characterized the Spanish economy after the Second World War began to disintegrate at the end of the 1950s. The 1959 Stabilization Plan was developed in three steps to liberalize foreign trade to stimulate growth. After 1974, economic activity set record growth rates, following the first oil crisis, which affected Spain more intensely because the Spanish authorities reacted slowly and insufficiently. The

early 1970s were the final years of the dictatorship, but democracy was not consolidated until 1984.

In 1977, all the political parties involved in the democratic transition signed a pact of economic measures to attain economic stability and growth; this was the "Pactos de la Moncloa" and it also allowed the establishment of the Spanish Constitution of 1978. Between 1979 and 1983, the transfer of political power to the 17 regions began, creating the autonomous communities (or regions), but it was not until the mid-1980s that the regions were fully empowered. In 1986, Spain joined the European Economic Community (EEC) and began a new period of higher growth rates. With this integration, the internationalization envisaged in the 1959 Stabilization Plan achieved its goal. The EEC at that time had 12 member countries (Germany, Belgium, France, Italy, Luxemburg, Netherlands, Denmark, Ireland, United Kingdom, Greece, Portugal and Spain), with free circulation of people, goods and capital among them.

The economic crisis of 1992-1993 was a brief episode for Spain, followed by a consistent recovery. The year 1998 was the last year of monetary sovereignty of Spain, because since 1999 Spanish monetary policy was decided by the European Central Bank as a consequence of its integration in the euro area. The period we are considering in the analysis begins at the third step of the dictatorship's Stabilization Plan, and ends with the full integration of the Spanish economy into the euro.

In Section 2, we carry out a descriptive analysis of the data for each of the Spanish regions and we provide evidence of convergence for the time period studied. In Section 3, we estimate an econometric model to determine the variables that affect Spanish internal migrations, both in the short and the long term, and to determine the predicted migratory position of each region in the long term. Our main conclusions are presented in Section 4.

2. A descriptive analysis of the data

In this section, we first describe the database. We use data on internal migration regional rates and capital/labor ratios, between 1972 and 1998. The migration rate is defined for every region as *[(Region$_i$ Emigration - Region$_i$ Immigration)/Region$_i$ Population]x1000* with i being one of the seventeen Spanish regions. The data on migratory

flows and population have been obtained from the *INE (*Spanish *National Institute of Statistics)*. The data on migrations correspond to the *EVR (Residential Variations Statistics*) elaborated by the *INE*, based on the information on subscriptions to and withdrawals from the municipal registries, due to changes of residence. EVR is a database covering the period 1988-2009. Data from 1972 to 1987 are obtained from other municipal registries recorded by the INE. Prior to 1988, the INE had only the number of international immigrants, without differentiating those who came from abroad but were Spanish, from those who were not. In 1988, there is an electronic registration of this difference, which means a much better quality of data. Therefore, the data capture all internal movements and some portion of external movements. These movements are the migrations between cities, and we consider only those inter-municipal migrations that are also inter-regional migrations.
We have used the data on residential variations because the *Migration Survey* from the *EPA (Active Population Survey)* basically underestimates the number of emigrants, as shown by comparison of both databases, despite the ever-growing quality and coverage of the *EPA*.

By following one of the pioneer migration models, Harris and Todaro (1970), most prior empirical papers relate migration and wage differentials (see Juarez, 2000 and Bentolilla, 1997). However, our model establishes this relationship in a different way: migration depends on the relative capital/labor ratio and institutional or technical characteristics (see Larramona and Sanso, 2006 for details)

The stock of capital may be considered as only private capital, or a more global concept which includes public capital. We will refer to the wider concept as total capital and will use it whenever possible, although for some regions we obtain better results with only private capital, as we will see in the following section. These variables are obtained using the series of annual data on capital provided by the *BBVA Foundation* for each region. The annual employment figures are the average of the quarterly data of the *EPA* published by the *INE*. The variable in which we are interested is not the absolute value of the capital/labor ratio, but the relative ratio of total capital per worker of each region with respect to the ratio of the rest of the country. If this ratio is greater than one, it means that the region has more capital per worker than the other regions, and if it is less than one, the opposite.

In the following subsections, we will give a descriptive analysis of the variables used and some preliminary results on convergence.

2.1 The path of the relative capital/labor ratio

In Figure 6, we examine the time path of the relative capital/labor ratio of two types of regions. We include the regions that seem to have a clear trend toward a relative capital/labor ratio below one (Andalusia, Extremadura and Galicia) and those with a clear trend towards a ratio higher than one (Cantabria, Navarre, La Rioja and Valencia). In this graph, we can corroborate the decreasing trend of the difference between each region's value and the rest, maintaining the gap between them in the long term. The range of variation clearly narrows but stabilizes at values different from one, with stable gaps. From the data shown, we can conclude that convergence does not have to be towards the same steady state value in all regions, so the gap between them will decrease but not disappear, as Raymond and Garcia (1996) have pointed out. There is, however, an exception to this decreasing trend: the Canary Islands is the sole region where this convergence cannot be observed.

Figure 6. *Relative capital/labor ratio for some regions*

[Insert Figure 6]

In short, we can say that the trajectories of Figure 6 clearly illustrate a tendency towards stabilization. This steady state is not equal for all regions: some tend to a relative capital/labor ratio lower than the average, while others have a higher ratio than the rest.

Broadly speaking, intuition tells us that the regions with a relative capital/labor ratio lower than one should tend to send emigrants, and those with a ratio greater than one to receive migration.

2.2 Some preliminary results on the convergence process

In this subsection we are going to confirm whether there is a convergence process in the capital/labor ratio. Sigma convergence requires a fall in the dispersion of this ratio for the regions as time elapses. Figure 7 shows that convergence occurs and that it appears to be stabilizing in the most recent years at a value around 0.1.

Figure 7. *Sigma convergence of the capital/labor ratio*

[Insert Figure 7]

In Figure 7 we can see the downward path followed by the standard deviation of the relative capital/labor ratio of the different regions throughout the period analyzed, confirming the relative convergence between the Spanish regions. There are only two intervals where this trend changes slightly, corresponding to two important events: the transition to democracy and the economic crisis of the early 1990s.

If we go on to test the existence of beta convergence, we can see that it is a very clear process, as is reflected in Figure 8, where a negative relationship is depicted between the value of the relative capital-labor ratio in 1972 and the average growth rate between 1972 and 1998.

Figure 8. *Beta convergence of the capital/labor ratio*

[Insert Figure 8]

In this descriptive approach, we have verified a convergence process in the capital/labor ratio, interpreted as a trend in which the regions with a lower capital/labor ratio have experienced a faster growth in this variable than those with a higher ratio.

2.3. Contribution of migrations to the convergence process

Having verified the convergence in the capital/labor ratio, in this subsection we study whether the behavior of migration is coherent with this evolution, which would indicate that migration influences the convergence process.

The theoretical model forming the basis of the methodological perspective of this paper predicts that, if there are technological or institutional differences between regions, the relative capital/labor ratio in the long run will not be one, so the gap between the regions will remain constant over time and cause migration flows in the long term. In this case, the trend that should be observed is that the migration rate (be it positive or negative) is higher in the years in which the relative capital/labor ratio is far from its stabilization, and approaches its steady state over time. We must test whether migration contributes to the convergence of the relative capital/labor ratio and whether its stabilization contributes

to the stabilization of this ratio, which could be interpreted as the stabilization of the two variables around their long-term value.

In Figure 9, we show the evolution of the migration rate for the same regions as in Figure 8 for capital stock. By comparing the two figures, we can see that the regions whose relative capital/labor ratio tends towards a value below one have a net flow of emigration in the long term, and those with a trend above one have a net flow of immigration.

Figure 9. *Migration rate for some regions*

[Insert Figure 9]

The migration rate is very high in the first years and gradually stabilizes in the later years, towards a value above or below zero. These high initial rates make the convergence of the relative capital/labor ratio towards its stabilization faster in the early than in the later years. It can also be observed that, in some periods of crisis in the labor market (the 1980s and the period 1992-1996), the migration flows are reversed in some regions.

We also have regions whose capital/labor ratio tends to a value higher than the average, but which seem to have positive long-run emigration. The explanation for this phenomenon must come from elsewhere. In any case, we can find some regions in which nothing clear can be concluded from the mere inspection of data. This indicates that it is essential to carry out an econometric estimation with which to capture the underlying trends in the behavior of each region, using the structural variables of the theoretical model. Then we will be able to see why these difficulties in explanation arise.

Up to now, we can conclude that internal migration between the Spanish regions follows a trend that is coherent, in general, with the capital/labor ratios, narrowing the net values in the former and the gaps in the latter over time. This can give us the intuition of a relationship between these two variables but, as we have said, some regions do not follow this pattern, indicating that the migratory process is not completely governed by the capital/labor ratio and must be adequately characterized.

3. Estimation of the econometric model

Having observed the evolution of the relevant variables, the next step is to carry out a quantitative analysis of the relationship between internal migration, the relative capital/labor ratio, and the institutional or technical characteristics of each region. In this analysis, we are mainly interested in long-term behavior. As a conditioning element of the relationship between migration and the relative capital/labor ratio, we have added two variables that reflect the institutional or technological differences: the unemployment rate (*u*) and the unemployment rate relative to the other regions (*ru*). Variables reflecting job opportunities are included in most of the papers about inter-regional migrations in Spain because of the high levels of unemployment registered in the 1970s and 1980s. Although Bentolila (1997) concludes that Spanish internal migration does not go to regions with lower unemployment, and that migration has decreased over the years with an increase in unemployment, Devillanova and García-Fontes (1998) and Juarez (2000) find that job opportunities are important in determining gross migration.

We begin the econometric treatment by carrying out a univariate analysis of the series. In the Appendix, we show that the series are first order integrated and present at least one structural break. Faced with this situation, the alternative that best fits our objective of estimating the relationship between capital and migration is the Error Correction Mechanism, because it not only gives us the possibility of carrying out a joint analysis in the short and long terms, but also integrates structural breaks and allows us to test for the existence of co-integration through the statistical significance of the error correction parameter.

The generic model that we are going to estimate is the following:

$$dm_t^i = a0^i + a1^i * d^i + a2^i * dct_t^i + a3^i * dct_t^i(-1) + a4^i * du_t^i + a5^i * du_t^i(-1) + a6^i * dru_t^i + a7^i * dru_t^i(-1) + a8^i * dm_t^i(-1) + a9^i * dm_t^i(-2) + e11^i * shock1^i + e12^i * shock2^i + ecm^i (m_t^i(-1) - b1^i * ct_t^i(-1) - b2^i * u_t^i(-1) - b3^i * ru_t^i(-1)) + e_t$$

$$i = 1,2, \ldots, 17 \qquad t = 1972, 1973, \ldots., 1998$$

Super-index *i* refers to the regions in alphabetical order, m_t^i is the migration rate in year *t* for region *i*, *ct* is the relative total capital/labor ratio (private capital in three cases indicated later in Table 1), *u* denotes the unemployment rate and *ru* the relative

unemployment rate with respect to the rest of the country. A term in brackets with a minus sign is a lag. The variables *dm, dct, du* and *dru* denote the difference of the variables *m, ct, u* and *ru* between *t* and *t-1*, while the variable *e* is the error term.

We have identified the years in which an anomalous behavior of the dependent variable is observed through shocks, which are never more than three. The variable *d* is a dummy that reflects a possible structural break that will be different, depending on the region, since each region reacts to general economic changes in different ways and at different times.

We select the estimated model following the general-to-particular method. Table 1 gives a summary of the results of the estimation for each region separately. It contains the estimated coefficients of the variables used to explain the interior migration rates. The p-values are in brackets and the year in which a structural break or a shock occurred is in bold in the corresponding cell.

Table 1. *The estimated model for each region*[2]

[Insert Table 1]

We can see that the explanatory power (R^2) of the estimated equations is always above 0.9. Furthermore, as is shown in the Appendix, in all cases, the null hypothesis of no autocorrelation is accepted. Seven regions present a break after the oil crisis, which was a time of stagnancy and deep industrial crisis. For two of them, the break occurs in the recovery stage, while another three change their behavior with the recession of the 1990s. Finally, there is no structural break in four regions.

Long-term effects

When we consider the estimated long-term part of the model, we see that the error correction parameter is in the interval (-2,0), which means that all the regions converge to the long-term behavior although, in the case of Andalusia, Castile Leon, Galicia and La Rioja, the convergence takes place through oscillations (absolute value of the parameter greater than one).

[2] See Appendix for details.

The relationship between the relative capital/labor ratio and the migration rate is clearly negative in the long term: an increase in the relative capital/labor ratio lowers the incentive to emigrate in fifteen of the seventeen regions, which brings about the convergence process we have described. There are only two regions where the effect is not significant, although negative: Canary Islands and La Rioja.

With respect to unemployment, one would expect a higher unemployment rate, or relative unemployment rate, to reflect a lower probability of finding a job in the corresponding region and to increase the pressure to emigrate. In fact, for most of the regions, unemployment and relative unemployment have a positive effect on the migration rate.

The absolute unemployment rate only has a negative effect in three regions. As we have seen previously, one of them shows emigration in the long term (Castile Leon), another immigration (Balearic Islands), and the third a process of migration reversal (Cantabria), confirming that any effect is possible if the absolute unemployment rate is an explanatory variable; the relevant variable with a sound theoretical effect is the relative unemployment rate.

The relative unemployment rate has an effect that fits with intuition. In fourteen regions, in the long-run, it has a positive or no effect and a negative effect in three regions, Aragon, Castile-La Mancha and La Rioja.

Short-term effects

The relative capital/labor ratio has a total short-term effect (adding up the estimated parameters of the contemporaneous and lagged differentiated values) that is predominantly negative. Seven regions show this behavior (Andalusia, Aragon, Balearic Islands, Castile Leon, Extremadura, Madrid and La Rioja). For Castile-La Mancha, Catalonia, Galicia, Navarre and Valencia, this ratio has no significant short-term effect. Finally, five regions reveal a short-term total effect of the relative capital/labor ratio that is positive: Asturias, the Basque Country, Cantabria, Canary Islands, and Murcia. The case of the Canary Islands can be considered as one without a short-term effect, because the sum of the estimated values of a2 and a3 is statistically zero. The other four cases have a positive lagged effect, which is compatible with the negative effect in the long run.

The unemployment rate in the Canary Islands, Murcia, Extremadura and the Basque Country has no short-term influence on their net emigration. The total effect is positive in six cases (Asturias, Balearic Islands, Catalonia, Valencia, Madrid and La Rioja). On the contrary, it is negative in another six cases. This result shows, once again, that the absolute rate can have any effect because the important magnitude, from the theoretical point of view, is the relative unemployment rate.

The relative unemployment rate affects 12 of the 17 regions positively in the short term (Andalusia, Balearic Islands, Cantabria, Castile Leon, Castile-La Mancha, Valencia, Extremadura, Madrid, Galicia, Navarre, the Basque Country and La Rioja). This means that the lower the probability of finding a job in these regions, the more emigration will increase in the short run. Only in Asturias is the effect negative in the first lagged value, which probably captures the effect of government benefits given to the mining industry in the 1970s and 1980s.

The dynamic effect of the net migration rate in the short term means that the explanatory variables of the long term lose explanatory power. There are eight regions that have no dynamic effect: Asturias, Balearic Islands, Castile-Leon, Castile-La Mancha, Galicia, Murcia, Navarre and the Basque Country. There is a positive dynamic effect for regions with high emigration (Andalusia and Extremadura), in the two in which the relative capital/labor ratio is not significant in the long term (Canary Isles and La Rioja) and in Aragon. The effect is negative for Cantabria, Catalonia, Valencia and Madrid. A positive effect means a certain tendency towards creating migration networks, while the negative effect represents a certain degree of congestion.

Long-term migration position of the regions

The fundamental result of the estimation is whether the relationship that exists between migration and the relative capital/labor ratio is negative in the long run. In addition, we are interested in the characterization of the long-term migration, not only in the cases in which it is clear, but also in those where there are some difficulties. The estimated model can help us in this task.

Using the econometric model, once we have calculated the constant of the corresponding long-term behavior, we can obtain the long-term position of each region,

taking the average values of the explanatory variables in the 1990s as a reference. Column 2 of Table 2 shows what happens in the long-term trend each of each region, according to the econometric model. Column 3 of this table presents the observed position derived from the average data of the decade after the period analyzed, that is, from 1999 to 2008. Comparing these two columns allows us to validate the prediction of the estimated model.

Table 2. *Long-term position of the regions in the migration process*

[Insert Table 2]

The prediction of the econometric model shows that Andalusia, Extremadura and Galicia are clearly regions of emigration, as shown in Figures 2 and 5, but so are Asturias, Castile Leon, Catalonia, Madrid and the Basque Country. The rest are clearly receivers of immigration.

This predicted position of Column 2 holds for the last decade, as Column 3 shows, with the exceptions of Andalusia and Aragon. As has been mentioned, in Section 1, the localization of foreign immigrants could affect the native internal migration patterns and these two regions have experienced the greatest proportion of international immigration, compared to the internal migration flow. Table 3 shows the ranking of the Spanish regions, taking into account the ratio of foreign immigration over the internal migration flow, in absolute values, on average in the last decade, 1999-2008 (the period of mass foreign immigration). This Table shows that both regions are above 20, which highlights the importance of international over national labor movements in the determination of internal migration. Catalonia is also above 20, but in this case the influence of international migration does not change the long-run position of the region.

Table 3. *Ranking of the Spanish regions. Foreign immigration over internal migration flows.*

[Insert table 3]

4. Conclusions

Following the results of a simple endogenous growth model, some useful conclusions are drawn from the empirical analysis of Spanish internal migrations between 1972 and 1998. Firstly, we find that there is no absolute convergence of the capital/labor

ratio towards a unique value in the steady state but, rather, a persistent gap between the regions that generates permanent migration flows. Nevertheless, there has been conditional convergence in the regions, understood as a higher transitory growth of the capital/ labor ratio of the poorer regions than of the richer ones.

Secondly, we find that the evolution of the relative capital/labor ratio of each region follows a feedback process with respect to migration. Migration stimulates convergence between regions, which is illustrated by two indicators. The first is the higher migration rates at the beginning of the sample period, corresponding to greater growth rates of the capital per worker in the sending regions during these first years, and the parallel decrease of both variables over time. The second is the negative relationship found between migration and the relative capital/labor ratio. As the capital/labor ratios converge, lower regional differences discourage emigration, showing a situation close to their long-term trend. This trend towards convergence is tested with the estimation of the long-term parameters.

We find that, in the long term, there is a negative effect of the relative capital/labor ratio on migration. This central result of our estimation shows the existence of a conditional convergence process. The relative unemployment rate has a positive effect, indicating how the technological or institutional position complements the effect of the relative capital/labor ratio. The results of the econometric model explain the characterization of the long-term migration position of the regions, which is compared with the data of the decade after the sample period. Fifteen of seventeen regions experienced the behavior predicted by the model, the two exceptions corresponding to regions with a very high proportion of foreign immigration over the internal migration flows.

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APPENDIX. Statistical analysis of the time series:

Univariate, co-integration, and structural break analysis of the series

The quantitative analysis prior to the econometric estimation of the model for each region has been carried out in three stages:

1) Univariate analysis of the series. The first step has been to analyze the univariate properties of the time series of the variables, since these properties condition the methodological framework in which we have to work. In the first five columns of Table A.1, we present the statistics of the modified Phillips-Perron test corresponding to each of the series used for each region. If we compare them with the critical value of the test at 5% significance level (-2.91), we can see that the null hypothesis of non-stationarity is always accepted, so we conclude that they are integrated. We have used this statistic because Ng and Perron (2002) consider that it presents the best properties. The use of alternatives does not substantially modify the results.

It should be pointed out that the unemployment rate is first order integrated. This is due to the phenomenon known as hysteresis. In the Spanish case, and due to the reduced sample, we have strong persistence in the data.

Table A.1. Estimated statistics of the different tests

Univariate analysis. Modified Phillips-Perron Test ***(Mzt)***						*Cointegration, structural break and autocorrelation analysis*		
	Migration	**Relative total capital/labor ratio**	**Relative private capital/labor ratio**	**Relative Unempl. Rate**	**Unempl. Rate**	**Dickey-Fuller Test ***	**SupF****	**Ljung-Box Statistics#**
Andalusia	-1.14	-2.01	-1.93	-1.03	-1.02	-3.98	299.15	1.63
Aragon	-1.20	-1.76	-1.45	-1.87	-1.03	-3.19	930.16	5.98
Asturias	-1.77	-0.96	-1.24	-1.81	-0.95	-1.37	967.88	1.26
Balearic Islands	-1.77	-1.47	-1.42	-2.39	-1.29	-3.22	40.59	9.15
Canary Islands	-1.97	-1.33	-1.24	-1.84	-0.46	-3.44	28.53	6.57
Cantabria	-2.43	-1.59	-1.55	-1.97	-1.16	-5.8	1854.93	1.96
Castile-Leon	-1.68	-1.08	-1.41	-2.32	-0.84	-2.41	1709.91	1.01
Castile-La Mancha	-1.73	-2.18	-1.71	-2.00	-1.40	-2.72	85.57	4.72
Catalonia	-1.32	-1.32	-1.32	-1.21	-0.76	-8.56	927.54	7.48
Valencia	-1.57	-0.49	-0.49	-1.60	-0.78	-3.7	12247.39	2.8
Extremadura	-1.59	-1.86	-1.25	-1.96	-1.72	-3.42	15290.9	8.76
Galicia	-2.06	-0.52	-0.73	-2.09	-1.76	-3.47	400.18	2.61
Madrid	-2.12	-1.15	-1.04	-1.62	-1.12	-3.08	12363.61	3.34
Murcia	-2.13	-1.96	-1.85	-1.88	-1.02	-4.45	269.59	6.07
Navarre	-2.54	-1.68	-0.98	-1.68	-0.63	-6.35	8509.24	7.88
Basque Country	-1.56	-1.68	-1.39	-0.95	-0.28	-5.37	496.28	1.63
La Rioja	-2.10	-1.04	-1.61	-1.73	-1.16	-3.36	973.76	3.82

*Critical value for 5% significance level and three explanatory variables is -3.74.
** The asymptotic critical value at the 5% significance level, according to Hansen (1992), is 19.3.
# The critical value of χ^2_4 is 9.49.

2) Analysis of the long-term relationship. We then estimated the long-term relationship between the migration rate, as the variable to be explained, and the relative total capital/labor ratio, unemployment rate, and relative unemployment rate as explanatory variables. With the Dickey-Fuller test, we found that the hypothesis of no-cointegration could not be rejected for all the regions separately. In the sixth column of Table A.1 we show, in blue, the regions in which this absence of rejection occurs.

3) *Structural break analysis*. The explanation of this absence of cointegration in the long-term relationship is that the parameters of the model are not constant, as is clearly demonstrated when we test the hypothesis of structural change, which is accepted for all the regions (as can be seen in the seventh column of Table A.1). The statistic we employ is the *SupF* from Hansen (1992), whose null hypothesis is the absence of structural change.

Autocorrelation test for the econometric models

As can be seen in the eighth column of Table A.1, all the models presented in Table 1 accept the null hypothesis of no-autocorrelation up to the fourth order. The tests have been carried out using the Ljung-Box statistics.

Figure 1.

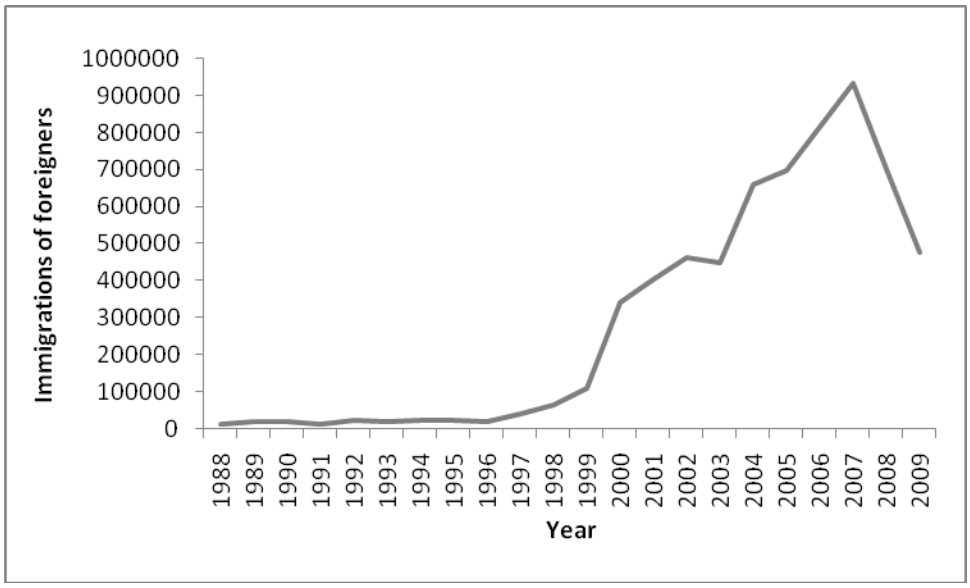

Figure 2.

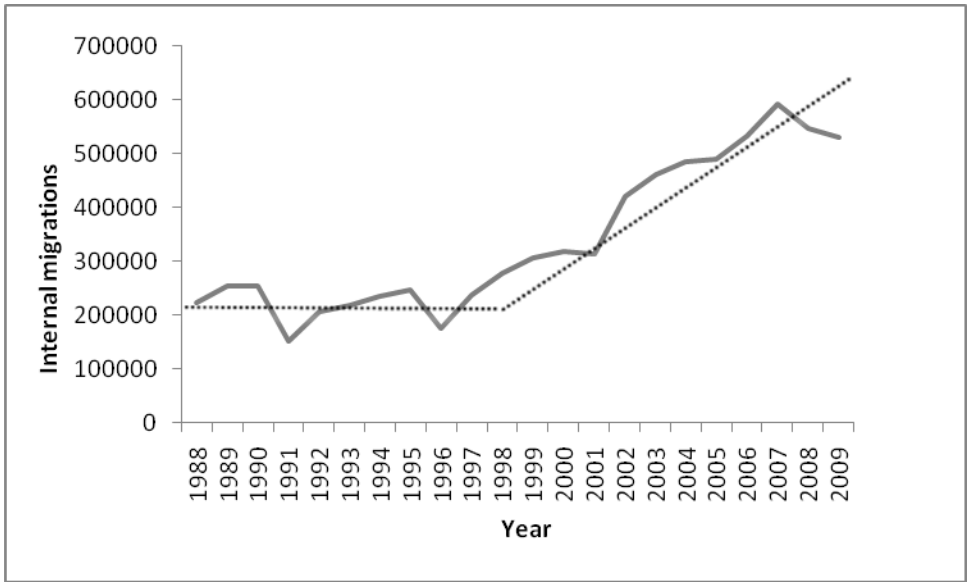

Figure 3.

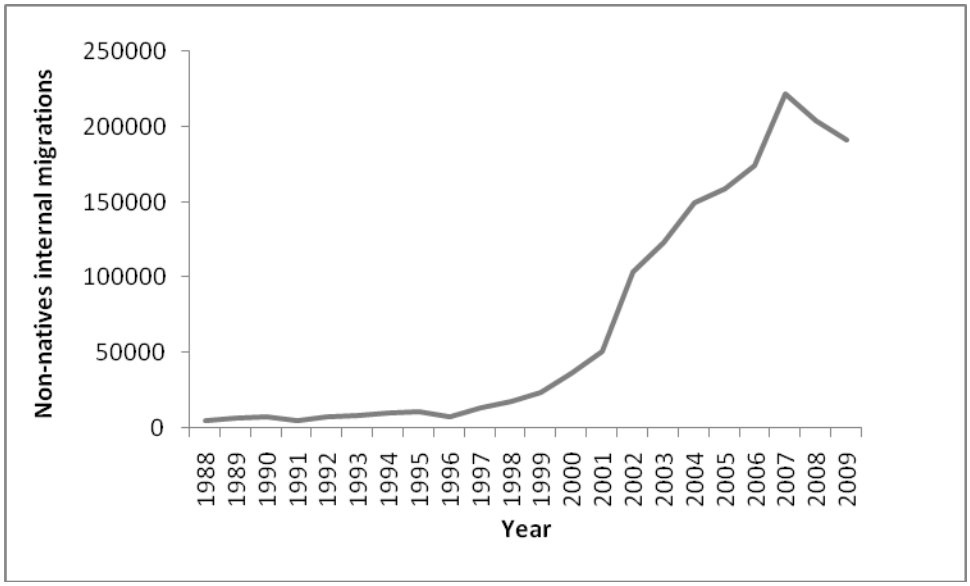

Figure 4.

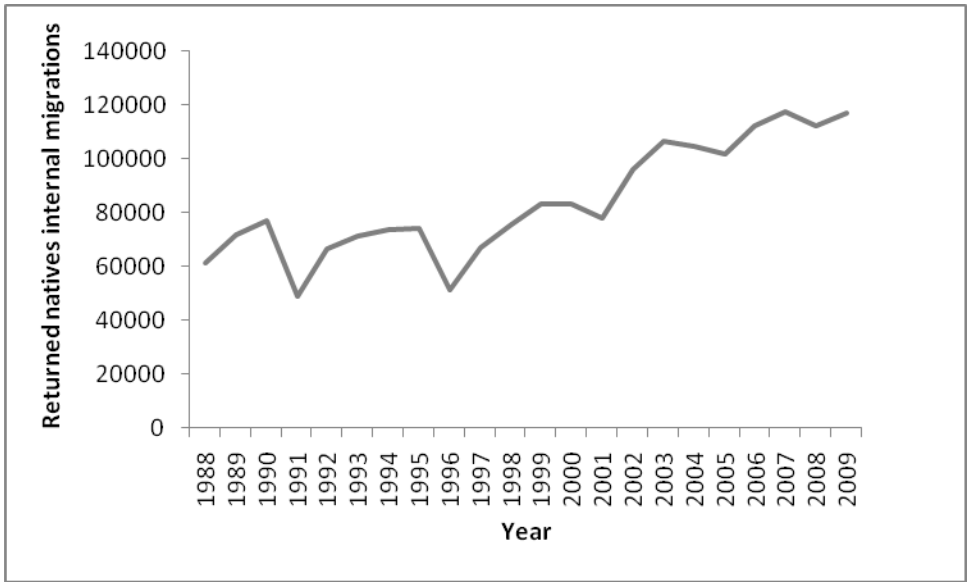

Figure 5.

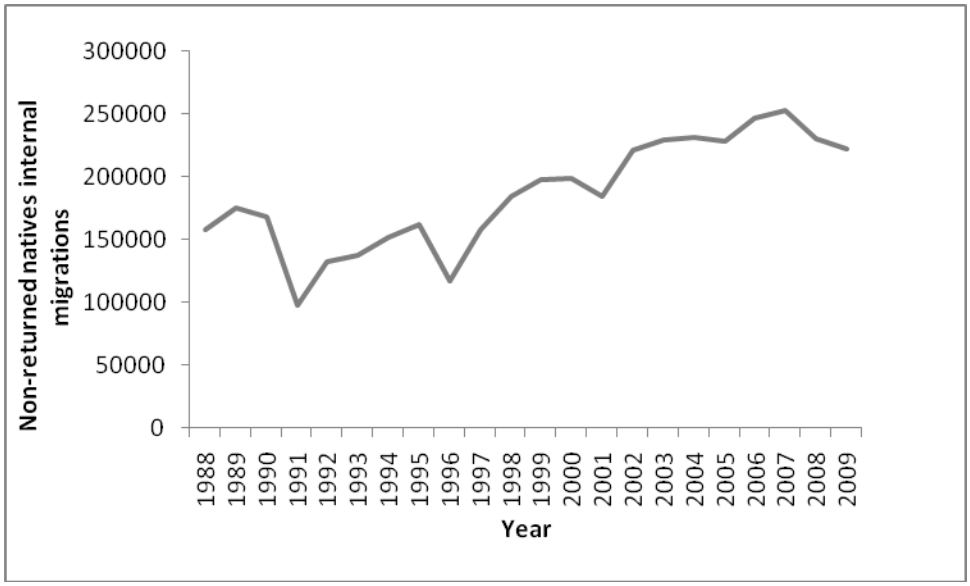

Figure 6

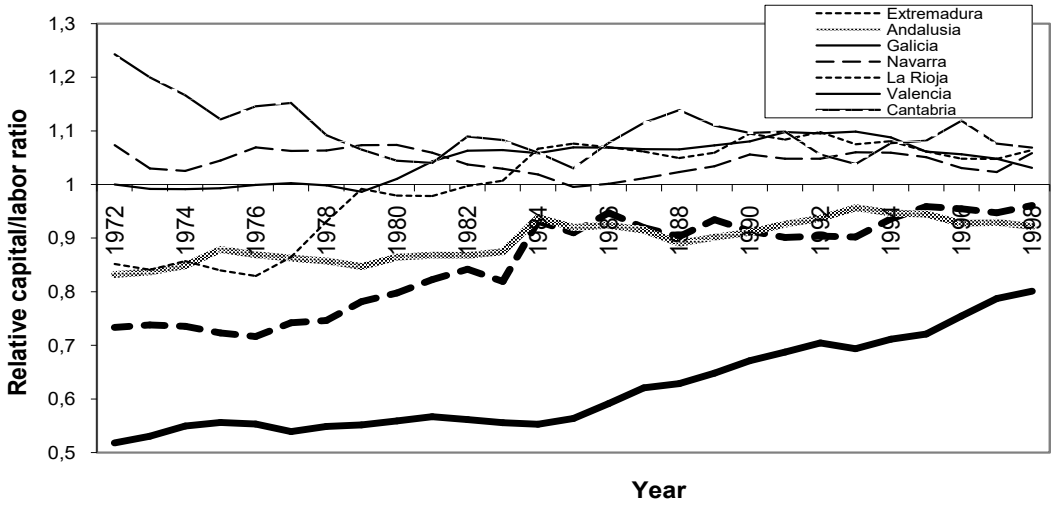

Figure 7

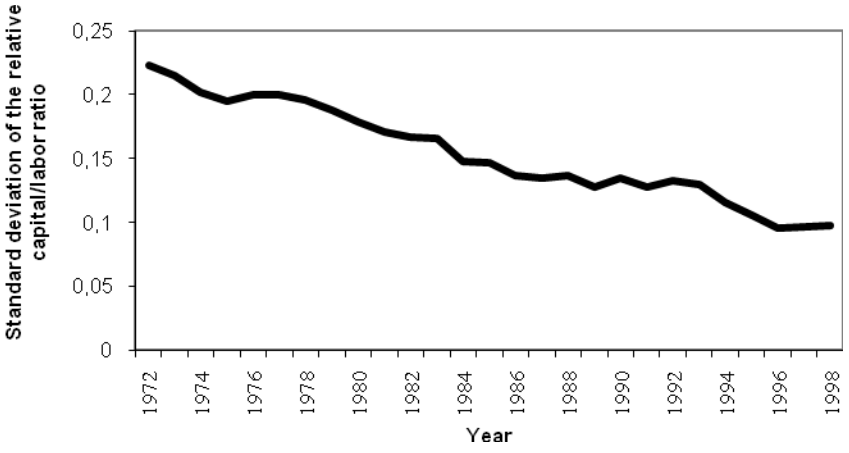

Figure 8

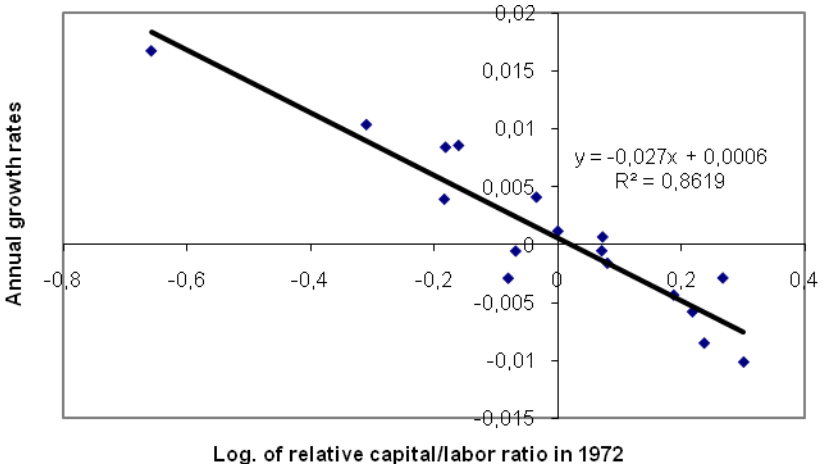

Figure 9

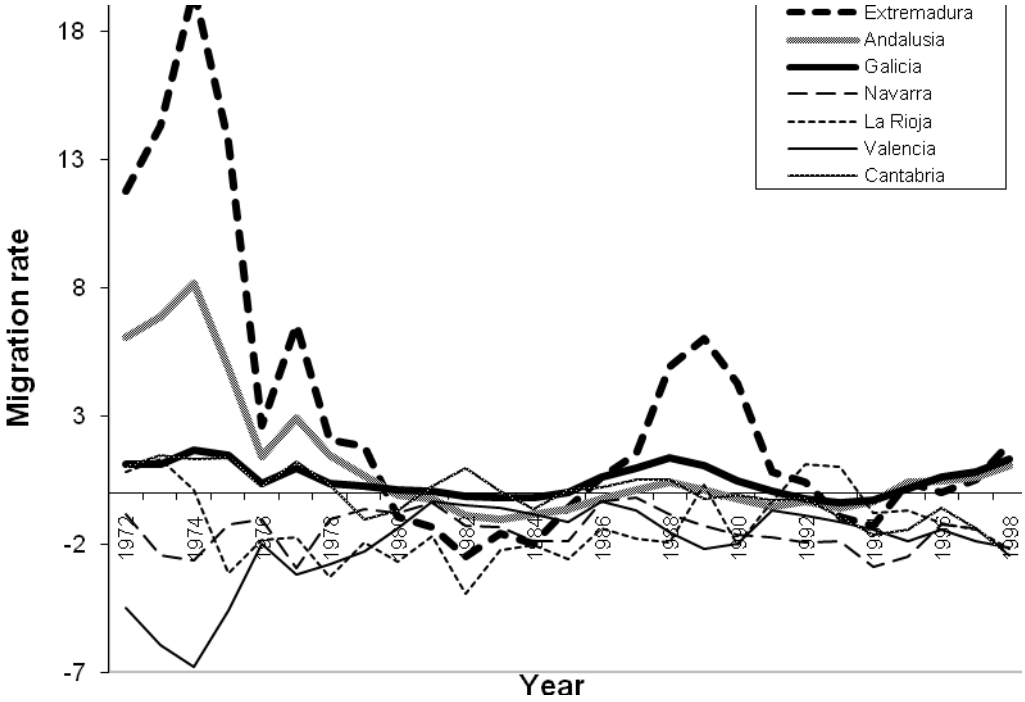
Extremadura
Andalusia
Galicia
Navarra
La Rioja
Valencia
Cantabria
Migration rate
18
13
8
3
-2
-7
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
Year

Table 1

	a0	a1	a2	a3	a4	a5	a6	a7	a8	a9
Andalusia	2.6967 (0.000)	0.1526 (0.000)**1992**	-3.1273 (0.00)			0.0182 (0.004)	0.7843 (0.000) (0)	0.1853 (0.013)	0.6274 (0.000)	
Aragón	2.7593 (0.003)	-1.8205 (0.027)**1986**	-3.1373(1) (0.000)			-0.0075 (0.013)				0.5767 (0.000)
Asturias	0.1318 (0.000)	0.0773 (0.0)**1977-79**		1.5448 (0.000)	-0.0076 (0.02)	0.0196 (0.000)		-0.2696 (0.000)		
Balearic Islands	9.8459 (0.000)		-3.9953 (0.000)	-6.1009 (4) (0.007)**1992**	0.1681 (0.000)			1.2140 (0.000)		
Canary Islands	-1.7906 (0.000)		1.5998 (0.003)	-1.3814 (0.033)					0.2651 (0.035)	
Cantabria	2.3633 (0.000)	-0.3177 (0.000)**1976**		1.9159 (0.001)		-0.0221 (0.001)	0.5849 (0.000)	0.4053 (0.02)		-0.2797 (0.015)
Castilla y León	1.1574 (0.042)	-0.616 (0.000)**1976**	-3.9507 (0.000)		-0.0438 (0.000)		1.7926 (0.000)			
Castilla-La Mancha	3.4157 (0.000)	-0.4517 (0.000)**1978**			-0.0467 (0.000)		0.8423 (0.000)	1.2626 (0.000)		
Catalonia	0.6137 (0.007)				0.0281 (0.000)					-0.2212 (0.029)
Valencia	0.9877 (0.018)				0.0081 (0.053)			0.5263 (0.000)		-0.2259 (0.007)
Estremadura	4.1300 (0.014)	-0.5036 (0.002)**1978**	-3.6535 (0.025)	-3.6745 (0.000)			0.4374 (0.010)	0.8247 (0.000)	0.2650 (0.09)	0.3762 (0.000)
Galicia	0.3472 (0.000)	-0.0568 (0.003)**1980**			-0.0293 (0.000)	-0.0131 (0.013)	0.1400 (0.000)	0.1360 (0.000)		
Madrid		0.2527 (0.000)**1988**		-3.393 (0.000)	0.0219 (0.002)	0.0254 (0.023)		0.5461 (0.001)	-0.4062 (0.000)	
Murcia	2.2344 (0.000)	-0.1606 (0.000)**1978**		1.5684 (0.000)						
Navarra	1.0819 (0.001)	-0.0694 (0.010)**1994**			-0.0593(6) (0.002)**1994**		0.4804 (0.000)			
Basque Country	2.9162 (0.000)	-0.2899 (0.000)**1990**		2.1079 (0.017)			0.7896 (0.001)	1.2170 (0.000)		
La Rioja	0.653 (0.041)	0.4486 (0.000)**1984**		-3.7844 (0.000)	0.0351 (0.002)		-1.2294 (0.000)	1.5227 (0.000)		0.4366 (0.000) (10)

Table 1 (continuated)

	e11	e12	ecm	b1	b2	b3	R2
Andalusia			-1.2225 (0.000)	-3.1117 (0.000)		0.3513 (0.000)	0.91
Aragón	0.0968 (0.000)**1980**		-0.6095 (0.000)	-4,0615(2) (0.019)	0.0366 (0.001)	-1,4918 (0.000)	0.91
Asturias	0.0996 (0.000)**1998**		-0.7245 (0.000)	-0.1428 (3) (0.000)			0.91
Balearic Islands	-0.7271 (0.000)**1980**	-0.3427 (0.034)**1982**	-0.5752 (0.000)	-14,0769 (0.000)	-0.0694 (0.000)		0.91
Canary Islands	-0.2764 (0.000)**1987**	0.355 (0.000)**1990**	-0.6018 (0.000)	-0.0604 (5) (0.328)			0.9
Cantabria	0.2023 (0.000)**1985**	-0.0754 (0.044)**1991**	-0.3519 (0.003)	-6.3939 (0.020)	-0.0714 (0.005)	2,4908 (0.013)	0.92
Castilla y León	-0.1508 (0.001)**1991**		-1.0211 (0.000)	-1.2339 (0.059)	-0.0077 (0.043)	1.1609 (0.000)	0.95
Castilla-La Mancha	0.1474 (0.060)**1983**		-0.6271 (0.000)	-3.7283 (0.000)		-1.2955 (0.008)	0.91
Catalonia	0.1956 (0.003)**1978**		-0.8773 (0.000)	-1.186 (0.000)		0.7772 (0.000)	0.91
Valencia	0.1444 (0.000)**1991**	0.1018 (0.002)**1986**	-0.3338 (0.000)	-3.1804 (0.036)	0.0130 (0.065)		0.93
Estremadura			-0.7687 (0.000)	-6.3789 (0.034)	0.0477 (0.071)		0.93
Galicia	-0.0558 (0.003)**1991**	0.0487 (0.023)**1997**	-1.0709 (0.000)	-0.4622 (0.000)	0.0040 (0.043)		0.91
Madrid		0.1506 (0.018)**1998**	-0.5481 (0.000)	-1.4069 (0.000)		1.3776 (0.000)	0.91
Murcia	-0.1054 (0.000)**1989**	-0.0685 (0.010)**1980**	-0.7938 (0.000)	-3.6390 (0.000)	0.0130 (0.000)	0.3606 (0.000)	0.91
Navarra	0.1143 (0.004)**1981**	-0.1054(7) (0.003)**1985**	-0.7407 (0.000)	-1.7954 (8) (0.000)		0.2015 (0.049)	0.91
Basque Country	-0.212 (0.004)**1980**	-0.2361(9) (0.001)**1986**	-0.7211 (0.000)	-3.5842 (0.000)		0.4476 (0.000)	0.91
La Rioja	-0.1144 (0.054)**1982**		-1.2002 (0.000)	-0.1648 (0.567)		-1.2928 (0.000)	0.96

Notes on Table 1

(0) The variable is lagged two periods instead of one.

(1) There is also a structural break in 1986 in this variable with an estimated coefficient of 2.1825 (0.002).

(2) The explanatory variable is private capital instead of total. There is also a structural break in this variable with an estimated coefficient -2.9737 (0.040).

(3) This variable reflects a structural break in 1976.

(4) This variable is estimated jointly with the dummy variable that reflects a structural break. Furthermore, to be significant, the model needs the same variable lagged two periods (-170.548 (0.000)), as well as the private capital lagged two periods (160.132 (0.000)).

(5) There is a positive effect of public capital in the long term (2.4579 (0.000)), private capital is not significant

(6) This variable is estimated jointly with the dummy variable that reflects a structural break.

(7) There is another shock in 1996 with an estimated coefficient of 0.1028 (0.011).

(8) The explanatory variable is private capital instead of total.

(9) There is another shock in 1992 with an estimated coefficient of 0.1279 (0.065)

(10) Also, migration lagged 3 and 4 periods is significant, with coefficients of 0.3653 (0.000) and 0.2575 (0.006), respectively.

Table 2.

Regions	Regression long-term position	Position during the decade 1999-2008
Andalusia	Emigration	Immigration
Aragon	Immigration	Emigration
Asturias	Emigration	Emigration
Balearic Islands	Immigration	Immigration
Canary Isles	Immigration	Immigration
Cantabria	Immigration	Immigration
Castile Leon	Emigration	Emigration
Castile-La Mancha	Immigration	Immigration
Catalonia	Emigration	Emigration
Valencia	Immigration	Immigration
Extremadura	Emigration	Emigration
Galicia	Emigration	Emigration
Madrid	Emigration	Emigration
Murcia	Immigration	Immigration
Navarre	Immigration	Immigration
Basque Country	Emigration	Emigration
La Rioja	Immigration	Immigration

Table 3

Regions	Ratio
Aragon	64.28
Catalonia	29.23
Andalusia	21.16
Canary Isles	18.60
Murcia	16.29
Madrid	6.67
La Rioja	6.56
Valencia	6.40
Navarre	5.94
Asturias	5.72
Galicia	4.93
Basque Country	3.81
Balearic Islands	3.68
Castile Leon	3.25
Extremadura	2.37
Cantabria	2.16
Castile-La Mancha	2.15