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GEOGRAPHY OF TALENT FOR UNDERSTANDING REGIONAL DISPARITIES IN SPAIN

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Abstract: Tentative empirical evidence suggests that the agglomeration of talent contributes to regional development. However, given that talented people are not evenly distributed across regions, this paper seeks to determine the role of talent for furthering our understanding of regional disparities in Spain. Here, we empirically evaluate the effects of the distribution of talent on regional differences by means of a detailed analysis of the 17 Autonomous Communities of Spain between 1996 and 2004. The static and non-spatial panel data models are constructed. The unit of analysis is NUTS2. Our findings confirm that the economic performance indicators point to the significant positive impact of talent on regional economic activity. The concentration of talent plays a crucial role in accounting for regional differences. Based on a preliminary analysis of the dispersion in employment and production figures among the Autonomous Communities, the performance of Spain's outperformers and underperformers is clearly not uniform.

Key Words: *talent, regional differences, panel data, Spain.*

Introduction

Talent is an emerging paradigm at the heart of the debate about economic development and a subject of growing interest among not only economists, economic geographers and regional scientists (Florida 2002a, Mallender and Florida 2007), but also sociologists, and urban planners (Power and Scott 2004, Hartley 2005, Cooke and Lazzeretti 2008, Lazzeretti et al. 2008). Regional development is driven by changes in economic specialization; Karlsson and Johansson (2008) identify talent as the basic driver of such regional specialization and development. Knowledge based economic growth and local development today are found according to Lucas (1988), in association with the productivity gains brought with the „clustering of talented people“. Other authors have similarly highlighted that local development is closely related to the presence of high skilled human capital (Glaeser et al. 1992, Henderson et al. 1995, Capone 2006). Indeed, economists have long stressed the link between the agglomeration of talent and regional development, reporting tentative empirical evidences that the agglomeration of human capital contributes to regional development. Given this association between talent and economic development, and the fact that talent is unevenly spread, it becomes critical to understand the factors that account for its varied geography (Mallender and Florida 2007).

This paper contributes to the literature by investigating the Southern European case study, Spain. It attempts to identify the role of talent for furthering our understanding of regional disparities in Spain. Here, talent is identified as the group of individuals who are highly educated and occupied with strategic sectors, which assumed to be strategic for regional

growth in that they provide economic specialization, including the high-tech sector, knowledge intensive services, real estate, architecture and engineering, R&D, advertising and market research, professional, scientific and technical activities, financial and insurance activities and creative activities. This paper constitutes an empirical evaluation of the impact of talent on regional differentiation by means of a detailed analysis of the 17 Autonomous Communities of Spain between 1996 and 2004. The static, non-spatial panel data models are simply constructed. The unit of analysis is NUTS2.

In the following section, discussions in the literature examining the impact of the concentration of talent on regional development are briefly reviewed. In section 3, first, the geography of talent, the characteristics of the Spanish regions and their levels of development are described. Second, data and research methodology are outlined, while the concentration of economic activity and the spatial distribution of talent in Spain's Autonomous Communities are analysed, the models of talent and regional development are discussed and findings are presented. The last section evaluates and discusses the achieved results.

Theoretical Framework: Talent and Regional Development

Many studies demonstrate that the quality of a region's labour force is a key determinant of that region's economic success (Glaeser 2000, Florida 2002a, Simon and Nardinelli 2002, Petrov 2008). Talent have long been linked to urban and regional growth and their presence considered key components of innovation, is essential for economic development. In this section we provide a brief summary of the voluminous literature on the effects of the concentration of talent on regional development. The literature has two types of talent: human capital and creative class (Qian 2008). As discussed above, highly educated people and employment in selected sectors, deemed strategic for the economic performance of regions in that they provide economic specialization, comprise our measure of talent. This paper examines accordingly the impact of both on regional disparities in Spain.

In recent decades, knowledge based and creative sectors have encouraged economic specialization. Thus, cities specializing in these industries characterized by their rapid productivity growth have undergone faster growth, attracting more college graduates from other regions. Thus, it would seem that knowledge based and creative sectors play an important strategic role in urban and regional economics and development (Karlsson et al. 2009). Talent geographically presents uneven distributions, both across countries and across regions or cities within a specific country (Qian 2008). Talent seems to concentrate in larger urban areas (Lucas 1988, Glaeser 1994). Based on the role of talent in explaining the relationship between inequality and economic growth, various studies have sought to determine whether growth is heterogeneous (Paci and Usai 2001, Castello and Domenech 2002, Ahmed 2009).

Karlsson et al. (2009) note that the critical input to the knowledge economy – the human capital – is strongly concentrated in geographical space, much more so than most other types of economic resources and activities. Thus, they conclude that human capital exhibits strong tendencies to agglomerate in certain locations (Karlsson et al. 2009, Berry and Glaeser 2005), human capital levels are diverging and its concentration is likely to continue to occur in certain regions only (Florida 2002, Berry and Glaeser 2005). Growing interest in the knowledge economy has led to the development of new economic growth models, frequently referred to as the theory of endogenous growth, in which the production of knowledge is endogenously determined, and in which the spillover of knowledge plays a critical role in the growth process (Romer 1986, Lucas 1988). The new growth theory associated with Romer (1990) formally highlights the connection between knowledge, human capital, and economic growth. In the new

endogenous growth models, human capital occupies a central role in spurring growth as knowledge spillovers and human capital externalities aid in delaying the tendency for diminishing returns to capital accumulation (Barro and Sala-i-Martin 2004).

There are strong theoretical arguments, supported by tentative empirical evidence that the agglomeration of human capital contributes to regional development. Human capital theorists (Becker 1964, Glaeser 2005) argue that concentrations of educated people will produce high levels of long-term economic growth. The importance of human capital to regional economic growth has been well documented. For years, human capital had been established by economists as a robust predictor of per capita income levels (Hoyman and Faricy 2008). As mentioned by Qian (2008), Ullman (1958) had noted the importance of human capital in regional development half a century earlier. Eaton and Eckstein (1997) and Black and Henderson (1998) suggested that given spillovers in the accumulation of human capital, workers are more productive when they locate near others with high levels of human capital.

Human capital has been shown to correlate with growth both in the service and knowledge economies (Barro 2001, Black and Lynch 1996, Zucker et al. 1998, Hoyman and Faricy 2008). Barro (1991) provided evidence that human capital or education is a significant contributor to economic growth. Glaeser (1998, 1999 and 2000) provided empirical evidence of the association between human capital or talent and regional economic growth. Glaeser et al. (1995) found a strong relationship between human capital and city growth, showing that cities which begin with more educated populations exhibit higher rates of population growth over time (Florida 2002). Simon and Nardinelli (1996) examined the connection between human capital and city growth in the US and the UK finding that the level of human capital in 1880 predicted city growth in subsequent decades. Simon (1998) and Glendon (1998) found a strong relationship between the average level of human capital and regional employment growth over a considerable time frame (Florida 2002). Barro (1991), Rauch (1991), Glaeser (1994, 1998, 2000), Glaeser et al. (1995), Glendon (1998), Simon (1998) claimed that human capital is a crucial driving force of economic development. Other studies (Florida 2002, Lee et al. 2004, Acs and Armington 2006, Audretsch et al. 2006, Mellander and Florida 2007) show that human capital is associated with innovation or entrepreneurship. It is argued that in addition to the skill level, the creative ability of the labor force (or of the creative class) is an essential component of the endogenous development of urban areas (Anderson 1985, Florida 2002, 2002a).

In short, the consensus in the literature appears to be that talent, a measure of human capital based on educational or occupational levels of attainment, is strongly associated with economic development but that it is a factor that displays an uneven spatial distribution. This paper seeks to add some information to this body of literature by examining the situation in a Southern European case study, namely the country of Spain. It sets out to identify regional differentiation associated with the concentration of talent in Spain's Autonomous Communities.

Spanish Autonomous Communities and Geography of Talent

Spain comprises 52 provinces and 19 Autonomous Communities. The crucial future of these regional communities is that they enjoy different levels of autonomy and, hence, there exists a clear differentiation in their competences at the local level. This makes a consideration of Spain's Autonomous Communities crucial as they may well hold important lessons for reducing regional imbalances. Indeed, many empirical studies have examined the regional inequality phenomenon in Spain, concluding that, despite some improvements, regional differentiation remains a marked phenomenon (Tortosa-Ausina et al. 2005, Pastor et al. 2010, Cuadrado et al. 1998, Villaverde 2001, de la Fuente 2002, Goerlich et al. 2002, Raymond

2002, Lladós 2002). Drawing on earlier findings, we begin this investigation of Spanish Geography by describing the historical evolution in the country's regional differences.

Historical and descriptive perspective

First and foremost, the size distribution of Spanish regions (in terms of their population) is a crucial factor. Thus, we see that its relatively larger regions are not uniform in terms of their economic performance. For instance, the performance of its regions with the highest populations Andalusia, Catalonia and Madrid and those with the highest population growth between 1981 and 2009 the Balearic and Canary Islands, Murcia, Valencia and Madrid, varied greatly in comparison to the Spanish average performance (Table 1 and Fig. 3). Similarly, Tortosa-Ausina et al. (2005) indicate that while Spanish regions are becoming more alike in terms of their productive characteristics, their welfare continues to present major differences in terms of the size of the dependent population (Tortosa-Ausina et al. 2005). They show that the slowdown in population movement has different origins. First, the deterioration in general economic conditions, which has affected all provinces, has led to a reduction in the possibility of finding a job elsewhere. Second, the new democratic political regime generated strong expectations of improvements in living conditions, thereby reducing the perceived need to emigrate. These expectations were fuelled by a rapid intense process of decentralization as provided for under Spain's democratic constitution passed in 1978. Finally, Spain's accession to the European Common Market, finalized in 1986, together with its declared support for territorial cohesion, further contributed to lowering the willingness to migrate because of investments received by the country's poorer regions from the EU's Structural Funds (Tortosa-Ausina et al. 2005).

Parallel to the size of the regions' respective populations, the highest levels of employment are also to be found in Catalonia, Andalusia and Madrid. Castile and Leon, the Balearic and Canary Islands, and Murcia reported the highest rates of employment growth between 1991 and 2008. In 1991, the highest share of industrial labor in the total regional labor force was recorded in the Basque Country, Catalonia, Navarra, Castile and Leon, La Rioja, while in 2009, Navarra, La Rioja, the Basque Country and Catalonia led this ranking. However, between 1991 and 2009, the greatest fall in the share of industrial labor was observed in Asturias, Catalonia, and the Basque Country, while the highest increase was recorded in Navarra and Extremadura. If we consider the spread of service employment, we find that 50% is concentrated in all regions of the country. The figures regarding the employment of selected sectors, both for 1996 and 2005, indicate that the highest share in the total employment by region is observed in Madrid, the Basque Country and Catalonia.

In terms of the highly educated people, Table 1 illustrates that in 1991 Madrid had the most highly educated labor force, while in 2009 the Basque Country had replaced it. According to Prados de la Escosura and Roses (2009), human capital provided a positive, albeit small, contribution to labor productivity growth thereby facilitating technological innovation, while broad capital accumulation and efficiency gains are complementary in Spain's long-term growth. In the period 1850-2000, Spain experienced a major transformation in the general level of qualifications of its labor force, with the proportion of Spanish workers having completed at least their secondary education more than doubling (from 36.4% in 1985 to 78% in 2002) (Prados de la Escosura and Roses 2009). The rise in the proportion of workers holding a university degree and higher went from 15.97% in 1991 to 47.81% in 2009 in the Basque Country, and from 19.39% in 1991 to 40.82% in 2009 for Madrid (Table 1). The number of jobs for the professionally trained levels has also grown very rapidly in the years between 1850 and 2000 (Prados de la Escosura and Roses 2009).

Table 1

The Ranking of the Spanish Regions

Autonomous communities	Population		Number in employment		Employment in industry				Employment in service sector			
	1981	2009	1991	2008	% in total empl. by region 1991	% in total state employment 1991	% in total empl. by region 2009	% in total state employment 2009	% in total empl. by region 1991	% in total state employment 1991	% in total empl. by region 2009	% in total state employment 2009
Andalusia	6429151	8150467	1847343	3149700	14.98	2.22	8.76	1.46	54.52	8.07	68.10	13.36
Aragon	1196430	1313735	408937	611600	26.73	0.88	17.74	0.57	5.79	1.66	62.02	2.01
Asturias	1128986	1058923	332519	451500	26.90	0.72	13.62	0.33	52.32	1.39	66.93	1.60
Balearic Islands	655134	1070066	254541	509800	13.16	0.27	7.63	0.21	65.46	1.33	72.24	1.95
Canary Islands	1364616	2076585	426521	861700	9.60	0.33	5.80	0.26	69.36	2.37	75.20	3.43
Cantabria	512579	576416	164457	260600	23.69	0.31	16.19	0.22	51.74	0.68	64.24	0.89
Castile and Leon	2582043	2510545	499426	1068100	32.10	1.28	16.76	0.95	81.35	3.26	62.32	3.52
Castile La Mancia	1647876	2022647	790638	842900	14.08	0.89	15.93	0.71	28.29	1.79	59.79	2.67
Catalonia	5948177	7290292	2240086	3494600	33.97	6.10	17.89	3.31	50.70	9.10	62.40	11.54
Valencia	3642816	4991789	1244933	2226200	28.28	2.82	15.19	1.79	51.16	5.10	62.83	7.41
Extremadura	1064289	1080439	270166	409300	12.16	0.26	10.29	0.22	50.96	1.10	63.21	1.37
Galicia	2809201	2738930	901421	1200100	17.23	1.24	16.17	1.03	45.01	3.25	62.50	3.97
Madrid	4679696	6295011	1777594	3064400	0.00	0.00	9.19	1.49	-	-	77.47	12.57
Murcia	953852	1443383	316654	627600	21.61	0.55	12.06	0.40	52.11	1.32	60.26	2.00
Navarra	508679	614526	182660	289400	32.20	0.47	26.74	0.41	47.84	0.70	55.81	0.86
Basque Country	2139860	2136061	701139	995300	35.89	1.96	21.48	1.13	51.92	2.92	63.35	3.34
Rioja	254201	315718	91576	146700	31.81	0.23	23.79	0.18	46.22	0.34	57.12	0.44
Ceuta and Mellila	118615	142637	31192	48100	4.64	0.01	3.53	0.01	85.17	0.21	89.19	0.23

Table 1

The Ranking of the Spanish Regions

Autonomous communities	GDP per capita			TALENT ^{*)}					
				Employment in selected sectors (ES)				Employment with university degree or higher	
	1996 - euro	2007 - euro	% change	ES by region / total employment by region		ES by region / total talent in Spain		% in total employment by region	% in total employment by region
				1996	2005	1996	2005	1991	2009
Andalusia	8943	18298	104.60	10.51	12.72	7.36	9.47	12.73	28.84
Aragon	12973	25749	98.49	17.68	17.86	5.07	4.75	13.84	33.60
Asturias	10383	21664	108.65	12.54	14.44	1.76	1.86	13.71	36.48
Balearic Islands	14603	25777	76.51	10.62	12.77	1.59	1.76	10.45	23.58
Canary Islands	11593	20949	81.55	11.33	16.59	0.83	3.46	13.76	27.41
Cantabria	11030	23679	114.69	13.50	13.35	0.45	0.33	12.80	37.38
Castile and Leon	11376	22698	99.53	11.49	12.43	3.32	3.33	9.35	34.35
Castile La Mancha	9872	18402	86.40	8.32	10.04	1.86	2.51	13.69	27.09
Catalonia	14776	27840	88.42	21.82	21.66	32.42	26.56	12.37	32.53
Valencia	11431	21567	88.67	12.35	14.61	4.30	10.96	11.44	28.24
Extremadura	7666	16198	111.31	6.61	9.70	0.55	0.70	11.72	26.61
Galicia	9673	19865	105.36	10.98	11.74	3.08	4.44	9.41	33.40
Madrid	15745	30863	96.02	24.67	25.47	26.84	20.41	19.39	40.82
Murcia	9934	19707	98.38	9.44	10.96	1.47	1.79	11.48	26.59
Navarra	15255	29744	94.98	18.58	18.26	1.79	1.52	15.02	38.87
Basque Country	14221	30650	115.52	22.59	22.04	6.71	5.70	15.97	47.81
Rioja	13682	25262	84.64	10.06	11.61	0.54	0.43	11.83	37.70
Ceuta and Melilla	10100	21583	113.69	-	-	-	-	17.15	32.85

*) Employment in selected sectors from SABI database (data not available for Ceuta and Melilla)
Employment with university degree or higher from IVIE database.

Source: INE (separate data are not available for Ceuta and Melilla, hence use of aggregated data).

The empirical literature examining inequality has mainly focused primarily on the convergence of economic factors, principally per capita income. The studies reviewed, as well as the authors' own study, point to convergence in per capita income among Spanish regions (Pastor et al. 2010). Similar findings are reported by Cuadrado et al. (1998), Villaverde (2001), de la Fuente (2002), Goerlich et al. (2002), Raymond (2002), Lladós (2002), although signs of stagnation in this convergence, and even divergence, have been detected since the mid-1990s, as well as the existence of "clubs" of regions. Marchante and Ortega (2006) analyzed the 1980–2001 period and found that disparities in regional GDP per capita remained constant. According to Pastor et al. (2010), in 1961 two regions recorded higher per capita income levels than Madrid (namely Catalonia and the Basque Country), while in 2001 Madrid led the ranking (Pastor et al. 2010). In 2007, Madrid was still the leader in terms of per capita income. In Maza and Villaverde's study (2009), provinces are reported as tending to form clusters with similar levels of income per inhabitant with the north eastern part of Spain being the most developed area and the south and north-west of the country being least developed. These authors highlighted the fact that there is a territorial imbalances in relative per capita income in Spain's provinces and that provinces with per capita income levels above (below) the national average tend to cluster (Maza and Villaverde 2009). For the 1961-1981 period, Leonida and Montolio (2001) highlighted the fact that the rich provinces had lost positions in the distribution of income, but that they still created a separate mode (showing *persistence*), indicating that there were few rich regions in Spain in that period. In the period 1991 to 1997 there began a process of polarization of income level. The provinces were grouped in two income levels: below and above average, indicative of this process of income divergence and polarization. The latter provinces were found to be located, primarily, in the north of Spain, as north-south divide became apparent during the nineties (Leonida and Montolio 2001).

In addition to providing information about regional differences in Spain, Figure 1 illustrates the geographical distribution of income among the Autonomous Communities. Indeed, even taking into consideration developments in terms of regional income, the north-south pattern regional inequalities seems to be persistent with the leading communities of Catalonia, Madrid, Navarra and Basque Country remaining dominant. This phenomenon is similarly associated with the rise in the overall development of the communities, which is apparent from the figures recorded in Table 1.

In 1961, the per capita incomes of Andalusia, the Canary Islands, Castile and León, Castile La Mancha, Extremadura, Galicia and Murcia were half that of Madrid or lower (Pastor et al. 2010). In 1996, Extremadura's GDP per capita was still half of that Madrid's (see Table 1). In 2007, the Basque Country had caught up somewhat with Madrid in terms of GDP per capita but Madrid still led the ranking. These two Autonomous Communities were followed by Navarra and Catalonia. Extremadura, Andalusia, Castile La Mancha, Murcia and Galicia still had the lowest GDPs per capita despite some changes in the ranking and Extremadura's GDP per capita was still approximately half that of Madrid's in 2007. However, between 1996 and 2007, GDP per capita more than doubled for most of the regions, especially in the case of the less developed Autonomous Communities. And yet despite the changes in the regional rankings, the developed and less developed Autonomous Communities remained in the same clusters from 1996 to 2007, with the northern regions making obvious progress in terms of economic development (Table 1).

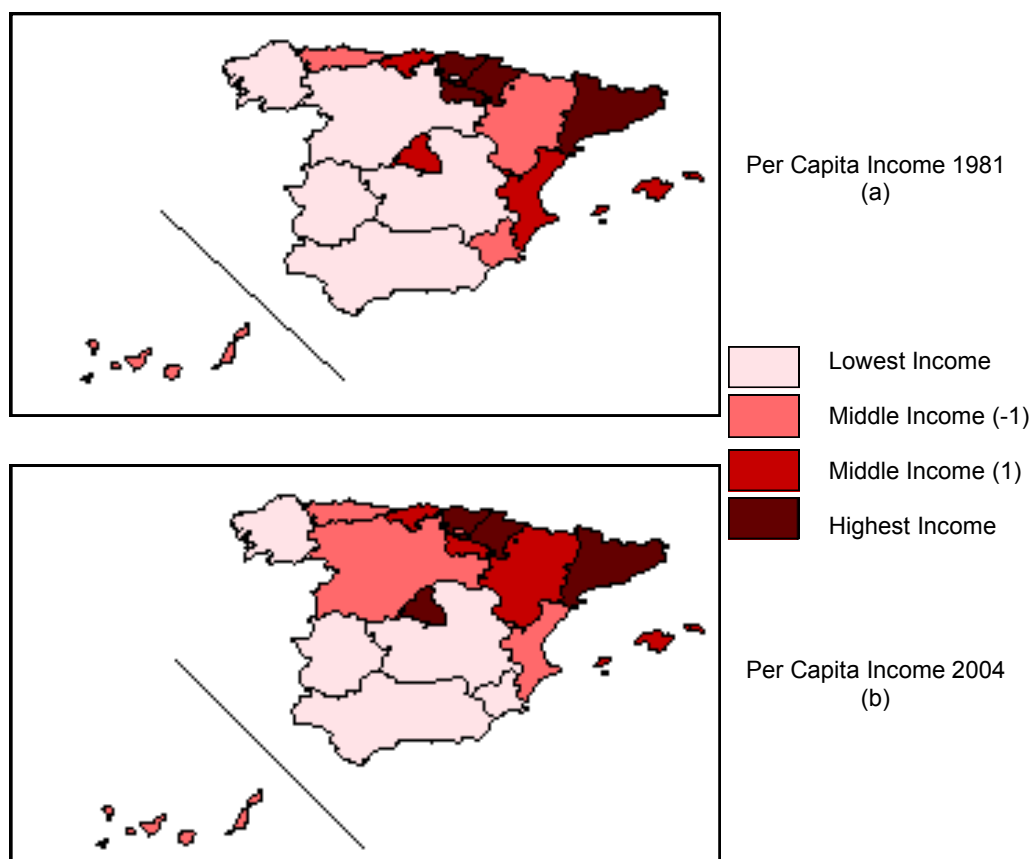


Fig. 1 - Income Dispersion in Spain (*). Source: INE
 (*) Due to data concerns Ceuta and Melilla are not included
 (a) In constant prices (Pesetas)
 (b) In constant prices (Euros)

An examination of the contemporary developments in the economic performances of the Autonomous Communities should broaden the perspective on these earlier figures. In the last decade, we can analyze the Autonomous Communities' performance by looking at the industry and service sectors' value added as well as at overall employment levels (relative economic activity level)¹. Table 2 shows the percentage of working population, and the industrial and service oriented production for in Spanish regions². Taking the Spanish average as 1.00 for each year, we compute the performance of each community with respect to this average³. This performance also contains information about the concentration of economic activity in Spain.

1) See appendix for the geographical dispersion of industrial and service oriented production in Spain.

2) Ceuta and Melilla are not included because of concerns about the data. As the empirical model is constructed for the 1996- 2004 period, the concentration is also plotted for this same time span.

3) See appendix for the path taken by the index from 1996 to 2004

Although a comparison of such an index over time provides little information about convergence, it nevertheless contains valuable information about the relative position of the regions' economic performances. Overall, the north-south pattern is reflected in the computed index. The dominant Autonomous Communities in the north of Spain still lead the economy. However, a number of interesting findings emerge. Notably, the Balearic and Canary Islands, while presenting figures that are well below the Spanish average for employment and industrial

Table 2

Economic Activity of Spain's Autonomous Communities

	Working population (% of total)		Industrial production (per capita VA)		Service oriented production (per capita VA)	
	1996	2004	1996	2004	1996	2004
Andalucía	0.47	0.54	0.55	0.6	0.79	0.84
Aragón	1.3	1.4	1.19	1.16	1.03	1.05
Asturias	0.91	0.94	1.05	1.01	0.83	0.86
Balears (Illes)	0.56	0.47	0.68	0.56	1.53	1.26
Canarias	0.39	0.35	0.53	0.56	1.17	1.09
Cantabria	0.99	1.03	0.94	1.03	0.93	0.98
Castilla - La Mancha	0.93	1.02	0.96	1.05	0.88	0.93
Castilla y León	0.89	0.97	0.8	0.8	0.74	0.77
Cataluña	1.67	1.51	1.5	1.34	1.19	1.13
Com. Valenciana	1.31	1.22	0.99	0.97	0.94	0.93
Extremadura	0.35	0.46	0.51	0.55	0.66	0.74
Galicia	0.81	0.97	0.81	0.88	0.77	0.82
Madrid	0.92	0.75	1.13	0.99	1.54	1.55
Murcia	0.91	0.98	0.78	0.77	0.82	0.82
Navarra	1.83	2.06	1.73	1.73	1.11	1.09
País Vasco	1.52	1.8	1.5	1.67	1.1	1.2
Rioja (La)	1.67	1.78	1.34	1.33	0.97	0.94

Source: INE, authors' own calculations
 (*) Spain Average = 1.00

production, enjoy relatively high service oriented production. Moreover, Extremadura, despite some improvements, continues to be the least developed region in the country. An alternative way of examining the picture is to focus on the path taken by this index among the developed and developing regions of Spain. Here, the information contained in Table 2 is complemented by Figures 3, 4 and 5 in the appendix. What is apparent is that no one uniform path has been taken by the leading and lagging communities. For instance, Navarra and the Basque Country, as leading communities in terms of employment and industrial production, seem to deviate from the mean and to have increased their relative standings. Meanwhile, communities such as Catalonia and Valencia have moved towards the Spanish average. Overall, we believe these figures increase concerns about the reasons underlying regional differences in Spain.

By taking the ratios for the whole of Spain, both in 1991 and in 2009, Catalonia stood out as a leader in terms of industrial employment and activities, while Madrid, Catalonia and Andalusia had the largest share of service employment. Meanwhile, in both 1996 and 2005, Catalonia and Madrid were ranked first in terms of employment in the strategic sectors selected for this study (Table 1).

If we look just at the developed regions, Catalonia is ranked second and Madrid third in terms of population while Madrid has the largest service sector labor force followed by Catalonia. The proportion of highly educated people in total employment rose in Madrid from 19.30% in 1991 to 40.82% in 2009, in the Basque Country from 15.97% in 1991 to 47.81% in 2009, in Navarra from 15.02% in 1991 to 38.87% in 2009, and in Catalonia from 12.37% in 1991 to 32.53% in 2009. Catalonia is the country leader in terms of total employment, industrial employment and employment in the strategic sectors selected for this study.

According to the occupational indicator of talent- employment in the strategic sectors selected for this study-, Catalonia, Madrid, the Basque Country and Navarra make up the first cluster in both 1996 and 2004. According to the educational indicator of talent-employment with university degree or higher-Catalonia, Madrid, the Basque Country and Aragon make up the first cluster in 1996, while in 2004 Catalonia, Madrid, the Basque Country and Navarra comprise this first cluster (Figure 2). In 2004, Catalonia, Madrid, the Basque Country and Navarra occupy the first cluster (*highest income*) in terms of income per capita (Fig.1). Some differences can be observed between the trends in the dispersion of income and talent. Andalusia, Valencia and Murcia mark a sharp break in income and talent between the North and South of Spain. Castile La Mancha and Murcia both lost positions, while Andalusia gained positions from 1996 to 2004 in terms of both educational and occupational attainment. However, there was a trend towards the concentration of activity in a few regions with a similar concentration of income during the period.

An empirical research

According to literature, both market factors (including the wage level, wage change, jobs, employment change, economic and financial opportunities etc.) and non-market factors (including cultural, natural, service amenities, openness, quality of life indicators etc.) may affect the geography of talent (Qian 2008). This research is interested in the market factors. Our talent definition contains two separate indicators that presents occupational and educational assessments: highly educated people and employment in selected sectors, including the high-tech sector, knowledge intensive services, real estate, architecture and engineering, R&D, advertising and market research, professional, scientific and technical activities, financial and insurance activities and creative activities, which assumed to be strategic for regional growth in that they provide economic specialization. Our occupational

indicator is measured as the percentage of employment in the selected sectors, while our education indicator is measured as the percentage of employment with a bachelor's degree or higher. In addition, we include two control variables: the percentage of employment in manufacturing industries and the percentage in service industries (Table 3).

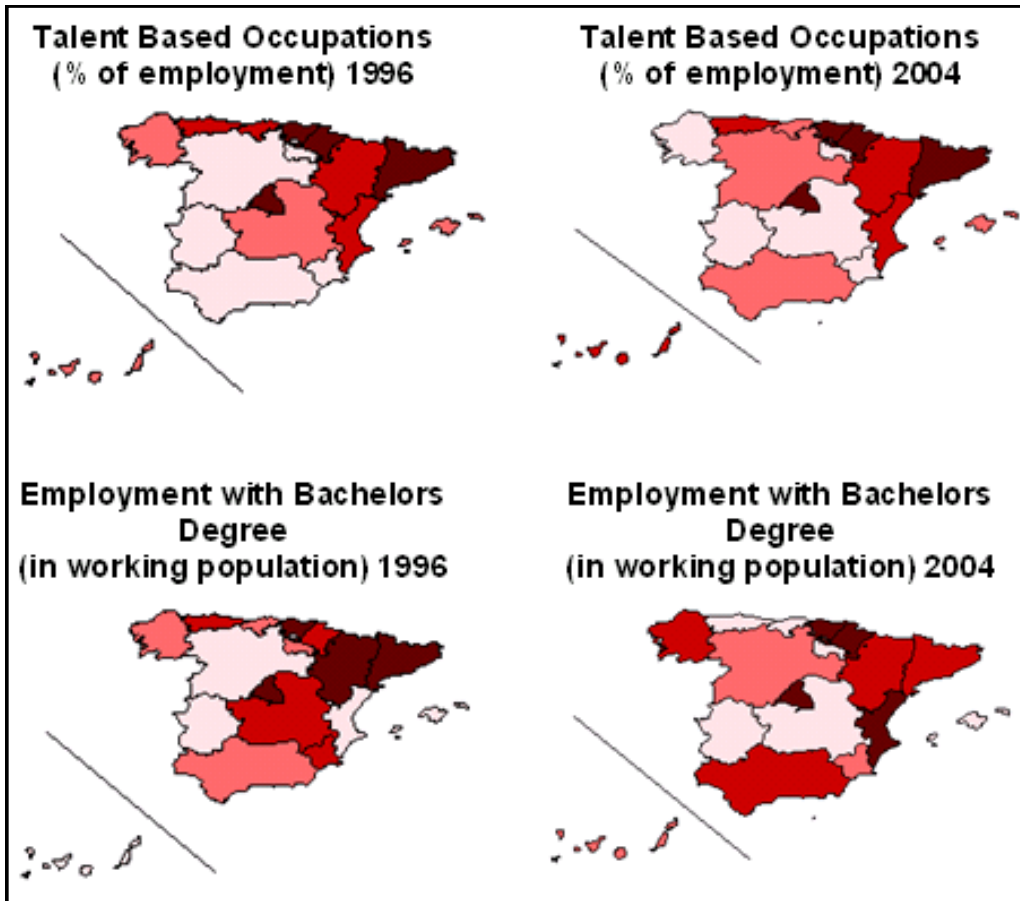


Fig. 2 - Spatial Distribution of Talent in Spain
Source: SABI. IVIE

Table 3

Description of the Variables		
Variable	Measure	Source
<u>Independent</u>		
Talent components		
Employment in selected sectors -talent based (occupational attainment)	Percentage of employment in the selected sectors*, in total employment by Autonomous Communities of Spain from 1996 to 2004 (the data are not available for Ceuta and Melilla)	„Sistema Anual de Balances Ibéricos“ (SABI) database*
Employment with university degree or higher-human capital (educational attainment)	Percentage of employment with a bachelor's degree and higher in total employment by Autonomous Communities of Spain from 1996 to 2004	Instituto Valenciano de Investigaciones Económicas (IVIE)
Explanatory/ Controls		
Manufacture based employment	Percentage of manufacture employment in total employment by Autonomous Communities of Spain from 1996 to 2004	Instituto Nacional de Estadística (INE)
Service based employment	Percentage of service sector employment in total employment by Autonomous Communities of Spain from 1996 to 2004	Instituto Nacional de Estadística (INE)
<u>Dependent</u>		
GDP per capita	Per capita income (GDP) per year by Autonomous Communities of Spain from 1996 to 2004	Instituto Nacional de Estadística (INE)
Industrial VA	Per Capita Industry Value Added per year by Autonomous Communities of Spain from 1996 to 2004	Instituto Nacional de Estadística (INE)
Service VA	Per Capita Service sector Value Added per year by Autonomous Communities of Spain from 1996 to 2004	Instituto Nacional de Estadística(INE)

* Data classified at four-4 digit level for selected occupations, represent talent indicator and, are only available from the SABI database. Given data availability for all variables selected, data can be collected from 1996 to 2004. Panel data models are constructed for 9 year period only.

The theoretical debate summarized in section 2 can be simply formalized as Equation 1.

$$[1] y = f(HK, T, IM)$$

Regional differences can be measured using three different indicators. Thus, while; per capita GDP shows the overall development made by the Autonomous Communities, industry and service oriented production value added figures (both in per capita terms) control for the differences in the production structures of the communities. If we examine the different factors affecting regional differences on the one hand, our focus will be on *HK* and *T* which represent the highly educated people (educational attainment) and employment in selected sectors-talent based (occupational attainment) levels, respectively. Based on those variables, static, non-spatial panel data models are simply constructed.

We expect these two indicators to positively affect the development of the Autonomous Communities in Spain. Although there are other region specific factors influencing these differences, we chose to include only the industry mix (*IM*) of the communities as a control for labor demand⁴.

In using Spanish data at the level of the Autonomous Communities for the period 1996-2004, we favored a number of different panel data models⁵. As discussed above, Ceuta and Melilla are not included in the analysis for reasons of data availability and so, the number of cross sections is 17. Thus, our data are taken from three separate Spanish sources: INE, SABI and IVIE.

Equation 2 is a static, non-spatial panel data model, where *y* represents the three indicators used to evaluate regional differences: GDP (per capita), industrial production (per capita value added), and services oriented production (per capita value added), respectively. *X* represents the relevant talent indicator and *Q* is the share of manufacturing and service based employment used to control for the industry mix of the autonomous communities⁶. As discussed by Baltagi (2005), the one way error model is represented in Equation 1, where v_i is the individual specific error and $u_{i,t}$ is a remaining independent identically distributed error. Here the central discussion is related to the individual specific effect v_i . In the case of a fixed effect model (FE), it is by construction a fixed parameter and will be correlated with the explanatory variables. In such a case, Baltagi (2005) proposes that the within transformation, also labelled the fixed effect transformation, is the right procedure. However, if one assumes that the individual specific effect is random and it cannot be correlated with the other exogenous variables, then use of an efficient GLS estimator will be more accurate. While the random effect (RE) estimator is also efficient. It may suffer from the consistency problem. Hence, it will be more informative to verify the consistency of the estimator by using a typical Hausman test (1978)⁷.

$$[2] Y_{i,t} = \alpha + \beta X_{i,t} + \delta Q_{i,t} + v_i + u_{i,t}$$

4) See Marlet and van Woerkens (2007).

5) The time span of the research is determined by the occupational assessment .

6) While a number of different social and economic indicators may be preferred, we limit the number of variables to avoid specification biases that might arise due to the relatively low number of observations. As an independent variable, we do not include employment; rather we prefer to observe GDP per capita.

7) Note that this test is not designed to compare the two models; rather it is implemented to decide between two estimators of the same model.

Table 4

Role of Talent in Dispersion of Industrial Production

	Model I		Model II		Model III	
	FE	RE	FE	RE	FE	RE
Talent Based	0.046*	0.046*	0.017*	0.019*	0.018*	0.016*
Occupations (%emp.)	(0.005)	(0.005)	(0.006)	(0.005)	(0.003)	(0.002)
Employment with	-	-	4.403*	4.255	1.164	1.315*
University Degree (% emp.)	-	-	(0.579)	(0.571)	(0.407)	(0.396)
Employment in	-	-	-	-	9.496*	9.072*
Manufacturing (% of emp.)	-	-	-	-	(0.806)	(0.581)
Employment in	-	-	-	-	0.642*	0.676*
Services (% of emp.)	-	-	-	-	(0.201)	(0.172)
# of observations	153	153	153	153	136	136
F-Wald Test	82.63	421.94	93.02	192.35	233.46	1044.42
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hausman Test		0.14		3.61		3.64
(p-value)		(0.71)		(0.16)		(0.46)

* ** *** represents significance at 1%, 5% and 10% respectively. Robust standard errors for coefficient estimates are in ()

Table 5

Role of Talent in Dispersion of Service Oriented Production

	Model I		Model II		Model III	
	FE	RE	FE	RE	FE	RE
Talent Based	0.030*	0.031*	0.005	0.010*	0.004	0.007**
Occupations (% emp.)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Employment with	-	-	3.721*	3.314*	1.039**	-0.281
University Degree (% emp.)	-	-	(0.458)	(0.456)	(0.428)	(0.426)
Employment in	-	-	-	-	6.088*	1.401*
Manufacturing (% of emp.)	-	-	-	-	(0.774)	(0.339)
Employment in	-	-	-	-	0.789*	1.911*
Services (% of emp.)	-	-	-	-	(0.217)	(0.175)
# of observations	153	153	153	153	153	153
F-Wald Test	37.91	3954.26	74.96	152.93	127.77	38427.53
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hausman Test		0.07		4.56		113.07
(p-value)		(0.79)		(0.10)		(0.00)

* ** *** represents significance at 1% 5% and 10% respectively. Robust standard errors for coefficient estimates are in ()

Table 6

Role of Talent in Dispersion of per capita GDP

	Model I		Model II		Model III	
	FE	RE	FE	RE	FE	RE
Talent Based	1.275*	0.883*	0.563*	0.475*	0.144*	0.415*
Occupations (% emp.)	(0.104)	(0.069)	(0.099)	(0.091)	(0.044)	(0.090)
Employment with			0.791	0.695*	0.099**	0.580*
University Degree (% emp.)	-	-	(0.080)	(0.087)	(0.038)	(0.082)
Employment in					0.769*	-0.176***
Manufacturing (% of emp.)	-	-	-	-	(0.088)	(0.096)
Employment in					0.726*	0.440*
Services (% of emp.)	-	-	-	-	(0.062)	(0.098)
# of observations	153	153	153	153	153	153
F-Wald Test	149.79	6747.77	221.54	9284.25	550.22	2980.34
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Hausman Test		25.39		2.12		769.20
(p-value)		(0.00)		(0.35)		(0.00)

* ** *** represents significance at 1% 5% and 10% respectively. Robust standard errors for coefficient estimates are in ()

Estimation findings are given in Tables 4 to 6. In general, the results reported for the economic performance indicators signal the significant positive impact of talent on regional economic activity. This is in line with theoretical expectations. The concentration of talent based occupation in employment plays a crucial role in understanding regional differences. On another note, the impact of highly educated employment is also crucial for each economic activity. However, when the share of services in overall employment is included, the effect is observed to be negligible for the differences between service oriented production.

We believe relatively well educated service sector employment already captures the indirect effect of educated employment on these two specific economic activity indicators. However, additional results reported for the differentiation of service sector value added as well as for regional GDP show that highly educated employment has a significant impact even when the share of the service sector employment is included.

Discussion

The concentration of talent and related social and economic properties of locations have been examined from distinct theoretical points of view. While different channels can be defined, in the end a common expectation postulates that talent is unevenly distributed among regions and that this unequal distribution creates differences in the economic performances of these locations. From these general arguments, this study has focused on Spain's 17 Autonomous Communities and validates the fact that talent is unevenly distributed among the regions. This uneven distribution has a marked impact on differences in the economic activity levels, measured in terms of industry and service value added as well as in terms of regional GDP (all in per capita terms).

We find that the economic performance indicators point to the significant positive impact of talent on regional economic activity. The concentration of employment in certain sectors plays

a crucial role in accounting for regional differences, while the impact of highly educated employment is also crucial for economic activity. Based on a preliminary analysis of the dispersion in employment and production figures among the Autonomous Communities, the performance of Spain's outperformers and underperformers is clearly not uniform. This picture validates our decision to focus on the roots of this differentiation. In line with the central thesis of this paper, an evaluation of how talented people locate across the country should provide valuable information. Thus, not only the specific impact of human capital accumulation on regional differences but also the innovative and creative role of employment can be understood by examining this dispersion.

We believe our results can be considered important from a number of different perspectives. First, the spatial dispersion of the talent base and of the economic activity indicators present identical geographically patterns. Second, the dispersion in talent based employment follows a trend towards a more equal distribution. However, an improvement in the distribution of employment among those holding a university degree cannot be detected. Finally, our panel data results reveal the overall connection between the talent bases and the economic performance of regions, providing clear evidence that talent is a vital element in accounting for regional differences. From this perspective, it would not be naive to propose that the promotion of talent based occupations (and/or jobs) and educational attainment in a region will have both direct and indirect consequences on regional development.

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APPENDIX
(Fig. 3, 4, 5, 6)

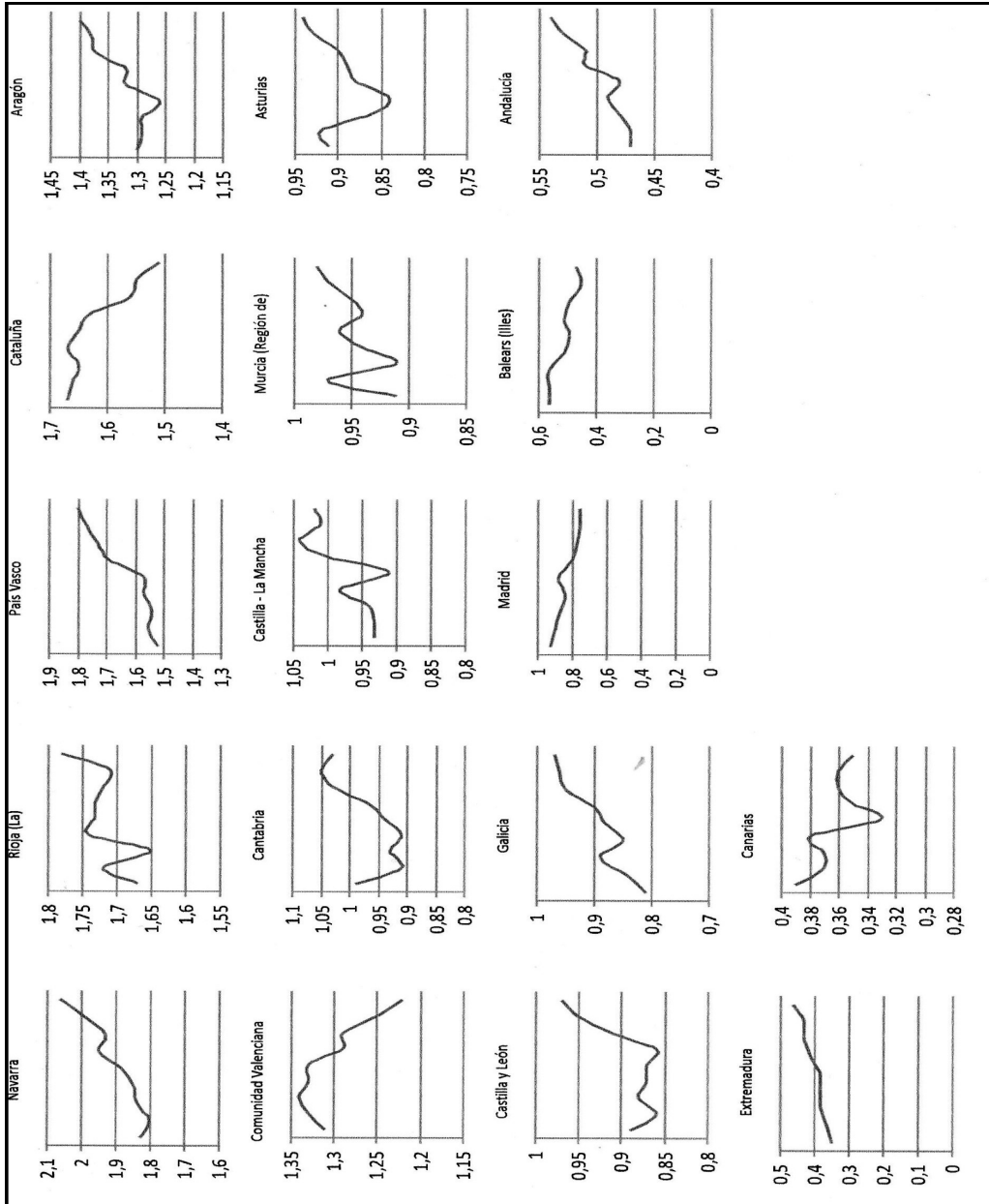


Fig. 3 - Performance of Autonomous Communities - Working Population from 1996 to 2004 (% of total Population) Spain Average=1.00

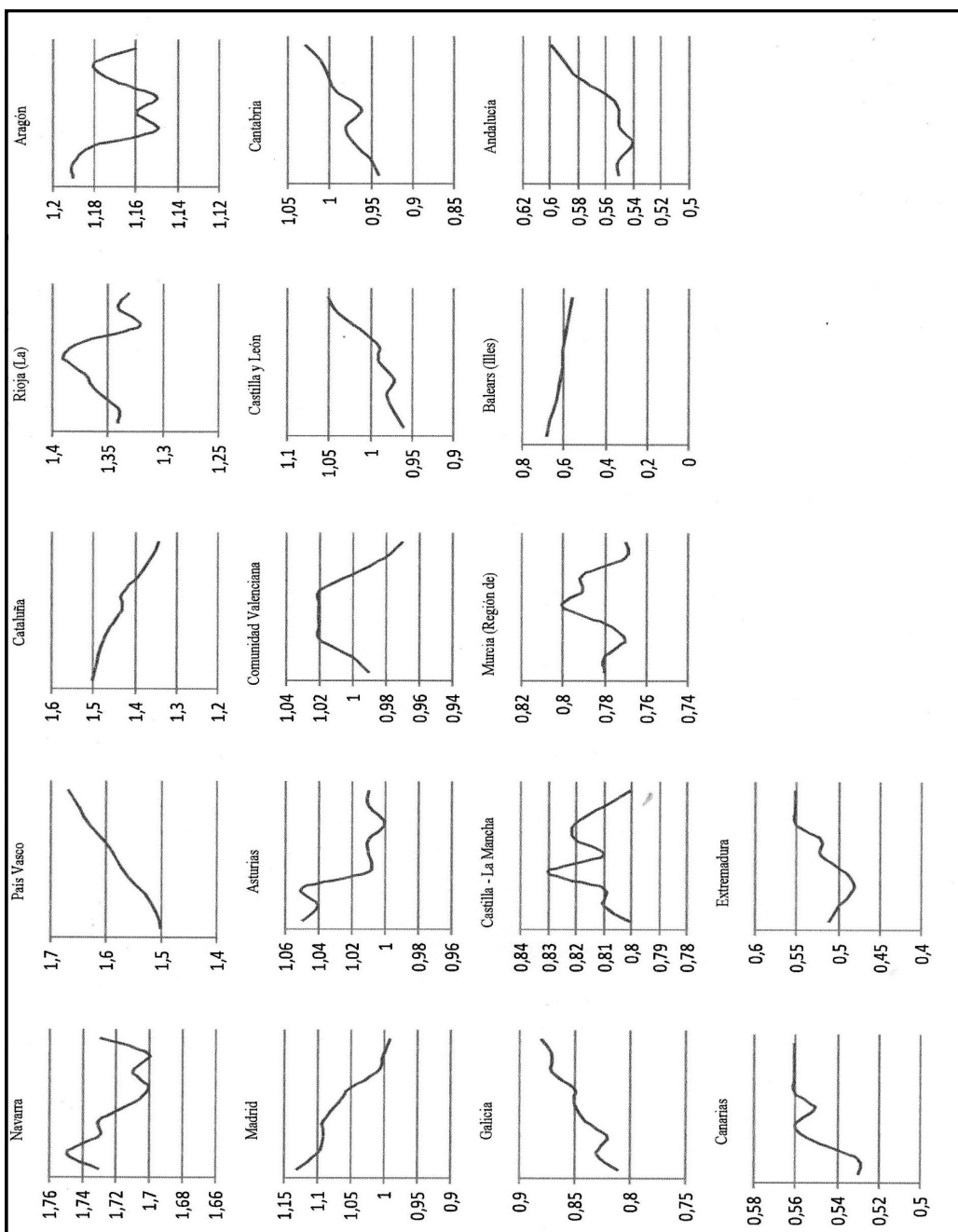


Fig. 4 - Performance of Autonomous Communities Industrial Production from 1996 to 2004 (Per capita VA) Spain Average=1.00

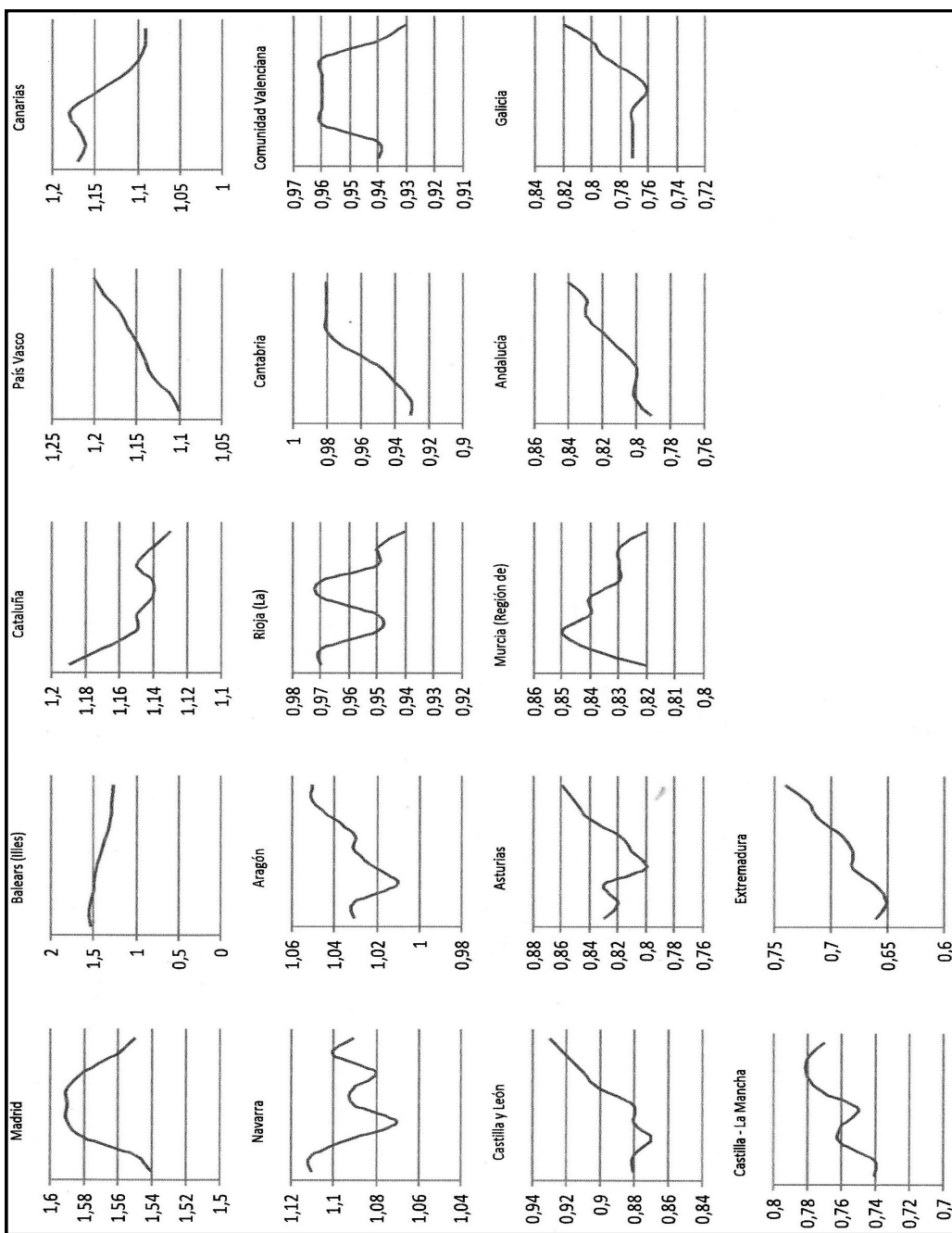


Fig. 5 - Performance of Autonomous Communities Service Related Production from 1996 to 2004 (Per capita VA) Spain Average=1.00

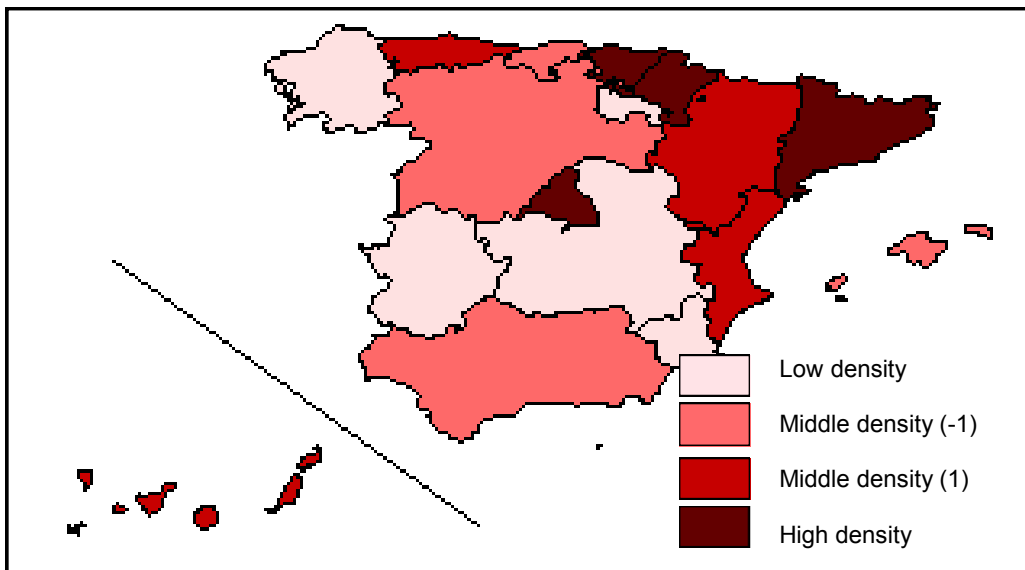


Fig. 6 a - Relationship between Talent and Regional Differentiation in Spain (2004)
Talent Based Occupations (% of employment)
Source: INE, IVIE, SABI

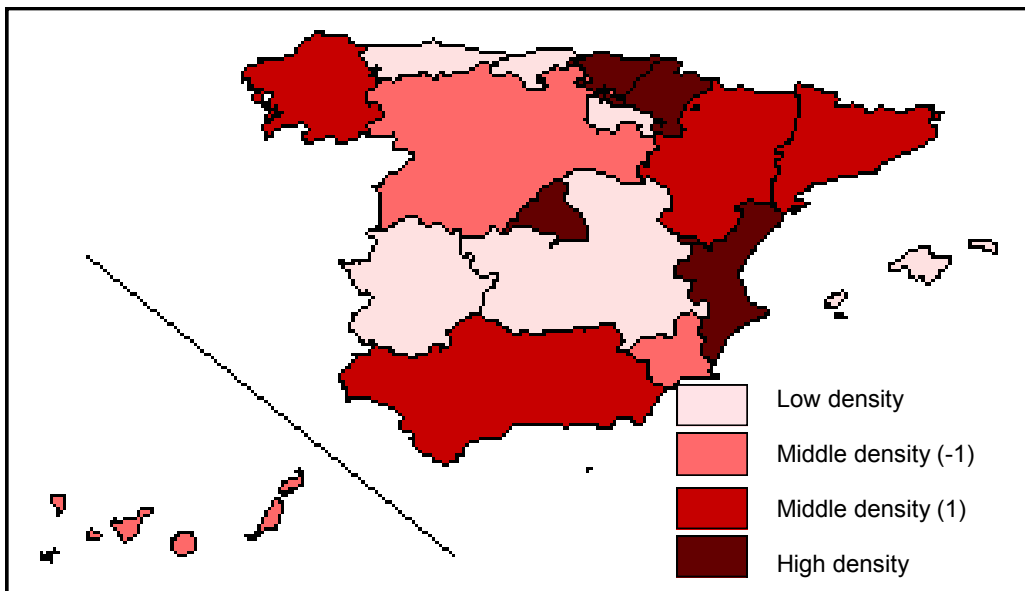


Fig. 6 b - Relationship between Talent and Regional Differentiation in Spain (2004)
Employment with Bachelor's Degree (in working population)
Source: INE, IVIE, SABI

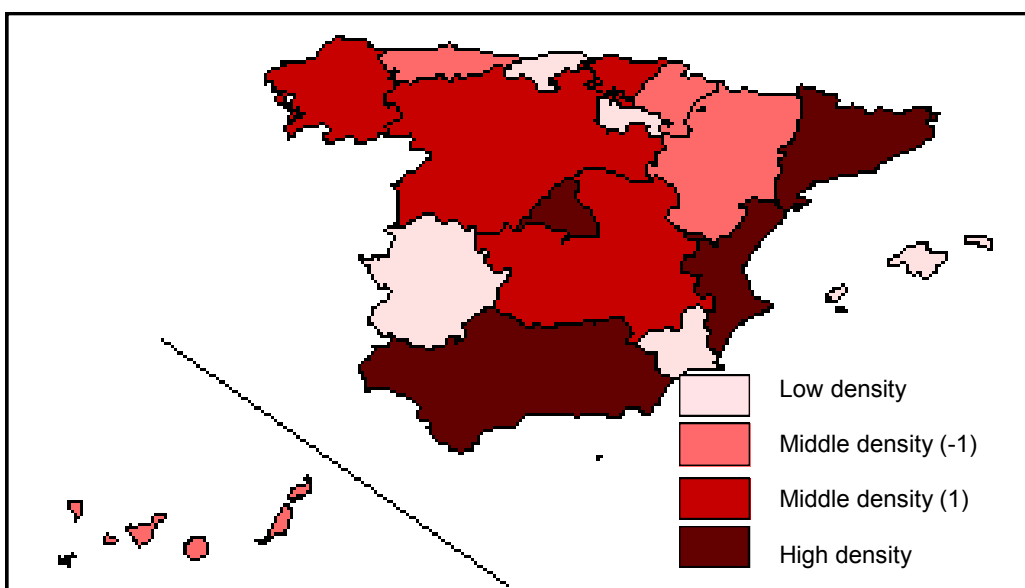


Fig. 6 c - Relationship between Talent and Regional Differentiation in Spain (2004)
Industry Value Added (gross)
Source: INE, IVIE, SABI

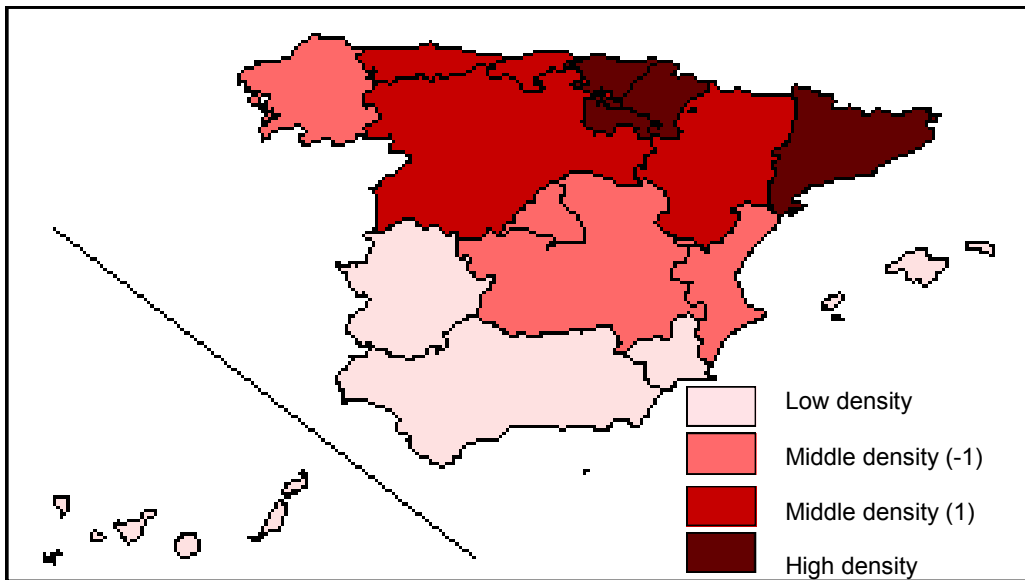


Fig. 6 d - Relationship between Talent and Regional Differentiation in Spain (2004)
Industry Value Added (per capita)
Source: INE, IVIE, SABI

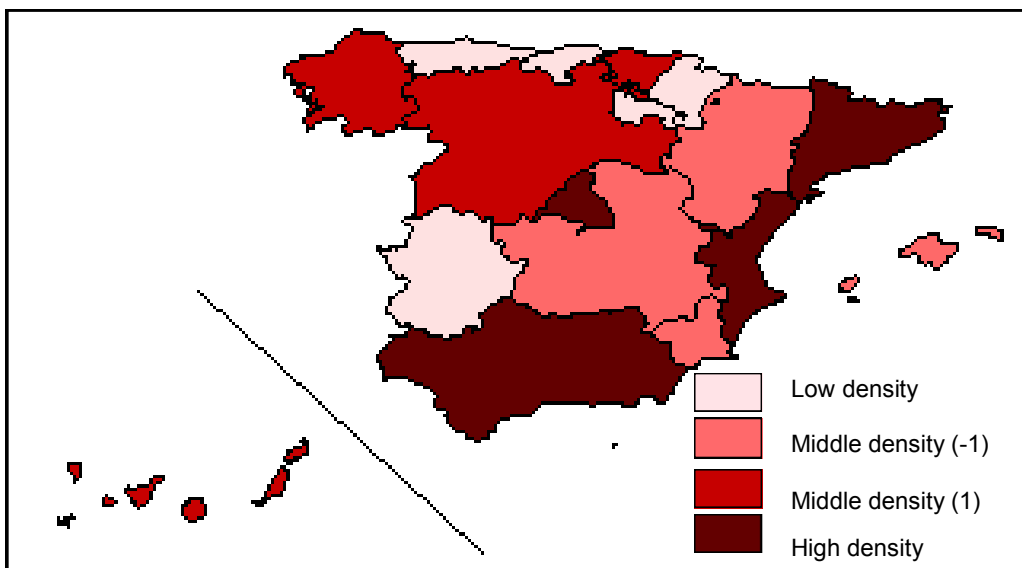


Fig. 6 e - Relationship between Talent and Regional Differentiation in Spain (2004)
Service Value Added (gross)
Source: INE, IVIE, SABI

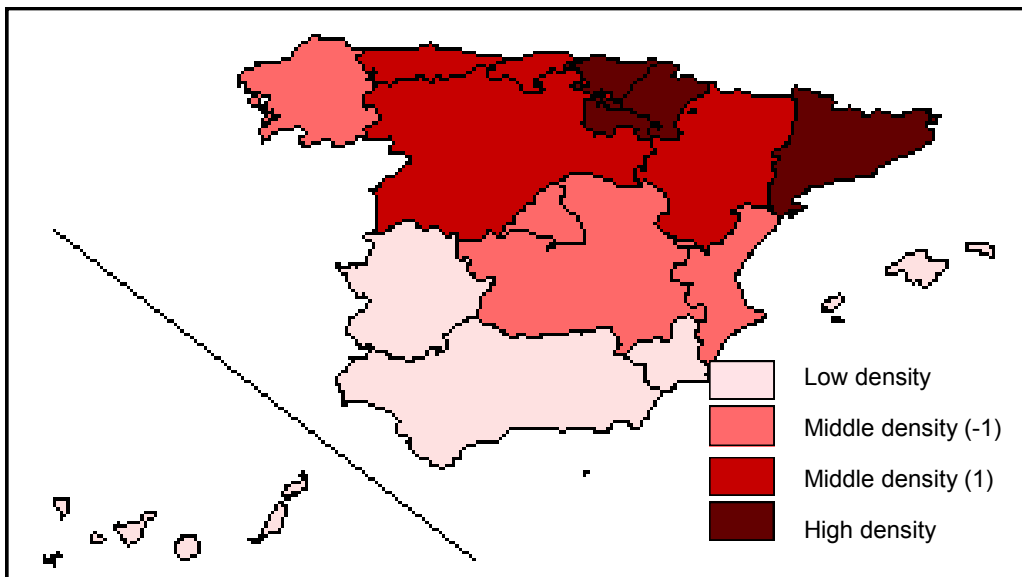


Fig. 6 f - Relationship between Talent and Regional Differentiation in Spain (2004)
Service Value Added (per capita)
Source: INE, IVIE, SABI

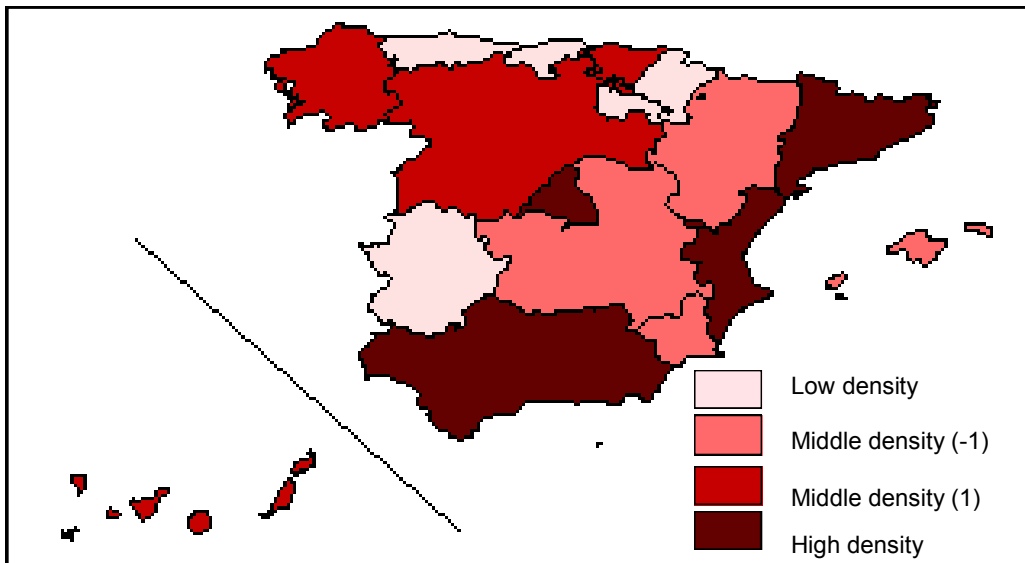


Fig. 6 g - Relationship between Talent and Regional Differentiation in Spain (2004)
GDP (gross)
Source: INE, IVIE, SABI

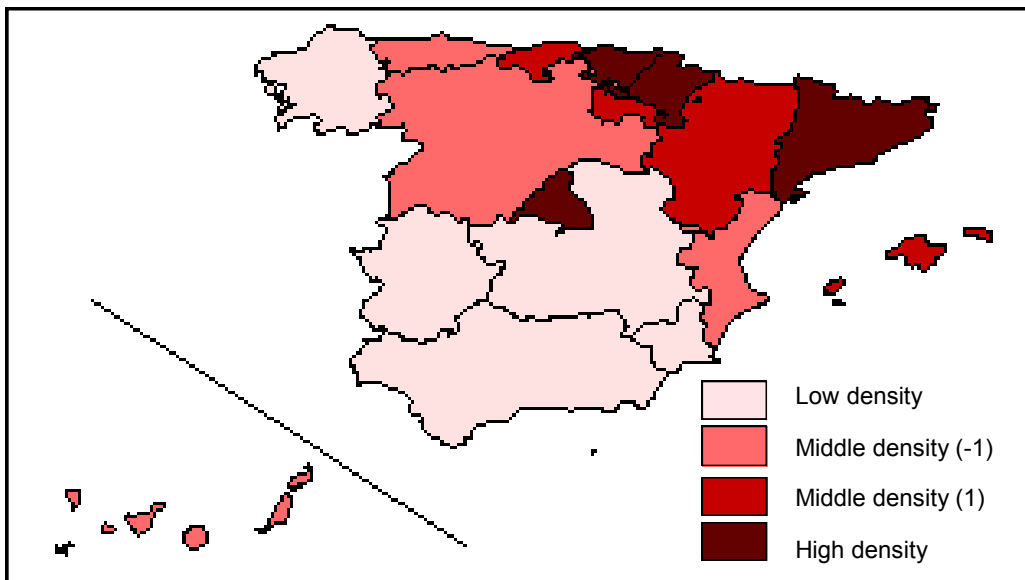


Fig. 6 h - Relationship between Talent and Regional Differentiation in Spain (2004)
GDP (per capita)
Source: INE, IVIE, SABI

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