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Per capita income convergence and internal migration in Spain: Are foreign-born migrants playing an important role?*

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Abstract. This paper aims to analyse the role played by internal migration of the foreign-born population in the process of income convergence at provincial level in Spain over the period 1996–2005. First, it examines, using both classical and recent analytical approaches, the provincial income convergence process. Second, the paper gives a succinct description of recent trends in foreign-born internal migration. Third, the influence of these migration flows on provincial income convergence is addressed by estimating several convergence equations. The results of this analysis seem to reject the hypothesis that foreign-born internal migration exerts a strong influence on the income convergence process.

JEL classification: F22, O15, R23, C23

Key words: Foreign-born population, internal migration, convergence, Spanish provinces

1 Introduction

The literature addressing internal migration of foreign-born populations has been prolific in recent decades, especially for the many countries that have experienced large population gains as a result of international migration, such as the United States, the United Kingdom, Canada and Germany. A substantial portion of this literature has focused primarily on the determinants both of recent immigrants' location choices and established immigrants' secondary migrations (Bartel 1989; Kritz and Nogle 1994; Buckley 1996; Zavodny 1999; Gurak and Kritz 2000). Considerable attention has been given to the effects of social networks and ethnic concentration on immigrants' subsequent resettlement (Belanger and Rogers 1992; Kritz and Nogle 1994; Nogle 1994; Newbold 1996; Wright et al. 1997; Rogers and Henning 1999; Kritz and Gurak 2001).

Since the mid-1990s or so, the growth of international migration into Spain has been intense, with its foreign-born population accounting for a growing share of the total population (rising

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from 1.3% in 1996 to 8.5% in 2005 according to the Spanish National Statistics Institute [INE]). This fact is clearly evident when one compares the case of Spain with that of other European countries. According to EUROSTAT data, Spain's net migration rate[1] reached 15‰ in 2005, which is the highest of all 15 EU Member States prior to EU enlargement in May 2004 (EU 15). Moreover, this rate is more than three times the European average rate, of 4.2‰. In the light of these changes in international migration, studies on this topic for the case of Spain in particular have multiplied in recent years.

The first papers to deal with the study of international migration in Spain were mainly concerned with socio-economic and demographic characteristics of immigrants (see, for instance, Arango 2002; Izquierdo and Carrasco 2005). Little attention, though, has been given to the internal migration patterns of established immigrants, despite the important implications that this topic could have on the geographic distribution of ethnic groups (Kritz and Nogle 1994), employment opportunities (Baker and Benjamin 1994; De New and Zimmermann 1994, Borjas et al. 1997; Card 1997; Westerlund 1997; Borjas 2003; Carter 2005; Borjas 2006),[2] social welfare provision (Jimeno and Dark 2007) and economic growth dynamics.

Another interesting topic that has not received adequate attention is whether the increasing volume of the foreign-born population in Spain is having any particular impact on the internal migration-convergence relationship. Among available studies concerning the relationship between internal migration and convergence for the Spanish case, Raymond and García (1996) found that the positive contribution of internal migration to convergence, which started in the 1960s, came to a halt beginning in the early 1980s due to dramatic changes in internal migration patterns. Among these patterns, the most important are the intensification of short-distance movements (basically intra-province movements), the increase in return migration rates, and the increasingly important role of migration flows from rich to poor regions (so-called 'inverse' migration) (Bover and Velilla 1999; Maza and Villaverde 2004).

This paper is aimed at ascertaining whether the internal mobility of foreign-born residents is restoring the provincial convergence in terms of per capita income in Spain. Our interest in this possibility stems from several facts. First, the significant contribution of foreign-born residents to the overall volume of internal migrations in Spain during the last few years. Second, the noteworthy differences observed between the migration patterns of foreign-born residents relative to those of natives (see, for instance, Hierro 2007). Third, despite both natives and the foreign-born population displaying relatively similar self-reported skill levels, the foreign-born residents are mainly concentrated in low-wage, low-productivity occupations (especially in the seasonal agriculture, construction and domestic service sectors), so that their contribution to the destination province's income is expected to be low (Amuedo-Dorantes and De la Rica 2008).[3]

With this aim, the paper responds to the call for more research on the consequences of migration made by Cushing and Poot (2004). We begin with a study of income convergence and a general description of foreign-born internal migration in the Spanish case. We go on to explore the link between migration and per capita income convergence by estimating the conditional β-convergence (see Pekkala and Kangasharju 1998; Maza 2006; Östbye and Westerlund 2007). The main advantage of this approach is that it provides a *causal* interpretation of foreign-born migration's impact on economic growth. Before going any further, however, we should mention that alternative approaches could be used for this purpose: a simple version of probability theory

[1] The ratio of (a) the difference between the number of immigrants and emigrants from a particular area during a specified period to (b) the population of that area during the previous period.

[2] Two recent papers address the relationship between employment opportunities and immigrant flows for the Spanish case: Amuedo-Dorantes and De la Rica (2005) and Cuadrado et al. (2006).

[3] According to Amuedo-Dorantes and De la Rica (2008), the immigrant surplus amounts to 0.04% of the national GDP, being the contribution to the main-immigrant receiving regions significantly higher.

(see e.g., Drenan and Lobo 1999), a state space model (see e.g., Durbin and Koopman 2001), and shift-share analysis (see e.g., Plane 1999).

The data employed in this study originate from the Spanish National Statistics Institute's official economic database; more specifically, we have employed data from several of its sub-databases: 'Spanish Regional Accounts' (*Contabilidad Regional de España*), 'Statistics of Residential Variations' (*Estadística de Variaciones Residenciales*), 'Municipal Register' (*Padrón Municipal*) and 'Economically Active Population Survey' (*Encuesta de Población Activa*). In order to analyse the effect of migration on convergence, it is necessary to define clearly how mobility is being measured. The migration data we use in this work, coming from the 'Statistics of Residential Variations', provides information on internal population movements across provinces, thus including both residential displacement and labour market mobility.

As regards the sample period analysed, it goes from 1996 to 2005. Some justification for this choice is mandatory. First, international migration into Spain has significantly increased since 1996. Second, in order to ensure availability and homogeneity in data; homogeneous series for the Spanish provinces are available for this sample period. Anyway, and given the reduced timescale, the conclusions drawn from this study must be treated with some caution until further data become available to confirm or qualify such conclusions.

In addition, regarding the level of territorial disaggregation,[4] it is convenient to recall that Spain is divided into 50 provinces (NUTS 3), which constitute 17 autonomous communities or regions (NUTS 2).[5] In this paper we have opted to use Spanish provinces as units of analysis for one main reason: a regional analysis would involve serious problems of aggregation because the Spanish autonomous communities are of widely differing sizes and encompass a different number of provinces (see Figure 1). Therefore, special advantage can be obtained in the use of a NUTS 3 level as it allows one to take into account movements across provinces belonging to a region that go unnoticed when using NUTS 2 level.

The remainder of this paper is divided into four sections. Section 2 examines, as a starting point of the later analysis, the current situation of the process of convergence in per capita income levels in the Spanish provinces throughout the period 1996–2005. Section 3 then provides a brief overview of internal migration patterns in Spain, comparing the foreign-born to the native-born with regard to their migration patterns. Section 4 examines the role played by foreign-born internal migration flows in the process of per capita income convergence at the provincial level. Finally, Section 5 presents the main conclusions of the paper.

2 Provincial convergence in per capita income in Spain: 1996–2005

As mentioned in the introduction, the present section deals with the study of provincial convergence in Spain. In order to do this, and according to the majority of articles on convergence (see, for example, recent papers by Dall'erba and Le Gallo 2008; Geppert and Stephan 2008), per capita income – defined as the ratio between gross domestic product (GDP) and population – is used as a variable of analysis for the period between 1996 and 2005.[6]

[4] As is well known, the results are usually sensitive to the level of disaggregation employed. This has to do with the ecological fallacy problem (King 1997), that is, the relationships observed for groups do not necessarily hold for individuals.

[5] The Nomenclature of Territorial Units for Statistics (NUTS) was established by Eurostat more than 25 years ago in order to provide a single uniform breakdown of territorial units for the production of regional statistics for the European Union. The NUTS classification is hierarchical in that it subdivides each Member State into three levels: NUTS levels 1, 2 and 3. The second and third levels are subdivisions of the first and second levels respectively

[6] Nevertheless, some studies on convergence tackle this question from the perspective of productivity (see, e.g., Le Gallo and Dall'erba 2008, Villaverde and Maza 2008).

Fig. 1. Provincial and regional map of Spain
Note: The provinces in same colour belong to the same autonomous community.

Before carrying out the convergence analysis, it would be convenient to illustrate the remarkable per capita income differences existing between Spanish provinces. Table 1 reports per capita income level for each province taking the national average as equal to 100 (real values). As can be seen, the ratio between the province with the highest per capita income level (Álava) and the province with the lowest per capita income level (Badajoz) is, for the average of the sample period, equal to 2.15. Additionally, it is worth mentioning that: first, the ratio between extreme values has decreased between 1996 and 2005 (2.26 and 2.04, respectively); second, provinces with the highest (lowest) per capita income levels are, in general terms, the same in the initial and final year of study. According to these results, the existence of a process of convergence and certain stability in the ranking of the Spanish provinces is to be expected. The analysis in the following paragraphs, studies in greater depth these and other characteristics of the per capita income distribution between the Spanish provinces.

Consequently, first we carry out a classical analysis of convergence. Thus, the most generally accepted measures of convergence are σ and β-convergence (Barro and Sala-i-Martín 1991, 1992). The first of these processes occurs when dispersion between provinces diminishes; the second when the poorer provinces grow more quickly than the richer ones.[7] In this section, we only calculate σ-convergence for two reasons: first, since it is more restrictive than β-convergence;[8] second, because β-convergence approach will be applied in Section 4 in order to examine the relationship between foreign-born internal migration and convergence. Hence,

[7] For a systematic review of the various approaches to the concept of convergence, see, for instance, the paper by Villaverde (2006).

[8] In fact, β-convergence is a necessary but not a sufficient condition for σ-convergence.

Table 1. Provincial differences in GDPpc (Spain = 100)

	Provinces	1996	2005	Average
1	Álava	134.2	140.8	138.1
2	Albacete	73.8	74.8	74.5
3	Alicante	85.6	85.3	86.2
4	Almería	80.3	92.6	90.6
5	Asturias	87.1	88.3	85.3
6	Ávila	83.5	81.9	80.9
7	Badajoz	59.4	69.1	64.3
8	Baleares	120.6	110.8	116.9
9	Barcelona	123.5	113.3	118.4
10	Burgos	114.9	113.1	111.9
11	Cáceres	70.8	72.0	68.1
12	Cádiz	73.2	80.8	75.7
13	Cantabria	93.2	99.4	95.8
14	Castellón	111.4	103.3	111.7
15	Ciudad Real	81.6	84.0	82.9
16	Córdoba	71.3	70.4	68.8
17	Cuenca	80.9	79.9	77.9
18	Girona	122.6	114.1	118.8
19	Granada	69.0	72.5	69.5
20	Guadalajara	98.7	83.4	92.2
21	Guipúzcoa	122.4	128.9	124.3
22	Huelva	76.2	83.6	79.4
23	Huesca	106.9	104.0	103.9
24	Jaén	70.1	69.3	68.5
25	La Coruña	86.7	84.0	83.4
26	La Rioja	113.1	103.2	109.7
27	Las Palmas	96.7	98.9	98.2
28	León	86.4	84.6	84.6
29	Lleida	118.7	117.4	117.3
30	Lugo	77.7	77.2	74.7
31	Madrid	133.2	132.9	134.9
32	Málaga	72.5	79.3	76.5
33	Murcia	82.9	81.1	82.6
34	Navarra	129.6	123.2	124.8
35	Orense	74.7	74.9	73.2
36	Palencia	95.8	100.5	94.7
37	Pontevedra	76.7	81.0	78.7
38	Salamanca	83.9	87.6	83.8
39	Santa. Cruz de Tenerife	93.0	89.1	91.6
40	Segovia	98.2	101.0	100.4
41	Sevilla	77.2	82.8	78.7
42	Soria	104.8	101.1	100.7
43	Tarragona	130.1	124.6	128.7
44	Teruel	106.1	102.8	104.7
45	Toledo	83.6	77.1	80.3
46	Valencia	94.8	93.3	95.9
47	Valladolid	108.0	105.1	103.9
48	Vizcaya	111.6	119.4	114.6
49	Zamora	77.5	81.5	75.4
50	Zaragoza	110.0	108.8	108.5

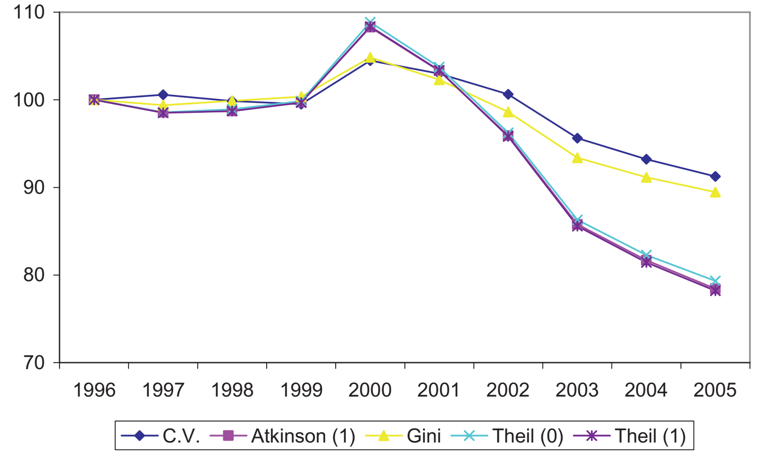


Fig. 2. Sigma convergence (1996 = 100)

σ-convergence is calculated by means of the typical measure of dispersion: the coefficient of variation. Figure 2 shows – taking the coefficient of variation of 1996 equal to 100 – that per capita income disparities, despite some swings, have declined during the sample period. The coefficient of variation fell by 9% in the period 1996–2005, which represents an annual convergence rate of 1.01%.

As there is a whole array of inequality indicators, and for sake of robustness, we have also computed σ-convergence by means of other inequality indexes, such as the well-known Atkinson, Gini and Theil indexes.[9] The results are also reported in Figure 2. We observe that all indicators point to a very similar evolution of provincial inequalities. However, the reduction of disparities is more intense according to all the inequality measures than it is according to the coefficient of variation. For instance, the Theil index $T(1)$ fell by 22% in the period under study, which corresponds to an annual convergence rate of 2.7% and confirms the existence of a convergence process in Spain.

Classical convergence is not the only approach to this issue. Despite the previous analysis being very informative, it is not without its problems. Perhaps the best-known criticism refers to the fact that it offers no information at all about the internal dynamics of the distribution (Quah 1996), since it only captures some moments of it. In order to respond to this drawback, the current study also applies a dynamic distribution convergence approach, which tries to obtain further knowledge about the provincial distribution of per capita income in terms of both the external form and changes occurring within it.

As regards its external form, the density functions for the initial (1996) and final (2005) years of the sample are estimated. The values for each province are expressed in relative terms with the national mean as base 100.[10] The pilot density estimate is a standard fixed bandwidth (h) kernel density, computed using a Gaussian kernel with optimal bandwidth, following Silverman's (1986) rule. The results obtained (Figure 3) offer relevant information about the significant changes that have occurred during the period under analysis, showing that the initial situation has not remained stable over time. On the one hand, there is an increase in the

[9] For the Theil index we apply the two measures proposed by Theil (1967) within the information theory context; that is, $T(0)$ and $T(1)$.

[10] As some studies indicate (see, for instance, Ezcurra and Pascual 2006), this is convenient in order to facilitate comparisons and eliminate the effect of absolute changes over time from the analysis.

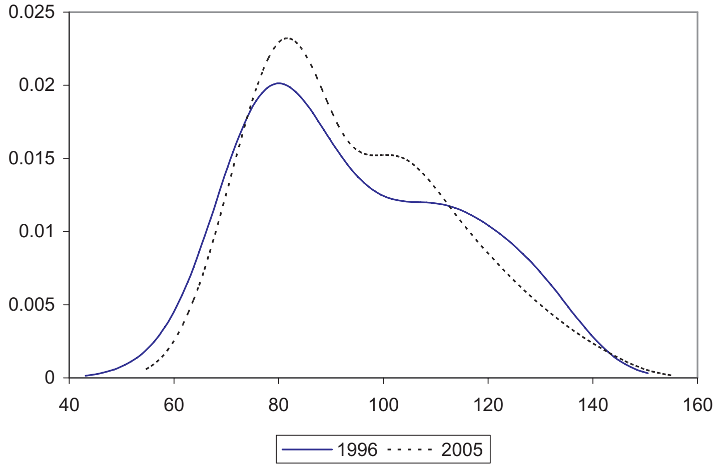


Fig. 3. Density functions (Spain = 100)

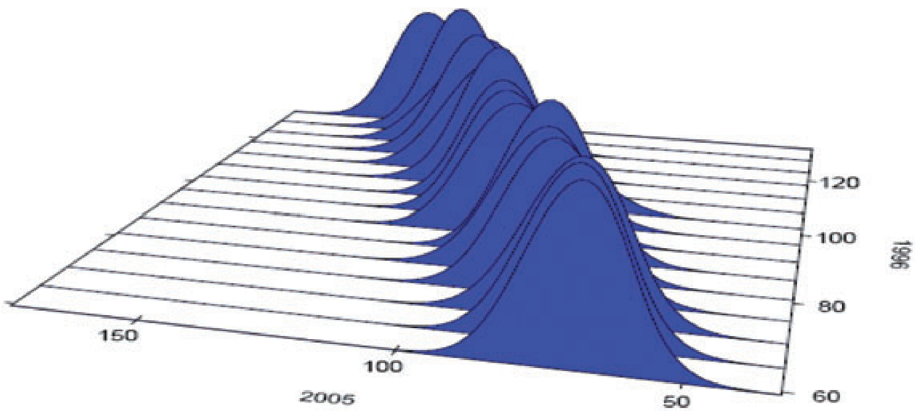
probability mass concentrated around 80% of the Spanish average between 1996 and 2005. On the other hand, the results seem to confirm the aforementioned convergence process in Spain, since there are more provinces concentrating around the mean in the final year than in the initial year of our sample; another sign of convergence in the distribution is the reduction in the ratio of extreme values. Finally, it is worth noting that the peak observed in 1996 for levels much higher than the Spanish average disappears in 2005.

The analysis based on density functions, although offering additional information, neglects one key factor: it does not provide any information about the changes occurring within per capita income distributions analysed. To study intra-distribution dynamics this paper applies an alternative technique to the standard stochastic approach: the estimation of the so-called *stacked density plot* and *highest conditional density region plot* (Hyndman et al. 1996).[11]

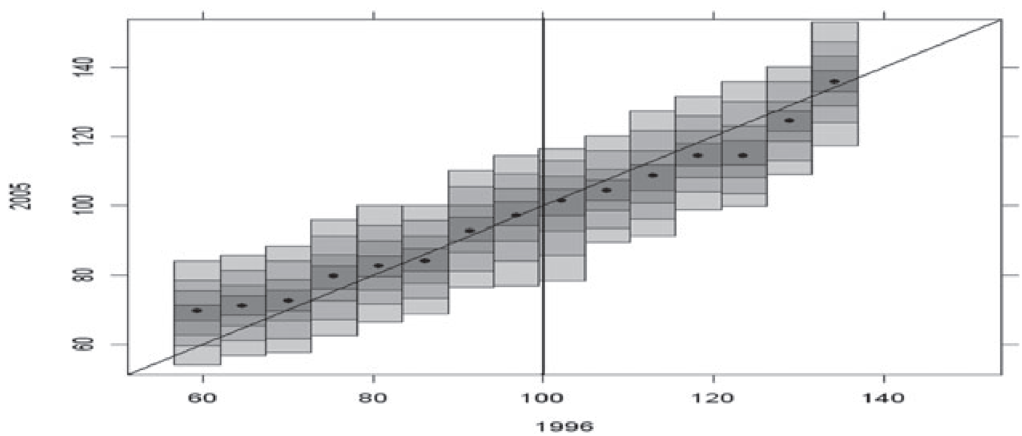
Accordingly, first we estimate a *stacked conditional density plot*. The results are shown in Figure 4a. As we can observe, this figure represents a number of conditional densities side by side in a perspective plot. Thus, this graphical method allows us to see the changes in the shape of the per capita income distribution between 1996 and 2005 for a given per capita income value in the initial year. Therefore, the *stacked conditional density plot* highlights the conditioning between per capita income levels. According to the results, it seems that the Spanish provinces have basically maintained their initial per capita income levels (the peaks of the density functions are aligned); however, an exhaustive examination of Figure 4a allows us to glimpse the existence of some changes in the per capita income distribution.

Nevertheless, a much more informative way to represent, and therefore to perceive, these changes occurring in the per capita income distribution is based on the *highest conditional density region plot* (Figure 4b). A highest density region (HDR) is defined, according to Hyndman et al. (1996), "as the smallest region of the sample space containing a given probability". Thus, each vertical strip in Figure 4b represents the conditional density for a per capita income level in 1996. In particular, this figure shows the highest density regions for a

[11] The main advantage of this technique is that, unlike the standard stochastic kernel approach, it applies two smooth parameters, which, as Arbia et al. (2006) indicate, control the smoothness between conditional densities in the *x* direction (in our case the relative per capita income in 1996) and the smoothness of each conditional density in the *y* direction (the relative per capita income in 2005). In our case, the optimum bandwidths in the two directions are 2.25 and 8.83, respectively.



(a)



(b)

Fig. 4a–4b. Intra-distribution dynamics. Stacked conditional density (a) and highest conditional density (b) plots (Spain = 100)

probability of 25, 50, 75 and 90% (as it passes from a darker to a less dark area). In addition, the figure illustrates, as a bullet (•), the mode (value of per capita income in 2005 where the density function takes on its maximum value) for each conditional density. Thus, the *highest conditional density region plot* allows us to observe that, although the mobility within the distribution has been reduced, the poorest provinces have improved, generally speaking, their income levels; this is quite clear because the first modes of the lower tail of the distribution are above the main diagonal. Furthermore, this analysis shows that provinces with per capita income levels above the average in 1996 have worsened their situation (modes below the diagonal); the richest provinces (last vertical strip) are the only exception to this rule.[12] On the other hand, if we observe the mass of probability (dark areas), we see that the area representing a probability of 25% (and sometimes of 50%) does not cross the diagonal in either the lower or higher extremes of the distribution, showing again the presence of certain mobility

[12] Álava, for example, had a per capita income of 134.2 in 1996 and one of 140.8 in 2005.

that, given its directionality, has favoured the convergence process across the Spanish provinces; as can be noted both ends of the distribution have tended to approach the national average.[13]

3 Foreign-born population and internal migration in Spain: An overview

Following our analysis of convergence in the per capita income distribution across Spanish provinces, the aim of this section is to provide a descriptive overview of recent trends in foreign-born internal migration across the Spanish provinces. This information will be used in the next section, which analyses of the role played by migration in provincial income convergence.

As mentioned in the Introduction, the migration data used in this paper come from the 'Statistics of Residential Variations', published by the INE. This archive consists of official registered migration movements: all changes of municipality of residence submitted each year.[14] Taking advantage of the disaggregated data on internal migration flows (a recent addition to this statistic), in this paper we denote all foreign-born internal movements (of any nationality) registered in the Civil Register as *foreign-born internal migration*. Although the completeness of registered migration data is to some extent questionable,[15] the fact that these data are published annually allows us to capture short-term migration patterns that may elude other official statistics such as census data. For these reasons, the annual statistics on registered migration are used extensively nowadays (Hierro 2007).

However, it should be noted here that throughout the 1990s, international immigration into Southern Europe has been highlighted as the main migration trend in Europe. In fact, one reason that justifies the choice of Spain as a sort of laboratory in this paper is that it has become a focus of major concern since the turn of the millennium: the high demand for low-skilled migrant workers, demographic factors, increasing aspirations of immigrants and the recent immigration policy have positioned Spain as Europe's principal immigration country over the last few years (De Haas 2007).

Most studies addressing this topic in Spain have been concerned with a description of socio-economic and demographic characteristics of established immigrants. Considerably less work has focused on other relevant topics related to immigration, such as spatial redistributions of the foreign-born population. This fact is quite surprising given that, without a doubt, the most relevant change in internal migration patterns in Spain during the last few years is, precisely, the noteworthy part of the foreign-born population in the overall volume of internal migrations (Arango 2002). As can be seen in Table 2, the number of foreign-born internal migrations was 26 times higher in 2005 than in 1996, rising from 15,197 to 401,877. Moreover, it is likely that these data under-estimate the true internal migration flows of foreign-born persons, as many immigrants have no incentives for declaring their residence. In the same period, the number of internal migrations for natives increased by only a factor of two. Thus, there is a clear trend for foreign-born persons to represent an increasing proportion of internal migrations (from 3% in 1996 to 26% in 2005).

[13] With regards to this issue, a close look at the data shows that provinces such as Almería, Badajoz, Vizcaya, Cádiz and Huelva have significantly improved their position, while Guadalajara, Barcelona, La Rioja and Baleares have seen theirs worsen.

[14] As a feature of note, this data source computes migration movements, not migrant persons. Notwithstanding that, it is likely that this fact does not involve serious problems in data due to the lack of incentives among most migrants to register all movements in the Civil Register.

[15] For a detailed discussion of migration statistics in Spain, see Ródenas and Martí (1997, 2007).

Table 2. Internal migration for the native-born and foreign-born populations (1996–2005)

Year	Native-born population		Foreign-born population	
	Movements	Gross rate (‰)	Movements	Gross rate (‰)
1996	558,620	14.0	15,197	30.4
1997	766,269	19.6	28,412	52.4
1998	893,694	22.8	39,529	67.0
1999	955,183	24.4	50,944	80.0
2000	952,458	24.1	79,626	106.3
2001	889,814	22.5	104,801	113.4
2002	1,085,061	27.3	238,866	174.3
2003	1,174,313	29.5	293,590	148.4
2004	1,169,708	29.2	357,738	134.3
2005	1,168,484	29.1	401,877	132.4

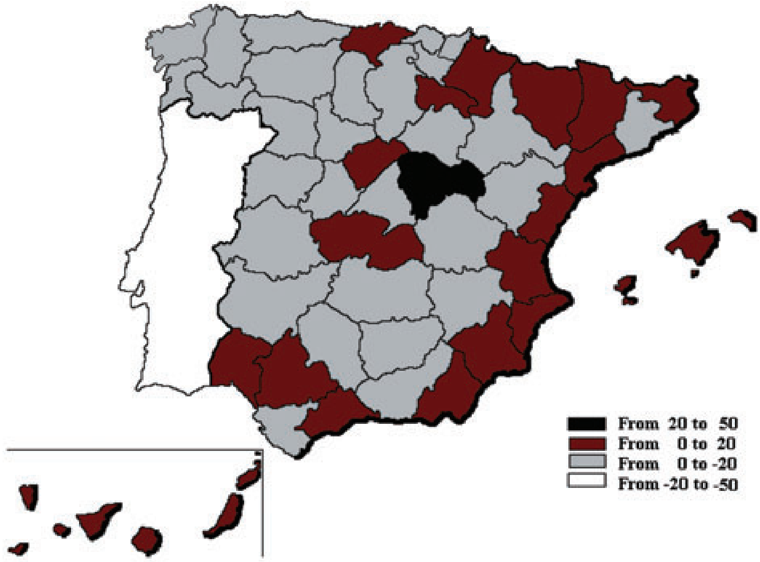
Table 3. Total internal migration for the native-born and foreign-born populations in Spain (annual average 1996–2005)

	Total migration	Inter-provincial migration		Intra-provincial migration	
		number	%	number	%
Native-born population	961,360	361,343	37.6	600,018	62.4
Foreign-born population	161,058	72,458	45.0	88,600	55.0
Total population	1,122,418	433,800	38.6	688,618	61.4

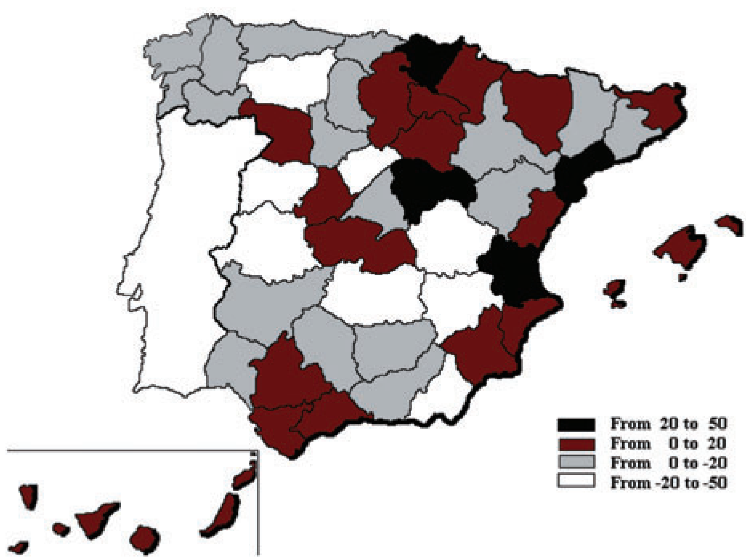
In addition to this growing weight in internal migration, another aspect that, in our opinion, encourages the study of the foreign-born population internal movements is the different mobility behaviour of immigrants relative to that of native-born Spaniards. In fact, this differential behaviour has given rise to a debate about the possibility of foreign-born internal migration being a distortion factor in the current migration trends in Spain. In this respect, the higher mobility rates among foreign-born residents represent a marked distinction. The comparison between the gross internal migration rates[16] for the native-born and foreign-born populations indicates that nowadays the foreign-born population moves 4 times more often than natives (Table 2).

The foreign-born population is also relatively more mobile between provinces.[17] According to data reported in Table 3, from 1996 to 2005, long-distance (inter-provincial) migration represented 45% of the foreign-born internal migration, compared to 37.6% of the native-born internal migration.[18] Among possible explanations for this difference, perhaps the most important is that the economic and non-economic costs of leaving a location (kinship, friendship, job search networks) are lower for foreign-born persons than for natives. As Plane and Bitter (1997) have indicated, personal characteristics decisively affect migration decisions[19] and the foreign-born citizens are less likely to own their homes, with a large portion of them having temporary work contracts in the informal economy (Izquierdo and Carrasco 2005).

[16] This rate was calculated by dividing the number of migrants by the corresponding population for the previous year.
[17] Some comments on the limited labour and firm mobility in Spain can be found in Bande and Karanassou (2009).
[18] This is also noted by Kritz and Gurak (2001) and Newbold (1996) for the United States and Canada.
[19] Hämäläinen (2002) shows that personal characteristics such as, among others, age, age of youngest child, level of education, occupation, etc., significantly affect the decision to migrate.



(a) Native-born population



(b) Foreign-born population

Fig. 5. Provincial net migration rates (‰) (annual average 1996–2005)

Comparing provincial net migration rates reveals different migration patterns between foreign-born and native-born residents (Figure 5a, b). On the whole, the preference patterns of the foreign-born residents seem to be more complex spatially, net migration rates generally being much higher for them than for natives. Consequently, the data in Spain seem to be consistent with studies elsewhere indicating that foreign-born and native-born populations

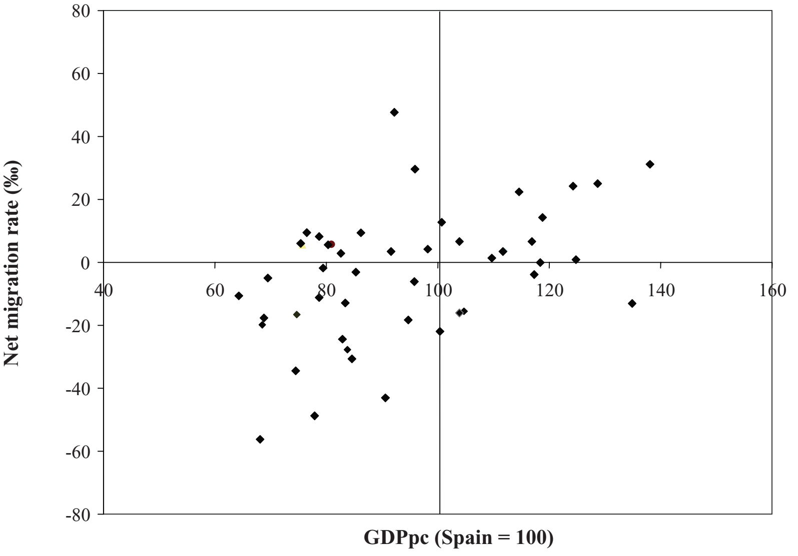


Fig. 6. Provincial net migration rate and GDPpc (annual average 1996–2005)

differ in their migration patterns (Belanger and Rogers 1992; Kritz and Nogle 1994; Nogle 1997; Gurak and Kritz 2000). For instance, Gurak and Kritz (2000) concluded that foreign-born United States residents are less inclined to leave states with high levels of development and economic growth than natives, a result that seems to be confirmed in Spain.

In addition, it is also worth noting that an analysis by province (see again Figure 5a, b) reveals that some high-income Spanish provinces with a negative net migration rate for natives, such as Álava, Guipúzcoa, Vizcaya and Burgos, record a positive net migration rate for the foreign-born population. Provincial distribution of net migration rate of the foreign-born in regards provincial income can be appreciated succinctly by observing Figure 6. For the period 1996–2005, this plot suggests a positive relationship between provincial GDPpc and net migration rate for the foreign-born.[20] In such a way, main receiving provinces of foreign-born movements are usually high-income provinces. One possible explanation for this fact is that foreign-born migrants could be more sensitive to employment opportunities than natives given their lower income levels and the lack of friendship and kinship ties.

Finally, social networks could be an important factor related to foreign-born internal migration. Some international studies have highlighted the importance of social networks in immigrants' initial settlement as well as in foreign-born residents' relocation decisions (Chau 1997). Kritz and Gurak (2001) showed that foreign-born residents in the U.S. are less likely to leave an area where there is a large concentration of immigrants of their nationality.[21] Some studies conclude that a concentration of immigrants of the same nationality is a greater determinant factor for migration than other economic factors, such as the unemployment rate and human capital (see, e.g., Kritz and Nogle 1994); this is especially true as the length of residence

[20] Anyway, although the correlation coefficient between these two series is statistically different from zero, it only reaches a value of 0.45.

[21] However, evidence from the 2000 U.S. Census seems to show that new immigrants are increasingly attracted by job growth rather than social network ties (Frey 2005).

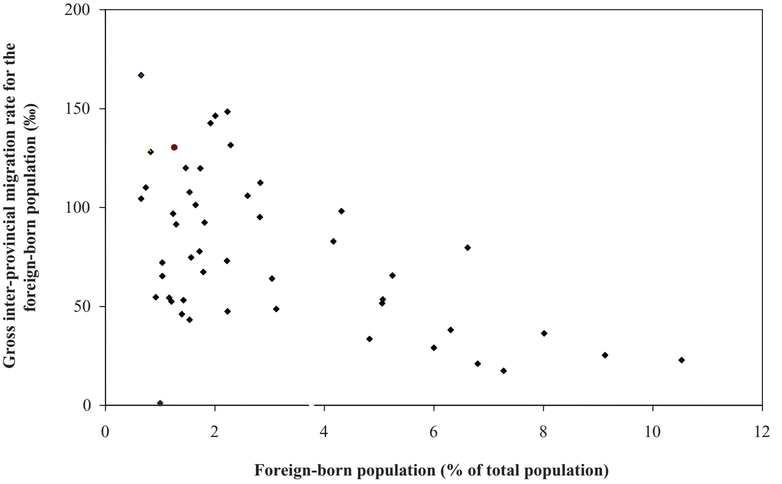


Fig. 7. Social networks in Spain (annual average 1996–2005)

increases (see Nogle 1994).[22] Thus, for the Spanish case, it would be interesting to know whether those Spanish provinces with a higher concentration of immigration show a higher retention of foreign-born populations (which implies the existence of social networks). In order to address this question, Figure 7 illustrates the relationship between the foreign-born population (pecentage of total population) and its gross inter-provincial migration rate in the Spanish provinces. As can be seen, the higher the concentration of immigrants in a province, the less likely the foreign-born population is to leave it. Indeed, the linear correlation coefficient between these two series is negative and statistically significant (–0.58). This finding explains, along with economic factors, the positive net migration rate obtained for the foreign-born population in some high-income Spanish provinces.

4 Convergence and foreign-born internal migration: Some evidence for the Spanish provinces

The aim of this section is to ascertain whether foreign-born internal migration has reinforced income convergence across Spanish provinces during the period studied. To test this hypothesis, first we estimate an absolute β-convergence equation using panel income data. We choose to use panel data because regional (or provincial in our case) convergence measures based on cross-sectional regressions (considering only the initial and final years) ignore whatever may have happened in the interim. Such studies therefore cannot provide any information about the evolution of the distribution.[23]

[22] In addition, related to the question about native-born migratory response to immigration, Kritz and Gurak (2001) suggest that natives in the U.S. are more likely to leave states with high immigration because of "perceived economic and social costs associated with immigration". This finding is supported by Wright et al. (1997) for metropolitan areas in the U.S. Nevertheless, for the Spanish case we believe that it is still somewhat early for this response because the levels of immigrant concentration are not so marked and labour market competition between immigrants and low-skilled native workers is at present not so strong.

[23] As various authors have argued in the economic growth literature (e.g. Islam 1995; Durlauf and Quah 1999; Temple 1999), cross-sectional regressions are largely uninformative since they concentrate exclusively on the behaviour of a representative economy.

Table 4. Several tests for model specification

	Value	Prob.
Chow test	1.20	0.176
Breusch-Pagan Lagrangian multiplier test	3.16	0.075
Breusch-Pagan test for heteroscedasticity	8.68*	0.003

Note: * Significant at 95%.

Thus, the growth rate of per capita income in province i during a period t ($g_{i,t}$) is expressed in terms of per capita income (in logs) during the previous period $t-1$ ($Y_{i,t-1}$) as

$$g_{i,t} = \alpha + \beta Y_{i,t-1} + u_{i,t}. \tag{1}$$

The error component is expressed as a series of disturbances: $u_{i,t} = c_i + v_{i,t}$, where the c_i's represent province-specific effects and the $v_{i,t}$ represent all other effects.

To improve model selection and check for the existence of province-dependent effects (c_i) in equation (1), we performed several tests. Table 4 reports the results of a Chow test (for fixed effects) and the Breusch-Pagan Lagrangian multiplier test (for random effects). The null hypotheses of these two tests (i.e., the absence of fixed and random province effects respectively) cannot be rejected at the 0.05 significance level. Additionally, we computed the fairly general Breusch-Pagan test for heteroscedasticity in order to choose between ordinary and generalised least-squares estimation for equation (1). Table 4 shows that the null hypothesis of homoscedasticity can be rejected at a significance level of 0.05. Thus, according to the results of all tests, estimation of the model is performed by generalized least squares (GLS) but without considering individual province-dependent effects (fixed or random).

The results of this estimation are given in the second column of Table 5. The coefficient β is negative and statistically significant, implying that a convergence process did take place between the Spanish provinces over the period 1996–2005. In addition, this table reports two indicators generally provided in studies of convergence: the speed of convergence[24] and the half-life.[25] The latter represents the number of years necessary to cover half the distance separating Spanish provinces from their steady state, assuming that the current convergence speed is maintained. The convergence is apparently very slow: 2.22% per year, implying a half-life of 27.7 years.[26] It is interesting to note that this speed of convergence is lower than that obtained in previous decades. Villaverde (1999), for example, obtained a convergence speed of 3.1% during the period from 1955 to 1995.

Now that we have obtained evidence for convergence, we can try to assess the effect of foreign-born internal migration on the process. Intuitively, we assume (a) that economic variables have a greater influence on foreign-born migration flows than on native migration flows, and (b) that foreign-born movements contribute little to their destination province's income; in spite of displaying similar self-reported skill levels to those of natives, their economic activities are usually associated with low productivity and low added value (Amuedo-Dorantes and De la Rica 2008). Taken together, these expectations imply that foreign-born internal migration would contribute to convergence at the provincial level.

The previous paragraph is just speculation, of course. In order to confirm our intuition and evaluate the relationship between foreign-born internal migration and provincial convergence in Spain, we need to carry out an analysis of conditional β-convergence. We again estimate

[24] The convergence speed (b) is calculated as $b = -\ln(1 + T\beta)/T$, where T is the number of years in the sample.
[25] The half-life (τ) is calculated as $\tau = -\ln(2)/\ln(1 + \beta)$.
[26] This finding confirms the results obtained in Section 2.

Table 5. Absolute and conditional beta convergence (1996–2005)

	Absolute β–convergence (GLS)	Conditional β–convergence (GLS)	Absolute β–convergence (GLS)	Conditional β–convergence (GLS)	Absolute β–convergence (GMM)	Conditional β–convergence (GMM)
Constant	0.268* (0.042)	0.244* (0.043)	0.297* (0.043)	0.274* (0.044)	0.431* (0.119)	0.365* (0.128)
$Y_{i,t-1}$	–0.025* (0.004)	–0.022* (0.005)	–0.026* (0.004)	–0.024* (0.005)	–0.043* (0.013)	–0.036* (0.013)
$M_{i,t-1}$		–0.004* (0.002)	–	–0.003** (0.002)		–0.002** (0.001)
Ind	–	–	0.015 (0.014)	0.013 (0.014)		
Con	–	–	–0.016* (0.037)	–0.158* (0.037)		
Speed of convergence	2.22	2.01	2.33	2.13	3.60	3.11
Half-life (years)	27.7	31.0	26.2	29.0	15.9	19.0
R^2 adjusted	0.35	0.36	0.37	0.38		
Hansen test					0.397	0.999
First order serial correlation					0.000	0.000
Second order serial correlation					0.271	0.284

Notes: Standard Error in parenthesis; * Significant at 95%; ** Significant at 90%. Results are reported for one-step System GMM with robust standard errors; GMM model is estimated including time-specific effects. Besides the lagged dependent variable, the migration rates are treated as predetermined, and instrumented. The figures reported for Hansen test and Arellano-Bond correlation tests are p-values.

Equation (1), but now include the independent variable $M_{i,t-1}$. This is defined as the net internal migration (immigration – emigration) of foreign-born in each province during period $t-1$, divided by the total population in that province during the previous period:[27]

$$g_{i,t} = a + \beta \log Y_{i,t_{-1}} + \gamma M_{i,t-1} + u_{i,t} \tag{2}$$

The results are reported in the third column of Table 5. The coefficient γ associated with foreign-born internal migration is negative and statistically different from zero. A negative coefficient indicates that a high net foreign-born migration reduces the province's per capita income growth. In addition, note that the annual speed of convergence falls from 2.22 to 2.01% when this variable is considered. In consequence, the paper seems to reveal the role played by foreign-born migration as a reduction of provincial disparities. Notwithstanding, the low value of γ and the slight reduction of convergence speed both seem to indicate that the contribution is relatively low.

In order to check the robustness of the results just discussed, we considered additional control variables to explain the structural differences between Spanish provinces. Specifically, we include the employment shares of industry (ind) and construction (con). As the next two columns of Table 5 show, the results obtained are very similar.

Finally, given the necessity of controlling for the dynamic panel nature of the model and for endogeneity of the regressors, we tried estimating Equations (1) and (2) by the generalized method of moments (GMM).[28] This technique is especially suitable when considering models with predetermined or endogenous regressors based on "small time, large cross-section" panels (Arellano and Bond 1991; Arellano and Bover 1995; Blundell and Bond 1998). Specifically, we estimate a one-step system[29] GMM with robust errors (see last two columns of Table 5). The lagged per capita income and migration rate variables are instrumented with suitable lags of their own first differences; as can be seen, the failure to reject the null hypothesis of the validity of the instruments (Hansen test) indicates that the specification employed is correct. Once again, the results are quite similar, although now the speed of convergence is higher than in our previous estimations. In any case, the GMM model confirms our main conclusion, that is, the weak contribution of foreign-born internal migration rates on income convergence.[30]

5 Concluding remarks

This paper has provided new insights into the nature of the per capita income convergence process across Spanish provinces, paying special attention to the effect of foreign-born internal mobility. To be precise, we have tried to ascertain whether internal migration of foreign-born residents contributes to the reduction of provincial per capita income differences in Spain.

[27] The denominator of this variable is the total population instead of the total foreign-born population because we wish to assess the effect of migration on provincial convergence. Let us consider an illustrative example. A net migration of 500 (the numerator of $M_{i,t-1}$) is much more important economically to a province like Rioja (where the total population is relatively low) than a province like Madrid (where the total population is high). This fact is independent of the total foreign-born populations of the two provinces.

[28] Some papers using GMM models to estimate β-convergence have also employed a transformation of the traditional β-convergence equation in which the current level of output is included as dependent variable (Badinger et al. 2004). Anyway, and in order to facilitate the comparison of the results, we have followed the most common practice in economic growth modelling, maintaining growth income rate as dependent variable.

[29] The first-difference GMM panel data estimator, as Bond et al. (2001) indicated, "does not perform well in the context of empirical growth models".

[30] Estimations by GMM including also control variables are available upon request. The results are again consistent with those obtained previously.

As a starting point, the evolution of provincial disparities for the period 1996–2005 has been examined. In correspondence with conclusions obtained from other studies for earlier periods, our results show that: first, according to the classical analysis of σ-convergence, there is a process of convergence in per capita income levels between the Spanish provinces, although the rate of convergence is found to be quite small; second, the external form of the provincial income distribution has varied significantly over time, with more provinces positioned around the 80% point of the Spanish average in 2005 than in 1996; third, the analysis of the intra-distribution mobility – based on the highest density region approach – demonstrates that, in general terms, the level of mobility within the distribution has been quite low; however, the poorest (richest) provinces have, generally speaking, undergone a weak improvement (worsening) in their situation, promoting the convergence process in Spain.

Among different explanations for the relatively weak process of provincial convergence, this paper has been concerned with the impact of the internal population movement. Although research on this topic points to this contribution having come to a halt since the beginning of the 1980s due to dramatic changes in migration patterns (Raymond and García 1996), there are several reasons that have justified the interest in examining the migration-convergence relationship at the present time, but now focused on the foreign-born internal migration. First, Spain has evolved into one of the world's leading immigration countries. Second, the internal migration patterns of the established immigrants in Spain are quite different from that of natives. Specifically, the main differences are: (1) The gross internal migration rate among the foreign-born is four times higher than among natives; (2) The foreign-born population is relatively more mobile between provinces and, in addition, its provincial net migration rates are higher than that of natives; (3) Foreign-born migrants seem to be more sensitive to employment opportunities than natives given their lower income levels and the lack of friendship and kinship ties. For all these reasons, an examination of whether foreign-born internal migration might be currently introducing certain changes in the null influence internal migration has exerted in income convergence for more than twenty five years does indeed arouse interest.

In order to analyse the causal impact of foreign-born migration on convergence, the paper estimated several variants of the β-convergence equation for panel data covering the whole period from 1996 to 2005. The main conclusions of this analysis are as follows: (1) There is weak convergence in the per capita incomes of Spanish provinces (the speed of convergence is around 2–3%); (2) Foreign-born migration is a significant but weak factor promoting convergence; (3) The first two results are quite robust; they are unchanged by additional control variables and new estimation methods (GMM); and (4) Finally, it seems unlikely that internal foreign-born migrations will play a critical role in per capita income convergence in coming years.

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