Internal migration dynamics in Spain: Winners and losers from the recent economic recession

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Abstract

This paper analyzes the impact of the 2008 economic crisis on the spatial distribution of inter-provincial migration in Spain, with particular focus on changes in provinces' relative attractiveness. For this aim, it first examines the distribution of the net migration rate across provinces over the period 2002-2013. Next, by comparing the pre-crisis (2002-2007) and crisis (2008-2013) periods, the paper examines which provinces became more attractive locations for migrants during the crisis, and explores some of the factors behind it. The empirical evidence unveils two key results. First, major changes took place in spatial patterns of migration flows in Spain in the wake of the 2008 recession. Second, the rich provinces that best weathered the economic downturn, especially those with a relatively small construction sector and a good performance of industry and services, became appealing destinations during the crisis.

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KEYWORDS

Internal migration, economic crisis, distribution dynamics, spatial lag model, Spanish provinces

1 INTRODUCTION

Parallel to the phenomenon of massive arrival of immigrants to Spain since the early 2000s, academic interest in international migration has grown considerably, as evidenced by the proliferation of articles published on the subject. Papers dealing with this issue include Arango (2000), Carling (2007), Peixoto *et al*. (2012), Amuedo-Dorantes & De la Rica (2013), González & Ortega (2013), Collantes *et al*. (2014), Duque & Hierro (2016), Hierro (2016), Rodríguez-Planas & Nollenberger (2016), and Neubecker *et al*. (2017), to name only a selected few. Despite the crucial role of internal migration in a myriad of economic and social affairs, such as income distribution, labor market and income disparities, and population and human capital redistribution (Jimeno & Bentolila, 1998; Coulombe, 2006; Carrasco *et al*., 2008; Hierro & Maza, 2010; Ellis, 2012; Larramona & Sanso, 2014; Lomax *et al*., 2014; Rees *et al*., 2017), the international migration boom of the last two decades deflected interest from internal migration issues in Spain.

At present, however, there is renewed interest in internal migration issues in Spain because of the profound economic changes brought about by the crisis of 2008. In a hypothetical economy with perfect labor mobility, migrants do generally move from areas with low income and high unemployment to others that are more dynamic. In such a way, internal migration becomes an effective mechanism to smooth away interterritorial disparities (Champion, 1987; Bayona-i-Carrasco *et al.*, 2017). In practice, however, the efficacy of this mechanism depends crucially on the supply elasticity of internal migration with respect to wage and unemployment differentials (Fidrmuc, 2004).

Regarding this issue, many studies have highlighted strong differences in mobility between Europe and the US, markedly higher in the latter (see, for instance, Blanchard & Katz, 1992; Eichengreen, 1993, 1998; Decressin & Fatas, 1995; Bentivogli & Pagano, 1999; Bentolila *et al*., 2012). As shown by Blanchard & Katz (1992) for the US case, a high degree of regional labor mobility contributes crucially to absorb asymmetric demand shocks and, therefore, to reduce regional unemployment and wage differentials. Anyway, it is important to note that even within Europe the intensity and/or effectiveness of labor mobility to idiosyncratic demand shocks differs between countries (see Puhani, 2001; Fidrmuc, 2004; Niebuhr *et al.*, 2012). As Bentolila *et al.* (2012) state, these differences in geographical labor mobility are indeed salient, with Spain standing out as one of the countries where it is lower. Partially because of this low mobility, territorial disparities have increased in Spain over the crisis period. Apart from a huge rise in the global unemployment rate, disparities across provinces, as measured by the unemployment rate standard deviation, increased around 65% between 2008 and 2013. In our view, this is also a clear signal of the highly heterogeneous responses of provincial labor markets to the crisis.

Against this backdrop, it seems imperative to carry out an exhaustive follow-up of the directionality of migration flows (namely, their spatial distribution across provinces) for an appropriate policy response. The literature on the impact of the global crisis of 2008 on internal migration movements in Spain is, however, very scant, and it has just begun to expand as more and better data have become available (Bayona-i-Carrasco *et al*., 2017; Gil-Alonso *et al*., 2015, 2016; Méndez *et al*., 2015; Minondo *et al*., 2013; Gutierrez-Portilla *et al*. 2018).[4] This paper tries to contribute to filling this gap.

Specifically, the main objective of this paper is to contribute to that discussion by providing a sound and complete methodological framework for the assessment of shifts in inter-provincial migration dynamics in Spain during the crisis. It assesses the issue by means of a non-conventional approach: the distribution dynamics approach. This methodology is ideally suited for addressing the directionality of internal migration flows because, unlike alternative approaches like regression models, "the distribution dynamics approach examines directly the evolution of the cross-sectional distribution […] to describe both the change in its external shape and the intra-distribution dynamics" (Magrini, 2007, pp.8). By using this methodology, we will be able to respond to two important questions. First, whether major changes in the relative position of provinces within the net migration rate distribution have taken place during the crisis. More specifically, whether some provinces have turned from being net receptors of internal migrants into net senders (or vice versa). Second, which provinces are the winners and losers in terms of migratory attractiveness during the crisis. Additionally, and in an attempt to go further than to simply offering a picture of changes in provinces' migratory attractiveness, the paper explores which factors might explain it by estimating a spatial lag model.

To answer these questions, the period 2002-2013 for the Spanish provinces is examined. Not only because we want to assess changes in migratory attractiveness over

[4] Regarding different countries, evidence suggests that the recent economic downturn has decreased both intra- and inter-country migration (Castles, 2009; Chan, 2010; Jauer *et al*., 2014; Lomax *et al*., 2014).

the crisis but also for methodological reasons, we split the sample period into two non-overlapping periods with the same length: the pre-crisis (2002-2007) and crisis (2008-2013) periods. The year 2008 is taken as the cut-off year since the Bank of Spain dated the outbreak of the crisis in the second quarter of 2008 (Ortega & Peñalosa, 2012). As for the spatial disaggregation (Figure 1), we opted for using provinces (NUTS-3) as units of analysis instead of regions (NUTS-2) to gather as much information as possible of migration flows. Although the use of NUTS-2 regions might be particularly relevant from the point of view of the European regional policy (Ezcurra *et al.*, 2009), it allows knowing little to nothing about migration flows across smaller areas (provinces) belonging to a region.

[FIGURE 1]

With regard to the data source, there is always a little bit of controversy. Data on internal migration used in the paper come from the 'Statistics of Residential Variations' (EVR) published by the Spanish National Statistics Institute (INE). This database collects annual origin–destination matrices from inter-municipal changes of residence recorded by the Spanish Municipal Register (*Padrón Municipal*). Although some under-registration problems do exist when working with it, as well as a certain gap between the time when the migration takes place and the time is actually declared, this data source is widely used because it provides the most trustworthy annual data on internal population movements in Spain.

The remainder of the paper is structured as follows. Section 2 provides a short overview of the main internal migration trends in Spain, as well as the 'state-of-the-art' of the literature regarding internal migration. Section 3 addresses the issue of how the recent economic crisis has altered the dynamics of migration movements across provinces. Section 4 reveals which provinces were winners (if any) and which ones were losers in terms of migratory attractiveness during the crisis and, more interestingly, it unveils some of the factors that might help explain it. Finally, Section 5 summarizes the main conclusions.

2 INTERNAL MIGRATION IN SPAIN: AN OVERVIEW

2.1 Internal migration patterns: stylized facts

Internal migration patterns in Spain have changed dramatically over the last few decades. All along the 1960s and 1970s, increasing job opportunities in the rich, industrial provinces spurred massive migration from the not so rich ones (Santillana, 1981). As illustrated by Raymond & García (1996), this directionality of internal migration contributed very significantly to the reduction of income disparities in Spain. In the early 1980s, industrial restructuring (associated with the economic recession after the various oil shocks) was followed by a great deal of return migration to poor provinces in the South and Southwest of Spain. This resulted in a dramatic drop in net migration rates, and in a practically negligible contribution of internal migration to income convergence in the country. Since then, both destinations and migration motivations changed abruptly. From the 1990s onward, short-distance movements (i.e. between provinces within the same region) tended to dominate internal migration, and location attributes started to gain prominence in the choice of migration destination.

Since the early 2000s, internal migration involving foreign-born population began to stand out. The above changes put a definitive end to the traditional role of internal migration as a convergence driver in Spain (Hierro & Maza, 2010; Larramona & Sanso, 2014).

As indicated, our analysis will be confined to internal migration across the 50 Spanish provinces from 2002 to 2013. In order to gain some insights into the recent evolution of internal migration figures for Spain, we present Table 1. A first relevant point is that people have not responded to the recent economic shock by moving to other parts of the country at a higher pace than before. As can be seen, the evolution of the gross internal migration rate[5] exhibits an inverted V-shape pattern: after a steady increase up to 2007 (reaching the highest value of 39.7‰), a somewhat comparable fall happened later (the value in 2013 being very close to that in 2002). Some factors that possibly contributed to the faster than anticipated decline of the gross migration rate were: a) high unemployment rates; b) increasing job precariousness;[6] c) the out-migration of both Spaniards and foreigners to other countries in search of better labor opportunities (usually to Europe, but also to their home country in the case of foreigners);[7] and d) the recent slowdown in immigration to Spain in response to the increasingly downward trend in employment.

[5] Defined as the ratio of internal population movements to the population of the country (multiplied by 1,000).

[6] According to the Spanish Wage Structure Survey (*Encuesta de Estructura Salarial*), the percentage of workers with a wage below the Spanish statutory minimum wage (*Salario Mínimo Interprofesional*) increased from 8.86 in 2008 to 13.28 in 2013.

[7] Population leaving Spain over the 2008-2013 period reached 2.1 million.

[TABLE 1]

A second important point is that intra-provincial migration, quite apart from being more prevalent than inter-provincial migration (60% of the total internal migration in 2013 was within provinces), declined less sharply than inter-provincial migration during the crisis period.

Moving on to the analysis of the net internal migration rate,[8] two additional points emerge by looking at its spatial (provincial) distribution (see Figure 2). For the convenience of comparison, we only display data for the years 2002, 2008, and 2013. The magnitude of the rate is reflected in the relative shade used: the darker the shade the higher the value of the rate. It is clear from the figure that key changes happened in the aftermath of the crisis. Although rates slightly changed from 2002 to 2008, there was a sharp drop afterward. Consequently, when comparing years 2008 and 2013 the number of provinces with a negative, albeit admittedly low, internal migration balance (represented by the lightest areas) increases. In this regard, it is shocking that provinces along the Mediterranean coast turned from being net recipients into net senders of migrants. This conclusion is in line with the study by Bayona-i-Carrasco *et al*. (2017).

[FIGURE 2]

2.2 Internal migration literature

[8] Defined as the difference between internal migration flows into a province minus the internal migration flows out of that province, per 1,000 inhabitants.

Most empirical studies concerning internal migration in Spain have focused their attention on internal migration motivations to explain these stylized facts. From a theoretical perspective, they have resorted to both equilibrium and disequilibrium models, being the empirical evidence not conclusive so far. While some studies have pointed to the influence of economic differentials and labor market conditions (see, for instance, Santillana, 1981; Bentolila & Dolado, 1991; Antolín & Bover, 1997; Juárez, 2000; Devillanova & García Fontes, 2004; Martínez-Torres, 2007; Paluzie *et al*., 2009; Mulhern & Watson, 2010), other studies have placed more emphasis on the increasing influence of amenities and other non-economic factors, such as climatic conditions as well as natural and social endowments (Ródenas & Martí, 1997; De la Fuente, 1999; Bentolila, 2001; Bover & Arellano, 2002; Maza & Villaverde, 2004; Faggian & Royuela, 2010). Despite equilibrium and disequilibrium models differing widely in underlying assumptions, they have shifted from being substitute to complementary approaches in understanding the role of economic motivations and locational attributes in internal migrants' decisions (Gutierrez-Portilla *et al*., 2018).

Albeit to a much lesser extent, some studies have also addressed the impact of internal migration on income convergence (Raymond & García, 1996; Hierro & Maza, 2010; Larramona & Sanso, 2014, among others). Unlike in the literature on migration determinants, in this piece of literature there is a consensus that internal migration contributed significantly to the reduction of regional and provincial income gaps in Spain until the late 1970s, but not from then onward.

A relatively new focus of interest emerged with the massive influx of immigrants to Spain in the early 2000s: foreign-born population internal movements (Recaño, 2002; Fernández & Ortega, 2008; Dall'erba and Guo, 2009; Maza *et al*., 2013; Neubecker &

Smolka, 2013; Silvestre & Reher, 2014; Duque & Hierro, 2016; Gutierrez-Portilla et al. 2018). These studies have pointed to the higher mobility of foreigners relative to natives, the crucial role played by social networks in their choice of destination, and that foreigners' preferences seem to be more economic-oriented/less amenity-based than those of natives.

Finally, it is important to stress that the impact of the 2008 economic crisis on internal migration patterns has also recently come to the fore (Bayona-i-Carrasco *et al.*, 2017; Gil-Alonso *et al.*, 2015, 2016; Méndez *et al.*, 2015; Minondo *et al.*, 2013). Empirical evidence reveals important changes not only in the intensity but also in the directionality of internal migration flows in Spain since the outbreak of the crisis. Among these changes, it is noteworthy the role of some provinces with large metropolitan areas as refugee centers for internal migrants, and the increasing appeal of some territories, in particular those less hit by the real estate boom. This study fits into this new line of research, proposing a novel approach to analyze how the crisis has influenced the directionality of internal migration flows.

3 INTERNAL MIGRATION DYNAMICS IN SPAIN: A DISTRIBUTION DYNAMICS APPROACH

The aim of this section is to ascertain how the crisis of 2008 has affected the spatial distribution of internal migration flows across the Spanish provinces, for which we first look into the external shape of the net migration rate distribution. Given the limitations of this approach, we also resort to the so-called intra-distribution dynamics approach to address the evolution of the entire cross-section distribution over time.

3.1 Changes in the external shape of the distribution

To examine the distribution of the net migration rate across our sample of provinces we initially resort to the use of a plot obtained by estimating non-parametric density functions. This kind of plot, which is the smoothed version of a histogram, provides a very intuitive graphical tool for studying the distribution as a whole and for detecting the possible presence of clusters of provinces with relatively similar values of the net migration rate. In addition, the comparison of a density function at different points in time allows one to get some idea, albeit not entirely reliable as we shall comment on below, of how the distribution evolves over time.

Specifically, in this paper we estimate univariate kernel density functions for the years 2002, 2008 and 2013. For it, a Gaussian kernel is used. Regarding bandwidths, and because of data sparseness, an adaptive rather than a fixed bandwidth is considered. This is common practice when estimating long-tailed distributions as it reduces under-smoothing in areas with few observations and over-smoothing in others. Then, to minimize the sensitivity of estimations to outliers, we use the standard adaptive two-stage estimator proposed by Abramson (1982) given by:

$$\hat{f}(x) = \frac{1}{\sum_{i=1}^{n} w_i} \sum_{i=1}^{n} \frac{w_i}{h_i} K\left(\frac{x - x_i}{h_i}\right) \qquad (1)$$

where K is the Gaussian kernel, $h_i = h\lambda_i$ is a varying bandwidth defined as the product of a global fixed bandwidth h and a bandwidth adjustment factor $\lambda_i = \sqrt{G/\tilde{f}(x_i)}$, and G is the geometric mean over all i of the standard fixed bandwidth kernel density estimate $\tilde{f}(x_i)$.

Figure 3 displays the net internal migration rate distribution for the three above-mentioned years. As can be observed, significant shifts took place in the external shape of the distribution between 2002 and 2013. First, the long tail to the right, associated to provinces with very high positive net migration rates, at both 2002 and 2008, nearly vanished in 2013. Second, the distribution was more peaked at the end of the sample period, although its main mode remained rather unchanged around negative values very close to zero. This fact shows the predominance of a very low but negative net migration balance. Finally, it can be also noticed the appearance of a new secondary bump at 2013 around a value of -4, associated with the emergence of a group of provinces heavily hit by the crisis where net migration declined even further.

[FIGURE 3]

3.2 Changes in intra-distribution dynamics

3.2.1 A continuous approach

Although informative, the comparison of density functions at different points in time does not offer a precise picture on the law of motion of the distribution as it only provides a static picture of the position that provinces occupy in it. In fact, it might happen that provinces changed their relative position within the distribution over time, something that the simple comparison of density functions would not reveal. In an extreme but possible scenario, it might also happen that some changes in provinces' relative position took place albeit the external shape of the distribution was not affected (Quah, 1997). To remedy this shortcoming, the literature suggests the use of the so-called continuous intra-distribution dynamics approach as it provides information about the dynamics within the distribution. Hence, we apply this approach, based on the so-called stochastic kernels (see Quah, 1997; Durlauf & Quah, 1999), which computes the conditional density of a variable *Y* given a variable *X*. The traditional estimator is defined as follows:

$$\hat{f}_{\tau}(y|x) = \frac{1}{b}\sum_{i=1}^{n}\omega_i(x)K\left(\frac{\|y-Y_i\|_y}{b}\right), \qquad (2)$$

where

$$\omega_i(x) = K\left(\frac{\|x-X_i\|_x}{a}\right) \Big/ \sum_{j=1}^{n}K\left(\frac{\|x-X_j\|_x}{a}\right). \qquad (3)$$

The norms $\|.\|_x$ and $\|.\|_y$ represent Euclidean distances on the spaces of *X* and *Y*, while *a* and *b* are smoothing (bandwidth) parameters on the two spaces respectively. $K(.)$ is the kernel function. Equations (2) and (3) show how a conditional density function in the continuous variables *x* and *y* can be obtained as the sum of *n* kernel functions in *Y* space weighted by the $\omega_i(x)$ in *X* space.

Based on this approach, Hyndman *et al.* (1996) developed the so-called highest conditional density region approach. This technique presents at least two main advantages over the traditional conditional density estimator just described. First, the new estimator has better statistical properties; second, it provides some powerful visualization tools (the *stacked conditional density* and the *highest conditional density region* plots) that offer a more direct interpretation of the results. The estimator proposed is:

$$\hat{f}_{\tau}^{*}\left(y|x\right)=\frac{1}{b}\sum_{i=1}^{n}\omega_{i}(x)K\left(\frac{\left\|y-Y_{i}^{*}(x)\right\|_{y}}{b}\right), \tag{4}$$

where $Y_i^*(x) = e_i + \hat{r}(x) - \hat{l}(x)$, $\hat{r}(x)$ is the estimator of the conditional mean function $r(x) = E[Y|X = x]$, $e_i = y_i - \hat{r}(x_i)$, and $\hat{l}(x)$ is the mean of the estimated conditional density of $e|X = x$.

A key element in the estimation of stochastic kernels, both the traditional (equation 2) and the one employed here (equation 4), is the choice of bandwidths. The role of these bandwidths is to put less weight on observations that are further away from the point under evaluation. In this study, we use optimal bandwidths in the two directions *x* and *y* following the Bashtannyk & Hyndman's (2001) rules. As regards the kernel function, once again we use a Gaussian kernel.

Figure 4 displays the results obtained for the pre-crisis (2002-2007) and crisis (2008-2013) periods and for a time-span of one year: the stacked density plot on its left-hand side and the highest conditional density region plot on its right-hand side. It is important to clarify that we consider year-by-year transitions because migration flows are usually very volatile so that a longer transition period might lead to a noteworthy loss of information. With reference to the first plots, we can see that they show changes in the net migration rate for a given value/level of it in the previous year. A striking difference between the two periods under consideration concerns the mobility degree. While in the pre-crisis period the probability mass and most of the peaks tended to be clustered along the main diagonal, during the crisis some apparent deviations from the diagonal (mainly at high rates of migration) happened. Put it in simple terms, the mobility degree within the distribution was much higher during the crisis than in the preceding period.

[FIGURE 4]

The highest conditional density region plot provides, however, a more informative way to represent changes in the distribution. In our case, each vertical strip on the right-hand side of Figure 4 represents the conditional density for a migration rate in the previous year. In particular, this figure shows the highest density regions for a probability of 25, 50, 75 and 90% (as it passes from dark to light). In addition, it illustrates, as a bullet (•), the mode (value of net migration rate in the year t+1 where the density function takes on its maximum value) for each value in the year t.

With respect to the pre-crisis period, the position of the modes (Figure 4a) seems to suggest that changes were not very significant at all. This result is confirmed if we observe the mass of probability (dark areas), as can be seen that, in general terms, the area representing a probability of 25% crosses the diagonal. This reveals again the existence of a high degree of persistence. The only exception occurs in the upper tail of the distribution. Relative to the crisis period, it is important to notice that the mobility degree was higher than in the pre-crisis one (Figure 4b). As shown, the modes are now further to the diagonal and, in more cases than in the pre-crisis period, the dark areas representing a probability of 25% do not cross it, especially in the tails of the distribution. In particular, the figure shows that mobility was especially apparent for regions in the migration rate range of -10−-5 and 5−20. In the latter case, our results also reveal that there exist signs of polarization among provinces with relatively high net migration rates: some of them even increased their rates, but most underwent a reduction over time.

3.2.2 A discrete approach

The continuous approach of the previous sub-section fails to make a reliable quantified estimation of the extent to which the mobility degree within the distribution is high or not. To overcome this shortcoming, here we resort to the Markov chain approach in a discrete state space. Let´s suppose that provinces are classified into a finite number of exhaustive and mutually exclusive states (in our case, intervals of net migration rates) and that X_t represents the interval in which a province's net migration rate falls at time *t*. Then, it is possible to define the distribution for the net migration rate at times *t* and *t+1*, denoted by $p(t)$ and $p(t+1)$, respectively. The link between both distributions is given by $p(t+1) = p(t) \cdot P(t,t+1)$, which defines the law of motion of the distribution. The key element in the preceding equation is the operator $P(t,t+1)$, the so-called transition matrix between *t* and *t*+1 with generic elements $p_{ij}(t,t+1)$, which maps the distribution from t to t+1. The interpretation of the transition matrix is particularly intuitive as its elements provide, in our particular case, the probability of a province of moving from an interval of net migration rate i to another j between t and t+1.

In implementing this approach, an important decision to make concerns the partition of the state space into a finite number of states. In order to get around some of the problems associated with the discretization of the state space, here we consider a large number of net migration intervals (25) using percentiles as a selection criterion: namely, percentiles defined from 0% on increments of 0.04% (the upper bounds of the intervals are in the second column of Table 2 below).[9] The idea is to split the distribution into a large number of equally sized intervals of net migration rates sorted in ascending order. Nevertheless, being aware that an excessive number of states may create a practical difficulty in terms of space and visualization of the results, here we resort to an informal representation of the estimated one-year transition matrix by plotting ranges of probability levels.

In any case, a word of caution is in order here before proceeding with the estimation. We first tested for the existence of Markovian dependence using the χ^2−test proposed by Anderson and Goodman (1957). The results lead us to reject the null hypothesis of non-Markovian dependence at the 5% significant level (p−value=0.000), this implying we can properly compute a transition matrix.

[9] There are alternative criteria for selecting states. An interesting one, recently proposed by Rey (2014), is based on examining movements within rank distributions. We ruled out this method, however, as it requires a number of periods much higher than the number of units. In any case, our approach is partially in line with Rey's one in the sense that we are trying to mitigate some of the limitations of discretization by defining a large number of states. Other standard criteria, based on the calculation of an optimal binwidth, are those proposed by Scott (1979), Magrini (1999) and Cheshire & Magrini (2000).

Figure 5 displays the transition matrices estimated for the pre-crisis and crisis periods. On the axes we have the 25 net migration rate intervals at *t* (horizontal axis) and *t*+1 (vertical axis), the shaded black areas being, from darkest to lightest, 0-10%, 10-20%, 20-40%, 40-60%, 60-80% and 80-100% probability ranges. Cells touching the diagonal correspond to transition probabilities of the type p_{ii} (i.e. the probability of staying in the same net migration interval), and the vertical line delimits negative intervals of net migration rate from positive intervals at time *t*.

[FIGURE 5]

The results provide strong evidence for two main conclusions. First, as revealed by the main diagonal in both Figures 5a y 5b, persistence does not characterize the net migration rate distribution. Second, both forward and backward movements exist in the two periods, although intra-distribution mobility in the crisis period seems to be higher than in the pre-crisis period.

The key point here is that we can quantify mobility. To do it we use a novel mobility measure formulated by Maza *et al*. (2010). This consists basically on an extension of Bartholomew's (1996) family of mobility measures that accounts for both the size of the states and the relative distance between them, the latter being a crucial point for the measurement of intra-distribution mobility. The expression of the mobility measure is as follows:

$$d(P(t,t+1)) = \sum_i \sum_j \frac{1}{k_i(t)} \cdot p_i(t) \cdot p_{ij}(t,t+1) \cdot d_{ij}(t) \qquad (5)$$

where p_i represents the size of each state at t (in this case the size is the same for all the states as they contain equal number of provinces); p_{ij} denotes, as already mentioned, each transition probability between t and $t+1$; $d_{ij} = \left| \overline{tmn}_j - \overline{tmn}_i \right|$ are absolute differences between the average net migration rate between states at t; and, finally, k_i denotes the largest value of each row in matrix D (distances matrix with generic elements d_{ij}). This mobility measure is bounded between 0 and 1, and its interpretation is straightforward: the closer its value to 1, the higher the mobility degree within the distribution. Specifically, $d(P)=1$ if all provinces change their relative position within the distribution, moving either upward or downward towards the more distanced net migration rate interval.

To gain understanding of the performance of each state separately, one can decompose the aggregate mobility measure (equation 5) into the so-called state-by-state measures, denoted by $d(P_i)$, so that we can write the mobility measure as:

$$d(P(t,t+1)) = \sum_i p_i(t) \cdot d(P_i(t,t+1)) \qquad (6)$$

where

$$d(P_i(t,t+1)) = \sum_j \frac{1}{k_i(t)} \cdot p_{ij}(t,t+1) \cdot d_{ij}(t) \qquad (7)$$

Table 2 presents both state-by-state and aggregate mobility indexes for our two periods. If we first look into the aggregate index, we find that intra-distribution mobility in the crisis period $\left(d(P)=0.127\right)$ is markedly higher than in the pre-crisis period $\left(d(P)=0.059\right)$. This leads us to conclude that low and falling internal migration rates (Table 1) co-existed with an increase in mobility within the distribution. Put it another way, people moved less but differently during the crisis.[10] In addition, provinces acting as a magnet for internal migration played a major role in aggregate mobility over both periods. This is apparent from the values of the state-by-state indexes. However, their evolution seems to reveal that the main contribution to the increase in aggregate mobility has come from provinces with a worse migration balance.

[TABLE 2]

4 WINNERS AND LOSERS FROM THE RECENT ECONOMIC CRISIS. SOME TENTATIVE EXPLANATIONS

The previous analysis of the net migration rate distribution poses two important questions: first, which provinces were winners (if any) and which ones losers in that process and, second, which factors might be involved. This section provides an answer to these questions.

4.1 Winners and losers

[10] For the sake of clarity, it is important to note we are referring to different concepts of mobility: while migration rates concern the net amount of people leaving a province, intra-distribution mobility refers to changes in the relative position of provinces within the net migration rate distribution.

As none of the discussed models provide for an adequate identification of winners and loser in migratory attractiveness, next we resort to the so-called *Causative Matrix (CM) model*. This approach, suggested by Lipstein (1965) and extended by Plane & Rogerson (1986) and Hierro (2009), has the following appealing features:

(1) Unlike classical Markov chain analysis, based on time-invariant transition probabilities (see, for instance, Magrini, 1999; Hammond, 2004; Ezcurra *et al*. 2005), it uses a non-stationary specification of the transition probabilities. This is appealing as it allows one to understand the way provinces move up or down in the internal migration hierarchy (intra-distribution dynamics) under the premise that the probability of a province to move from one state to another can change over time.

(2) The consideration of inter-provincial dependency effects through a constant causative operator. In doing so, the model goes beyond a simple comparison of transition matrices (Plane & Rogerson, 1986).

(3) Through this approach, it is possible to gain insights into the trends of the relative attractiveness of provinces over time (Plane & Rogerson, 1986). To us, this is its most appealing feature.

With the above considerations in mind, we can model changes between transition probabilities as follows:

$$p_{ij}(t,t+1) = \sum_k p_{ik}(t-1,t) \cdot c_{kj}^R \quad (8)$$

for all i, j, where c_{kj}^{R} are the elements of the so-called right-causative matrix C^{R} that gauges the rate of change of transition probabilities from a competing destination perspective (Plane & Rogerson, 1986). Accordingly, as indicated by equation (8), a transition probability at time *t*, $p_{ij}(t, t+1)$, is not only influenced by its value at *t-1* ($k = j$), but also by the transition likelihood from province *i* to all the other "competing" provinces (when $k \neq j$). In such a manner, the model captures not only the direct effect of $p_{ij}(t-1, t)$ on $p_{ij}(t, t+1)$, but also the induced effect (an offsetting effect in some cases and an enhancing effect in others) of probabilities $p_{ik}(t-1, t)$. Put it differently, as the competitive position of other provinces vis-à-vis *j* can change, *j*'s attractiveness for potential migrants from province *i* may also be altered.

Hence, a measure of the total change in relative migration attractiveness of any province *j* with respect to any other province can be defined as $RA_j = \sum_{k \neq j} c_{kj}^{R}$. The interpretation of this measure is straightforward. A value higher than 0 indicates that there is an increase in the relative attractiveness of destination province *j*, so that the province can be labeled as a winner. Analogically, if the value is less than 0, the province has lost attractiveness relative to the rest of provinces so that it can be labeled as a loser.

Figure 6 displays the provinces identified as winners (Figure 6a) and losers (Figure 6b) of relative attractiveness during the crisis period. As shown in the legend of the figures, in both cases we split provinces into four groups according to their RA_j using the quartile criteria. We find that the main metropolitan areas, in particular Madrid and its immediate surrounding provinces (Guadalajara and Toledo), Barcelona and Sevilla experienced by far the highest increase in relative attractiveness for migrants. It is also worth pointing out the case of the Basque Country (grouping the provinces of Álava, Vizcaya, and Guipúzcoa), which maintains its traditional role to attract migrants, as well as the higher pull power of some provinces in the North and South of Spain. On the other hand, the Canary Islands (Tenerife and Las Palmas), the Balearic Islands (Islas Baleares) and many provinces along the Mediterranean coast find themselves among the biggest losers from the crisis.

[FIGURE 6]

4.2 Some tentative explanations

Having identified the winners and losers in terms of relative migratory attractiveness, it is of interest to learn something about the reasons for this result. To do so, we propose to estimate the following cross-section equation:

$$
\begin{aligned}
RA_j &= \alpha + \beta_1 GDP_j + \beta_2 unemp_j + \beta_3 hprices_j + \beta_4 ind_j + \beta_5 cons_j + \beta_6 serv_j + \\
&+ \beta_7 \Delta GDP_j + \beta_8 \Delta unemp_j + \beta_9 \Delta hprices_j + \beta_{10} \Delta ind_j + \beta_{11} \Delta cons_j + \beta_{12} \Delta serv_j + u_j
\end{aligned}
\qquad (9)
$$

which tries to explain the gains/losses in relative attractiveness of any province *j* (RA_j) between the pre-crisis and crisis periods by a set of variables: per capita income (in logs) (denoted as *GDP*), unemployment rates (*unemp*), housing prices (in logs) (*hprices*), and sectoral employment shares (for industry (*ind*), construction (*cons*) and services (*serv*))[11]. These variables are included in both initial levels (defined as the average value over the pre-crisis period) and growth rates (computed considering the average values for the two subperiods). By doing this (see the seminal paper by Pissarides & McMaster, 1990) we try to capture the idea that, when it comes to making their decision, potential migrants pay attention not only to the level of some key variables but also to their recent evolution.

As for data, regarding the dependent variable, we use the values for relative attractiveness previously estimated, while for the independent variables we use official data collected from the INE and the Spanish Ministry of Industry.

Before presenting the results, it is important to point out a crucial question that, although usually overlooked, could affect them: the presence of spatial autocorrelation in the model. In fact, the maps in Figure 6 show that this might be the case and, if so, the results of a non-spatial approach (such as equation (9)) would be inconsistent (see e.g. LeSage & Pace, 2009). To address this issue, we compute a series of Lagrange multiplier (LM) tests on the residuals of the ordinary least squares (OLS) estimation of equation (9). Namely, the LM-ERR test and its robust LM-EL version, whose null hypotheses are the absence of residual spatial autocorrelation, and the LM-LAG test and its robust LM-LE version, whose null hypotheses are the absence of substantive dependence. The results, displayed in Table 3, reveal that only in the latter the hypothesis is rejected at the standard levels. Thus, the conclusion is that there is spatial (substantive) dependence in the equation and, therefore, equation (9) should incorporate a spatial lag of the dependent variable. Therefore, we estimate the following Spatial Autoregressive Model (SAR):

[11] We left out the agriculture sector to avoid multicollinearity.

$$RA_j = \alpha + \phi \sum_i w_{ji} RA_i + \beta_1 GDP_j + \beta_2 unemp_j + \beta_3 hprices_j + \beta_4 ind_j + \beta_5 cons_j + \beta_6 serv_j +$$
$$+ \beta_7 \Delta GDP_j + \beta_8 \Delta unemp_j + \beta_9 \Delta hprices_j + \beta_{10} \Delta ind_j + \beta_{11} \Delta cons_j + \beta_{12} \Delta serv_j + u_j \quad (10)$$

where W is the spatial weight matrix, whose elements w_{ji} reflect the intensity of the interdependence between provinces *j* and *i*. Here we use the row-standardized inverse of the square of the distance (geographic distance between the corresponding provincial centroids) as a distance matrix (Anselin, 1980). We also tried, in any case, with alternative distance matrices, and the results were roughly the same.

[TABLE 3]

The estimation of equation (10) is done by maximum likelihood (because the inclusion of spatial lags causes OLS results to be inconsistent) and considering heteroscedasticity-consistent standard errors. Table 4 presents the results. First, the spatial lag of the dependent variable is significant and positive (last row of the table), so gains or losses in a province´s relative attractiveness appear to be positively associated with those of its neighbors. Moving on to the variables that can help explain changes in relative attractiveness, perhaps the most telling result is the positive and statistically significant value for both the level and growth rate of per capita income; this implies that income-earning prospects remarkably affect internal migration decisions.[12] Another

[12] The results of equation (9) did not reveal, for example, the influence of the level of per capita income, which proves the need of dealing with spatial dependence to avoid misleading conclusions.

important finding is the negative and statistically significant effect of the share of employment in construction (and to a lesser extent in industry, as its coefficient is borderline statistically significant). It seems, therefore, that provinces specialized in this sector were seen by potential migrants during the crisis as areas with limited job opportunities. The growth rates of employment shares in industry and tertiary, on the other hand, have a positive and statistically significant effect on relative attractiveness. This reveals that the performance of the most dynamic sectors in terms of employment generation in Spain over the crisis was a key determinant for people in deciding whether, and where, to migrate. Although it may sound counter-intuitive, the coefficient linked to the unemployment rate growth turns out to be positive and statistically significant. One possible explanation, pending more detailed research, lies on the role played by the city of Madrid, as the capital of the country gained much attractiveness but suffered (and this has to do with its low initial value) one of the most severe increases in unemployment rates. Aside from this, overall we think that these findings are consistent with empirical results obtained by Minondo *et al*. (2013) in that the Spanish provinces responding better to the challenges posed by the crisis became more attractive for internal migrants.

[TABLE 4]

5 CONCLUSIONS

This paper examined how the economic crisis of 2008 reshaped the directionality of migration flows across provinces in Spain. To do so, the study first focused on addressing the external shape of the net migration rate distribution, as well as changes within it (intra-distribution dynamics). Next, and these are the two main contributions of the paper, it focused on identifying the winners and the losers in terms of relative attractiveness during the crisis (by employing a non-stationary Markov chain approach), as well as the main factors that might help explain it (estimating a spatial lag model).

One of the overall conclusions of this study is that the 2008 crisis affected both the intensity and directionality of internal migration flows in Spain. Specifically, our analysis revealed a drop in intensity of internal migration, strong changes in the relative position of provinces within the net migration rate distribution, and that intra-distribution mobility during the crisis period was more than two-fold higher than during the pre-crisis period. Furthermore, the analysis unveiled that the main metropolitan areas (with the only exception of Valencia) and, in general, the rich provinces which resisted the economic crisis best (especially those with a relatively small size of the construction sector, and a good performance of industry and services) became preferred destinations for migrants during the crisis. By contrast, most of the Mediterranean coastal provinces and the Islands (Baleares and Canarias) were the main losers.

In summary, our results showed that the directionality of internal migration flows after the economic shock of 2008 was consistent with migration as an adjustment mechanism. Yet, if this situation continues any longer, the low and decreasing intensity of internal migration (if persisting) might prevent migration from facilitating provincial adjustment. Hence, and although politically challenging, the intensity of mobility should be fostered through the implementation of fiscal incentives, as well as other policy actions aiming at, as suggested by Faini et al. (1997) and Fidrmuc (2004), reducing mobility, search and information costs, as well as inefficiencies in inter-provincial job mismatching.

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TABLE 1 Internal migration in Spain, 2002-2013

Year	Total internal migration		Intra-provincial migration		Inter-provincial migration	
	Number	Gross rate ‰	Number	Gross rate ‰	number	Gross rate ‰
2002	1,318,621	31.6	790,482	19.0	528,139	12.7
2003	1,462,443	34.4	880,916	20.7	581,527	13.7
2004	1,522,102	35.4	907,985	21.1	614,117	14.3
2005	1,565,463	35.6	944,037	21.5	621,426	14.1
2006	1,727,057	38.8	1,049,703	23.6	677,354	15.2
2007	1,790,145	39.7	1,050,637	23.3	739,508	16.4
2008	1,638,423	35.6	958,826	20.8	679,597	14.8
2009	1,648,198	35.4	983,441	21.1	664,757	14.3
2010	1,675,902	35.8	1,010,197	21.6	665,705	14.2
2011	1,644,628	35.0	978,295	20.8	666,333	14.2
2012	1,580,726	33.6	938,482	19.9	642,244	13.6
2013	1,546,348	32.9	929,436	19.8	616,912	13.1

Source: INE and own elaboration.

TABLE 2 Intra-distribution mobility

State	Pre-crisis period			Crisis period		
	Upper bound	$d(P_i)$	$d(P)$	Upper bound	$d(P_i)$	$d(P)$
1	-4.15	0.050		-5.03	0.088	
2	-3.59	0.031		-3.82	0.104	
3	-2.92	0.035		-2.97	0.187	
4	-2.70	0.033		-2.52	0.134	
5	-2.41	0.036		-2.00	0.127	
6	-2.12	0.057		-1.74	0.170	
7	-1.84	0.046		-1.48	0.105	
8	-1.44	0.032		-1.21	0.065	
9	-1.07	0.036		-0.95	0.086	
10	-0.85	0.048		-0.84	0.075	
11	-0.66	0.033		-0.64	0.074	
12	-0.35	0.038		-0.45	0.087	
13	0.02	0.045	0.059	-0.31	0.091	0.127
14	0.23	0.089		-0.18	0.088	
15	0.48	0.026		-0.03	0.089	
16	0.85	0.028		0.12	0.185	
17	1.21	0.050		0.25	0.114	
18	1.69	0.049		0.46	0.196	
19	2.04	0.094		0.63	0.125	
20	2.51	0.060		0.94	0.108	
21	3.29	0.049		1.21	0.127	
22	4.55	0.079		1.59	0.197	
23	6.06	0.161		2.23	0.133	
24	13.18	0.230		3.65	0.258	
25	30.57	0.043		16.85	0.161	

Source: Own elaboration.

TABLE 3 LM tests for spatial dependence

	Statistic	*p*-value
LM test for SEM		
LM-ERR	1.206	0.272
LM-EL	2.712	0.100
LM test for SAR		
LM-LAG	4.610*	0.032
LM-LE	6.115*	0.013

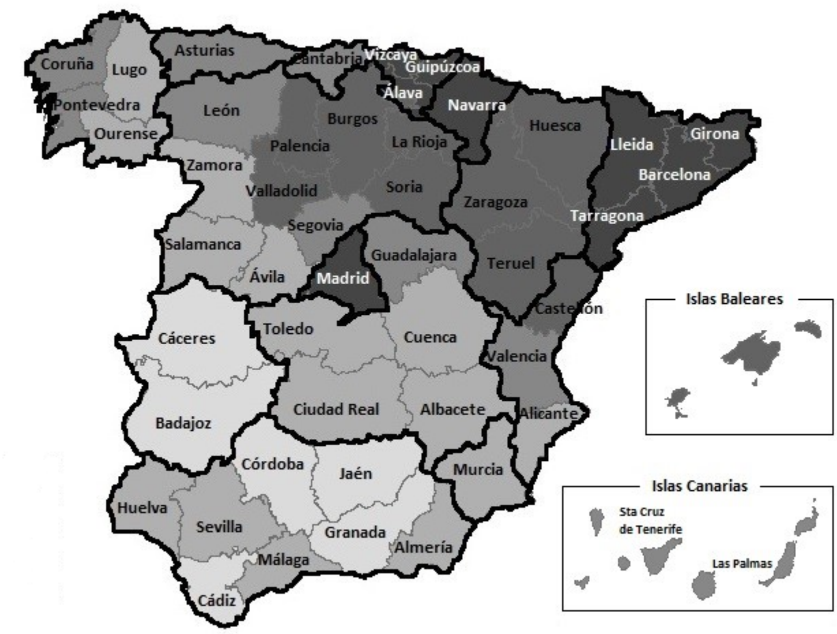
Notes: LM-ERR = Lagrange multiplier test for spatial error dependence; LM-EL = robust LM-ERR; LM-LAG = Lagrange multiplier test for spatial lag dependence; LM-LE = robust LM-LAG; * Significant at 5%.
Source: Own elaboration.

TABLE 4 Winners and losers in relative attractiveness: Main determinants

Dependent variable: RA_j	Coefficient
$\sum_i w_{ji} RA_i$	0.49*
	(0.02)
α	-2.57*
	(0.02)
GDP_j	0.25*
	(0.04)
$unemp_j$	0.27
	(0.42)
$hprices_j$	0.11
	(0.11)
ind_j	-1.53
	(0.05)
$cons_j$	-3.98*
	(0.02)
$serv_j$	-0.36
	(0.15)
ΔGDP_j	1.37**
	(0.00)
$\Delta unemp_j$	0.07*
	(0.02)
$\Delta hprices_j$	0.04
	(0.80)
Δind_j	0.65*
	(0.02)
$\Delta cons_j$	0.23
	(0.23)
$\Delta serv_j$	1.26*
	(0.01)
R-squared	0.55

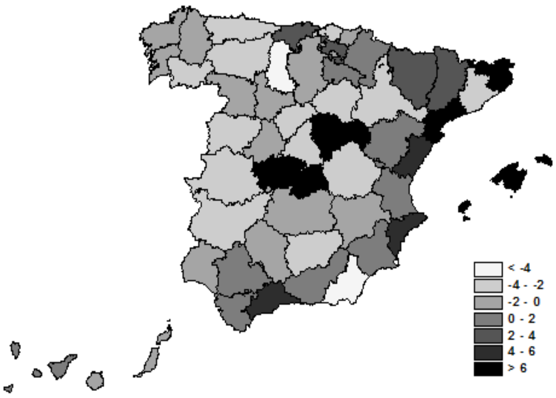
Notes: p-values in parenthesis; * significant

FIGURE 1 Spanish provinces (NUTS-3)

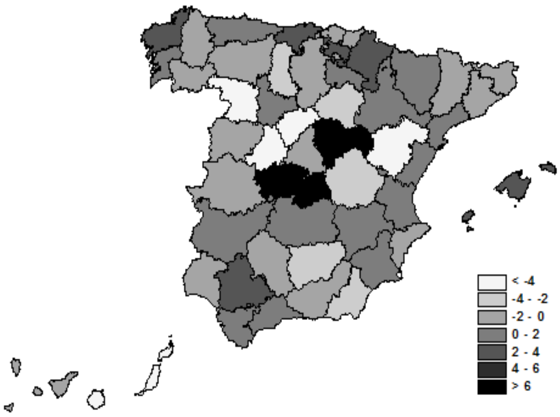


Note: Bold lines delimit regions (NUTS-2).

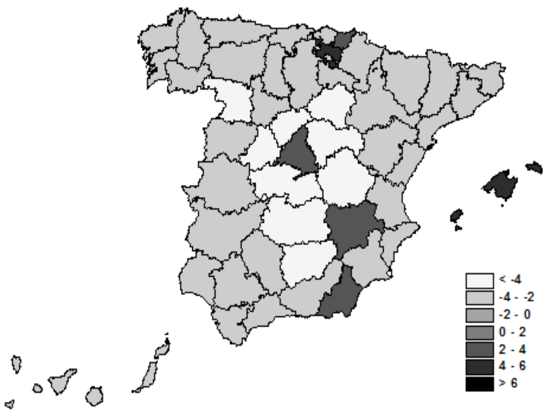
FIGURE 2 Provincial net internal migration rates in Spain



a) 2002



b) 2008



c) 2013

FIGURE 3 Adaptive kernel density

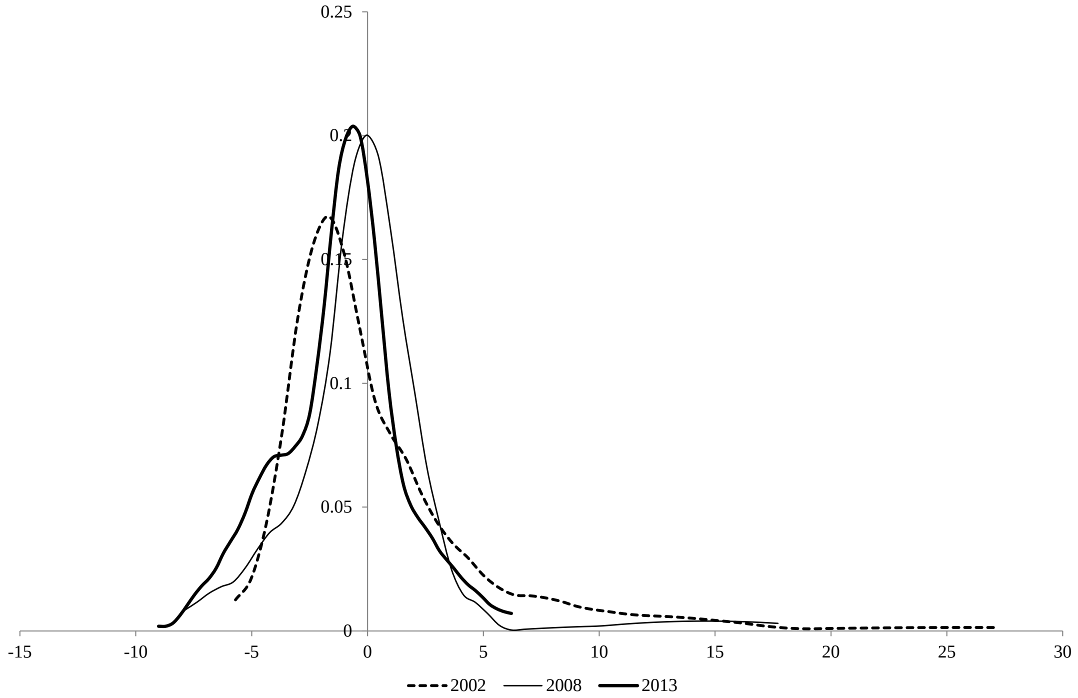
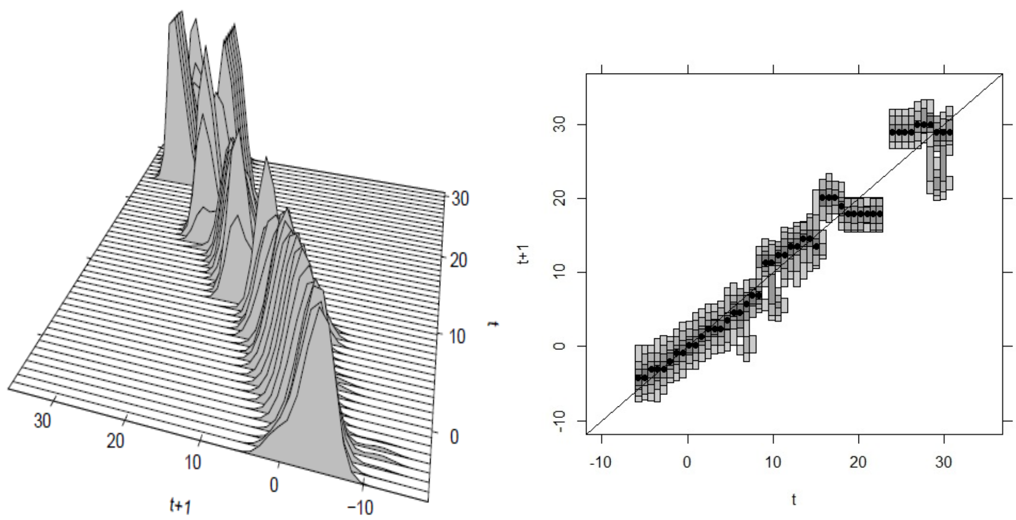
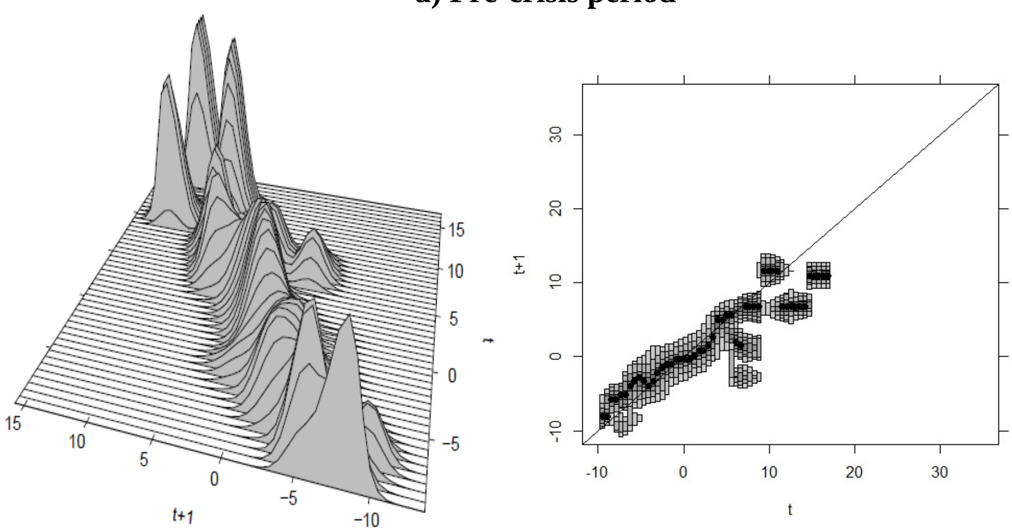


FIGURE 4 Stacked conditional density and highest conditional density region plots



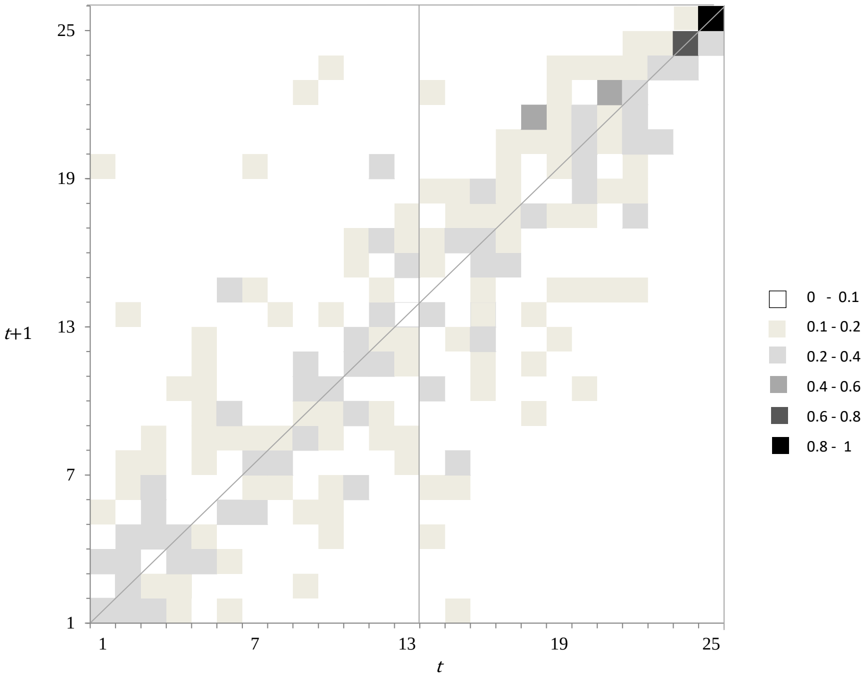
a) Pre-crisis period



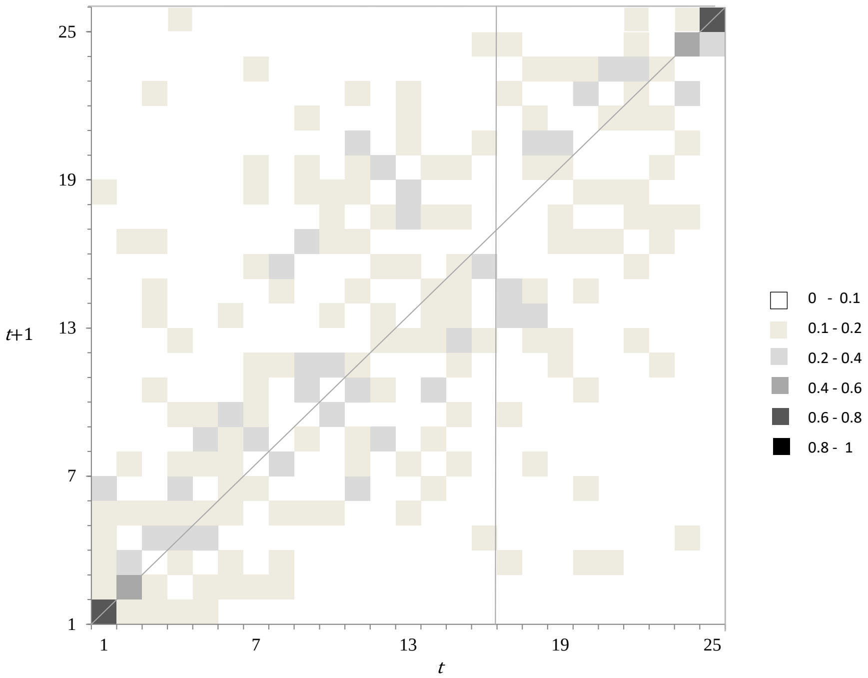
b) Crisis period

Notes: From dark to light, the shadings represent 25%, 50%, 75% and 90% of the total probability. Bullets indicate the mode. Both the stacked conditional density plot and the high conditional density region plot were estimated at 50 points.

FIGURE 5 Estimated one-year transition matrix

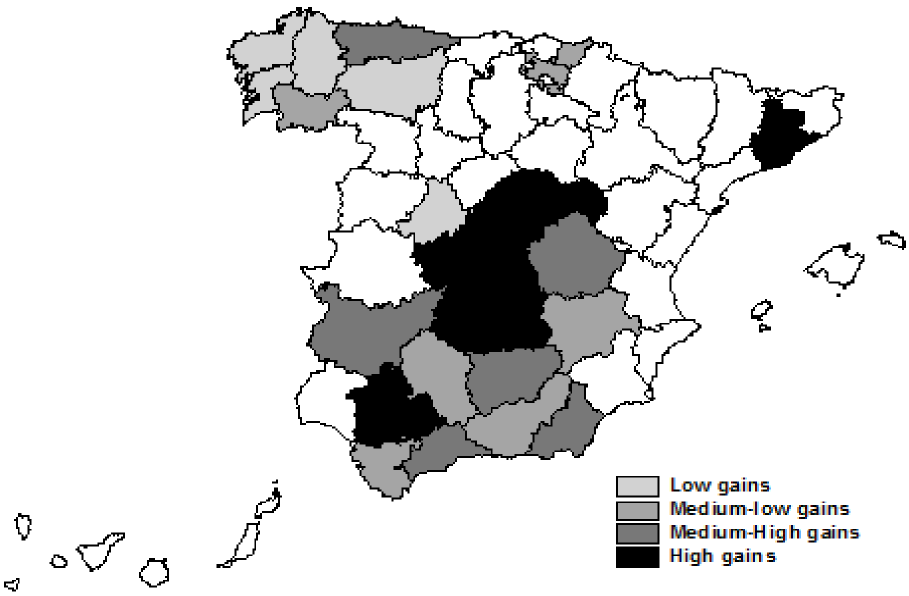


a) Pre-crisis period

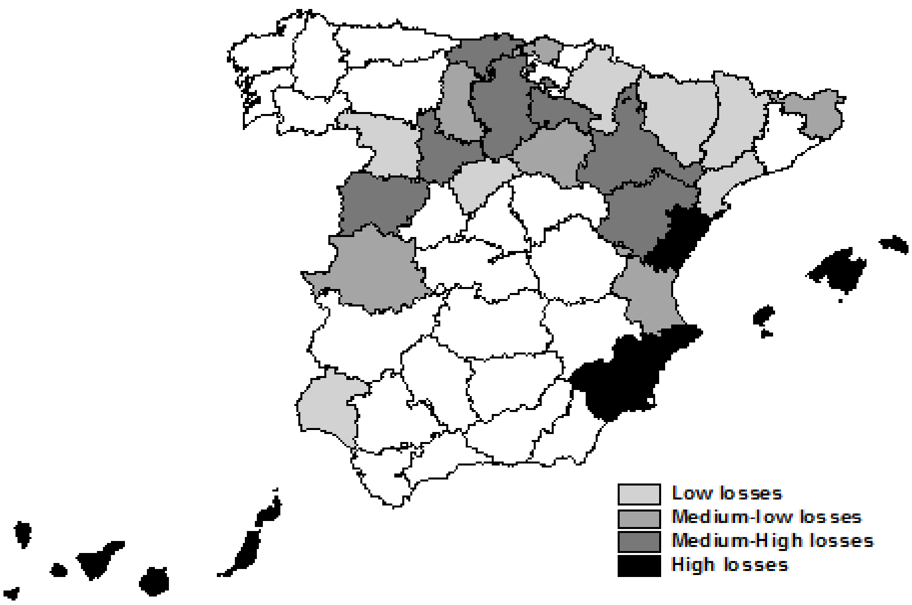


b) Crisis period

FIGURE 6 Winners and losers in relative attractiveness



a) Winners



b) Losers