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Regional Structural Change and Cohesion in the Process of European Integration: A Comparison of French, German, Portuguese and Spanish Regions

44th Congress of the European Regional Science Association: "Regions and Fiscal Federalism", 25th - 29th August 2004, Porto, Portugal

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Regional Structural Change and Cohesion in the Process of European Integration: A Comparison of French, German, Portuguese and Spanish Regions

Paper to be presented at the
44 th European Congress of the European Regional Science Association on
„Regions and Fiscal Federalism" in Porto, Portugal, August 25-29, 2004

Very preliminary! Please, do not quote without permission by author!

Abstract:

The process of European integration entails regional structural change thereby affecting the economic situation of regions and the objective of regional cohesion in Europe. As some kinds of specialization may be more favourable to regional income opportunities than others, there may be winning and losing regions depending on their characteristic specialization pattern.

Relying on regional employment data from national data sources in a deep industrial break-down, I study the long-term structural change of regions from four countries depending on their initial kind of specialization, i.e., their initial set of industries with high or low scale economies and with high resource, labour, skill or research intensities. This approach requires a classification of industries according to their characteristics, and of regions according to their industrial mix, by means of cluster analyses. This will help identifying types of regions like the core regions of each country with usually quite diversified industrial structures and a certain focus on more modern industries, like old industrialised regions with a focus on iron-and-steel or textiles, like peripheral regions with an initial focus on traditional labour intensive industries, and finally like some highly and very specifically specialised regions. The evolution of specialization is then analysed in the context of the identified type-classes of regions with similar specialization. While the overall change of regional specialization is slow and without a clear direction towards an increase or decrease, the analysis for types of regions yields some more explicit results.

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1. Introduction

In May 2004, with the first round of the east enlargement, the European integration process got new momentum. The ongoing process of European integration is likely to increase trade and factor mobility thereby increasing interregional competition and affecting the interregional division of labor between European regions. Once again, this also raises worries that cohesion between countries and regions within the EU might deteriorate. This motivates the present paper on regional structural change.

The theoretical background on the relations between integration, regional structural change, and the resulting specialization of regions is spanned by neoclassical trade theory and new economic geography since they address trade (the most obvious consequence of integration) and the division of labor, which is reflected in the location of industries and in the specialization of countries or regions. All these theories are comparative-static by nature, yet they get a dynamic dimension by considering increases of the degree of integration between the regions of the model or, what is assumed to be the same, by exogenous decreases of transaction costs between the regions, usually illustrated by decreases of transportation costs. The trade theories differ remarkably in their view of the most relevant phenomenon in shaping trade and the division of labor, and they thus highlight different aspects of regional reality. Also, they differ in their expected results regarding regional specialization and regional cohesion. The neoclassical trade theory, on the one hand, focuses on natural comparative advantages of regions rooting in different endowments with immobile factors, and it expects regional specialization to increase and regional cohesion to ameliorate as a result of integration. The new economic geography, on the other hand, focuses on acquired comparative advantages of regions originating from the existence and exploitation of scale economies, and it reveals much ambiguity regarding the prospects of regional specialization and cohesion as a result of integration.

Hence, the various trade theories supply us with various predictions of possible effects of integration on the specialization pattern of regions and localization pattern in space. Accordingly, the predicted results of integration on regional income and thus on regional welfare may differ remarkably. Particularly, in the world of the new economic geography the outcome of integration is rather ambiguous, as it depends not only on the

assumptions of a respective model, e.g., regarding the degree of labor mobility, but as well on the starting point of the integration process due to the non-monotonic relationship between integration and specialization. In order to draw lessons from these theories on the possible development of regions after the east enlargement, it is urgently necessary to look for empirical evidence.

This paper asks for the experience of regions from four countries with the European integration process in the past, particularly with the south enlargement. The countries are France, Germany, Spain and Portugal – countries that represent a certain line from central Europe to the periphery, and that can be thought to have been affected considerably by the south enlargement. The paper focuses on specialization within the manufacturing sector not withstanding that this is only one and by far not the largest sector within the economy. On the one hand, this restriction is due to data availability: It is the novelty of this paper to exploit databases from national sources with very disaggregated employment data for regions, yet for most countries these detailed data are available for the manufacturing sector only. On the other hand, this restriction complies to the fact that trade theories are generally formulated with a particular focus on the manufacturing sector.

Questions concerned are:

- What have been the specific characteristics of regional specialization within and across countries at an early time of the European integration process (i.e., in the late 1970s, before Spain and Portugal joined the EU in 1986)?
- To what extent can the directions and magnitude of subsequent changes be attributed to these initial conditions?

The paper is organized as follows: after some methodological remarks concerning the specialization indicator adopted (chapter 2) industries are classified according to similar (exogenous) characteristics related to trade theories (chapter 3). This classification provides groups of industries that can be compared across countries in spite of the fact that the basic data are given in different (national) industrial classification schemes. It will then be investigated what regions belong to classes with a similar industry mix, and how these region classes are situated in space (central or peripheral; chapter 4). Also it

will be investigated whether they share common characteristics with respect to the subsequent evolution of specialization, and in how far this evolution can be traced to their specialization on this industry mix (chapter 5). Chapter 6 concludes.

2. Methodological remarks

In the literature, there are several indicators for measuring industrial concentration or regional specialization, e.g., Herfindahl index, specialization coefficient, Gini coefficients, Ellison-Glaeser coefficient. The workhorse of the present analysis, however, will be the Theil index that is exhaustively elaborated by Brülhart and Traeger (2003). The Theil index is a measure of entropy, it measures the diversity of respective indicators (here: value added or employment shares of industries) for certain units (here: each region). In its simple form, it is defined

$$theil = \frac{1}{n}\sum_{i}^{n}\frac{a_i}{\frac{1}{n}}\log\left(\frac{a_i}{\frac{1}{n}}\right)$$

(where a_i is the share of the ith industry in a given region, n is the number of industries). Values range from 0 (no variance of indicators) to … (complete variance of indicators).[1] Since a region is the more specialized the more its industrial shares vary and diverge from the average share $1/n$, the index is also a measure of specialization. It is an *absolute specialization measure* in that it does not compare each region's sectoral/industrial shares to those of a national average, but rather to an equal distribution with similar shares for each industry. Regional specialization can also be measured by a weighted Theil index. It measures the diversity of weighted indicators (here: localization coefficients across industries) for certain units (here: each region). In contrast to the unweighted measure, it is a relative specialization measure in that it controls for different sizes of industries that may be due simply to the arbitrariness of a given industrial classification system. It is defined

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[1] Some calculations as to the sensitivity of this indicator in comparison to others are to be found in cf. Appendix 2.1.

$$theilweight = \sum_{i}^{n} \frac{l_i}{\bar{l}} \frac{a_i}{b_i} \log\left(\frac{a_i}{b_i}\right)$$

(where where a_i is the share of the ith industry in a given region, b_i is its share in the country as a whole, n is the number of industries, l_i is the ith industry's size, and $\bar{l}$ is the respective average size for all industries). The values range from… In contrast to other specialization measures, both in its simple and weighted form, allows for additive decompositions of the total specialization into contributions from specialization between certain industrial groupings and contribution from specialization within these groupings. This is a property that we will take advantage of later on.

Both, the unweighted and weighted indices dispose of advantages and disadvantages. The simple, unweighted Theil index allows in particular, to analyse the evolution of regional specialization without eliminating evolutions that are equal to all regions of a country. If the perspective is to analyse the integration of a country's regions into the European division of labour rather than to analyse the intra-national division of labour, this appears much appropriate. Yet the indicator may be biased by an arbitrary system of industrial classification with very differing sizes of industries, where a specialization on a very small industry enters the indicator with the same weight as the specialization on a large industry. The weighted Theil index controls for such arbitrariness of the classification system, but it also puts the specialization of a region into perspective of the overall Spanish specialization. This implies, for instance: the specialization of a large region may be underestimated, as the yardstick itself is not independent from the object of measurement. In the following, the different messages of the different indicators will be recognised.

Description of database to be supplemented: employment data for manufacturing are drawn from annual enterprise surveys by national statistical authorities in the case of Spain (88 branches) and France (35 branches), and from Bundesanstalt für Arbeit in the case of Germany (persons employed that are subject to social insurance contributions; 165 branches). Data on value added for 17 large economic sectors are drawn from

Hallet (2000).[2] The database on Portugal available to me, so far, is not very satisfactory, yet results for Portugal will perhaps be supplemented.

3. Groups of industries with similar characteristics

Before entering the analysis of regional specialization, groups of industries are identified, with similar (exogenous) characteristics related to trade theories, that will be needed to characterise the initial division of labour among European regions. The classification procedure is exercised for the initial year of each database, i.e., 1978 in the case of Spain, 1973 in the case of France, 1980 in the case of Germany, and it is based on three discriminating variables: (i) the dependency of industries on *highly localized resource deposits* (drawing on an OECD, 1987, classification of resource intensive industries, yet applying it only to those industries where resources are localized and not ubiquous), (ii) the existence of *internal IRS* for industries (drawing on Pratten,1988, who identified industries with different levels of technical IRS). (iii) The remaining industries are assumed to be footloose. In order to structure this large group, we apply weighted Theil indices[3] for the observed concentration of industries in the initial year (this is preliminary).

The classification yields the following type classes of manufacturing industries (cf. Appendix):

- *Resource intensive industries*: includes industries depending on highly localized resources, i.e., coal mining and coke ovens, iron and steel works, mining, production and transformation of non-ferrous metals and non-metal minerals, petroleum refining. These industries are usually characterized by high internal IRS. The observed concentration of these industries is usually quite high.

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2 I like to thank Martin Hallet for the generous provision of his data.

3 The concentration measure adopted here is

$$theilwght = \sum_{r=1}^{m} \frac{l_r}{\bar{l}} \frac{a_r}{b_r} \log\left(\frac{a_r}{b_r}\right)$$

(where a_r is the share of the rth region in a given industry, b_r is the share of the rth region in the total economy of the respective country, m is the number of regions, l_r is the region r's size, and $\bar{l}$ is the respective average size of all regions)

- *High IRS industries*: includes industries with high internal IRS according to Pratten that are not dependent on localized resources, i.e., aircraft industry, some branches of the chemical and machinery industries, automobile industry, office and computing machinery and electronic material industries, optical and professional instruments industries, some food industries. Different to expectations, the observed concentration varies considerably from high to extremely low.
- *Footloose industries*: includes all remaining industries. Some of them are quite *concentrated*, i.e, several food industries, footwear industry, shipbuilding, the pharmaceutical industry, while others are fairly *dispersed*, like several branches of the textiles industry, branches of the automotive and the chemical industry, gas supplies, foundries and metal finishing, rubber and plastic materials industries, ceramic, construction material and glass industries, water and electricity supplies, paper industries, branches of the machinery industry, clothing, wood and other consumption industries.

4. Region classes and their characteristics

The above classification of industries is now used as an input to classifying European regions according to their initial specialization. Also, the influence of other sectors (agriculture and services) on the subsequent evolution of regional specialization is allowed for by considering their part of the regional economies. For the initial years of the respective data bases, twelve discriminating variables are considered: (i) seven variables characterizing each region's structural composition with respect to broad economic sectors (i.e., each region's value added shares of the agricultural, the construction, and five services sectors), and (ii) four variables characterizing each region's structural composition within the manufacturing sector with respect to industrial type classes (i.e., each region's employment shares of resource intensive, high IRS industries, concentrated footloose, and dispersed footloose industries).

Applying Ward's minimum cluster analysis, separately for each country (will perhaps be changed and done for all regions of the databases jointly) we arrive at six type classes of European regions. Although classified solely according to their structural composition, several of them exhibit further characteristics in common, e.g., with respect to their geographic situation and their level of economic development. This

observation by itself indicates the spatial reference of a region's industrial mix, and allows labeling these classes with some associative names:

- *Highly specialized region*: is characterized by the extreme specialization on very few industrial branches, includes only the Spanish coal and iron-and-steel region Asturias.
- *Old industrialized regions*: characterized by relatively high shares of manufacturing, with a focus on resource dependent and high IRS industries; contains Cantabria and Navarra. These regions are situated at the north of Spain, close to the border of France, and they are thus the most central Spanish regions viewed from a European perspective. It also contains Lorraine, Nord-Pas de Calais, and Haute Normandie (which, in fact, forms a cluster of its own, yet is most similar to the other two regions). These regions are situated at the north of France, close to the border of Belgium and the sea route to Great Britain. In Germany, it contains four regions forming the Ruhr area.
- *Center region*: characterized by relatively high shares of credit and insurance and other market and non-market services, of intermediate and high IRS industries; contains the Spain's and France's capital regions Madrid and Île de France, and the German cities Hamburg and Bremen.
- *Core regions*: characterized by shares close to average for all sectors and branches, could almost be taken as median regions; contains País Vasco, Rioja, Castilla y León, Communidad Valenciana, Aragón and Cataluña. These regions are situated in a belt stretching from north west to east Spain between the old industrialized regions and the center region. It also contains Champagne-Ardennes, Picardie, Bourgogne, Alsace, Franche-Comté and Rhône-Alpes. These regions are situated in a belt stretching from north west to east France between the old industrialized regions and the center region. In Germany, it contains the urban areas of West-Berlin, München, Stuttgart, Frankfurt, Köln, Hannover, etc.
- *Semi-peripheral regions*: characterized by relatively high shares of agriculture, and relatively high shares of concentrated footloose industries; contains Galicia, Extremadura, Castilla la Mancha, and Andalucía. These regions are situated in the south and the utmost west of the country. It also contains Basse Normandie, Centre, Pays de la Loire, Aquitaine and Auvergne. These regions are situated in the western

part of the country, south of the center region. In Germany, it contains the regions Detmold, Giessen, Kassel, Freiburg, Tübingen, Ober-, Unter- and Mittelfranken, Schwaben, Niederbayern and Oberpfalz, mostly situated in southern parts of the country.

- *Peripheral regions*: characterized by relatively high share of recovery, trade and lodging services, and a high share of concentrated footloose industries; contains the Baleares, Murcia, Ceuta y Melilla and the Canarias. These are regions that are small, very distant from the center and particularly well-known as holiday regions. It also contains Bretagne, Poitou-Charentes, Limousin, Midi-Pyrénées, Laguedoc-Roussillon, and Provence-Alpes-Côte d'Azur-Corse. These regions are very distant from the center at the utmost west and south of the country. In Germany, it contains the regions Schleswig-Holstein, Lüneburg, Weser-Ems, Trier and Koblenz, that are situated at the utmost north and west of the country.

The classification procedures thus yields region classes that have several characteristics in common, even across country borders. Most obvious is the geographical situation with respect to the center of Europe and to center within each country. Also, the classification reveals the spatial structure of European regions still being significantly shaped from the industrialization process that spread from the old industrialized regions in central Europe and proceeded stepwise further southwestwards.

Figure 4-1: Maps of region classes in Spain, France, Germany and Portugal
– will be supplemented –

5. Evolution of specialization by region classes

As trade theories hold that the initial structural mix of a region matters for its further improvement, the evolution of regional specialization within these classes of regions ought to reveal highly similar characteristics. Also, any regional specialization at each time ought to be strongly shaped by its specialization on the groups of industries with similar trade related characteristics. These are the hypotheses that are subject to this chapter.

The base of the analysis is the Theil index on regional specialization as presented and discussed in chapter 2 of this paper. As the message of the absolute measure, the simple Theil index, and of the relative measure, the weighted Theil index, differ both are recognized.[4] On this base, a bird's eye view of the specialization and diversification process that takes place in space is provided by Figure 5-1. It shows averages of the specialization measures for each region class. The region classes are arranged according to their approximate geographical situation from north east to south west within each country.

Let's start viewing only the graphs from simple Theil indices (left hand graphs). These graphs seem to tell an appealing story, and a somewhat similar one for all countries considered: regional specialization is high at the very periphery of the country, and it is elevated at the center, whereas it is relatively low for regions between center and periphery. Over time, specialization of the center decreases in Spain until the mid 1980s and increases again after Spain's EU entry, in the then incumbent EU members France and Germany the central regions increase throughout. A high degree of integration thus seems to sharpen the division of labor between center, periphery, and the spacing between both. This story would comply to some NEG models that suggest a high specialization of the center (on IRS industries) and a similarly high spaecialization of the periphery (on non-IRS industries).

Yet however appealing the story, one has to bear in mind that the difference between center region and neighboring regions is very small, as is the movement over time. What is worse, when considering the graphs from weighted Theil indices, the argument is almost inverted, either with respect to the specialization relative to other region classes (Spain and France) or with respect to the evolution over time (Germany). One explanation for these diverging results may be traced to the fact that in the case of Spain and France the center region are very large as compared to the country as a whole, and thus, in the case of the weighted Theil index bias considerably the national yardstick which they are compared to. ….(some more interpretations required.)

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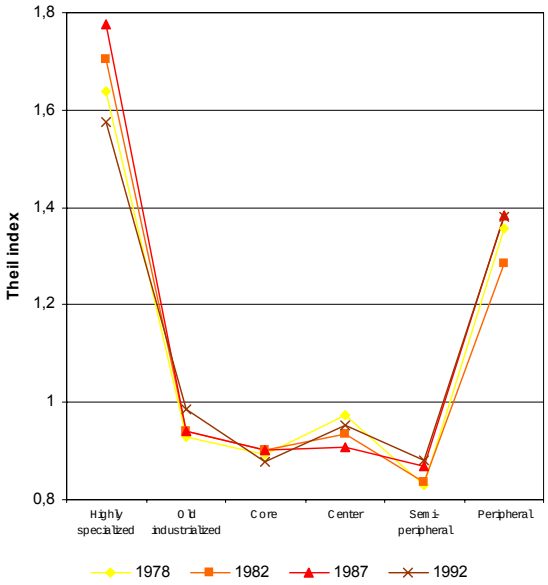
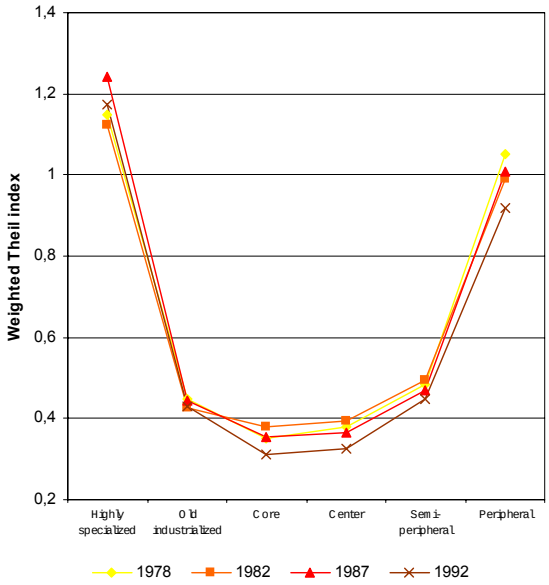
[4] Standard deviations for each region class will be supplemented in the appendix.

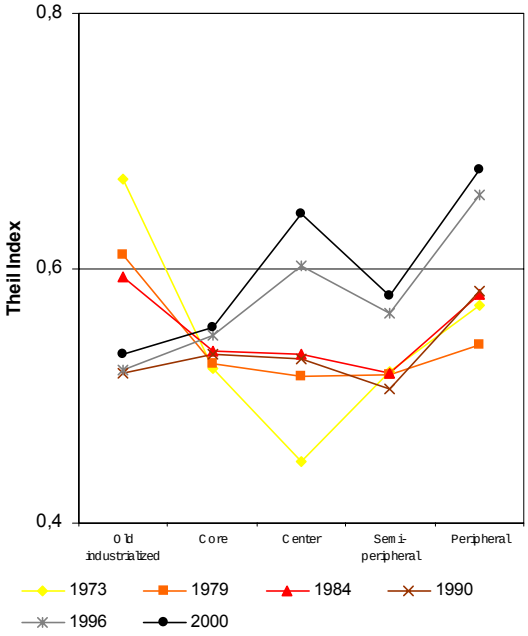
Figure 5-1: Spatial processes of specialization/diversification of Spanish regions (average Theil indices)

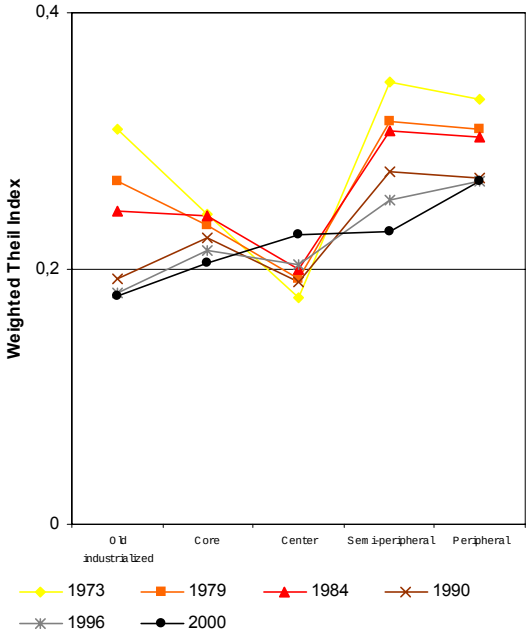
Spain



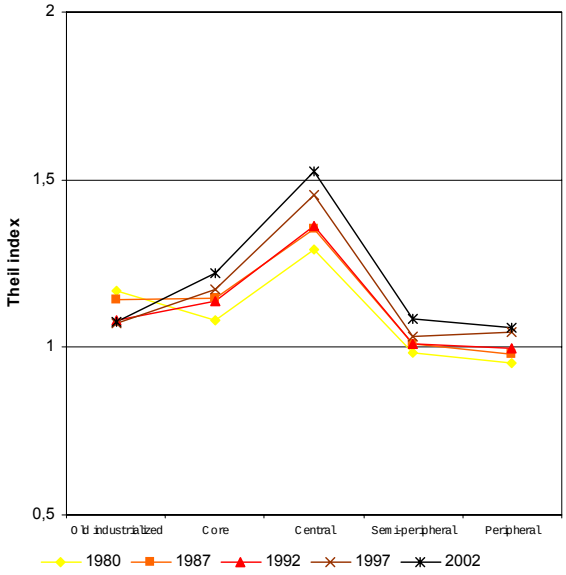


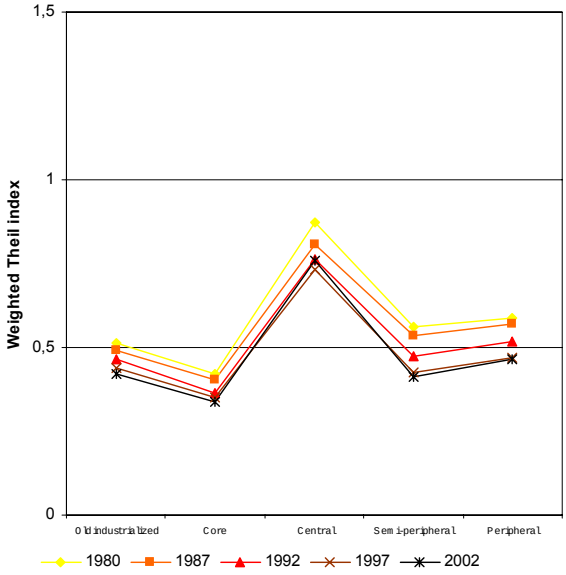
France





Germany

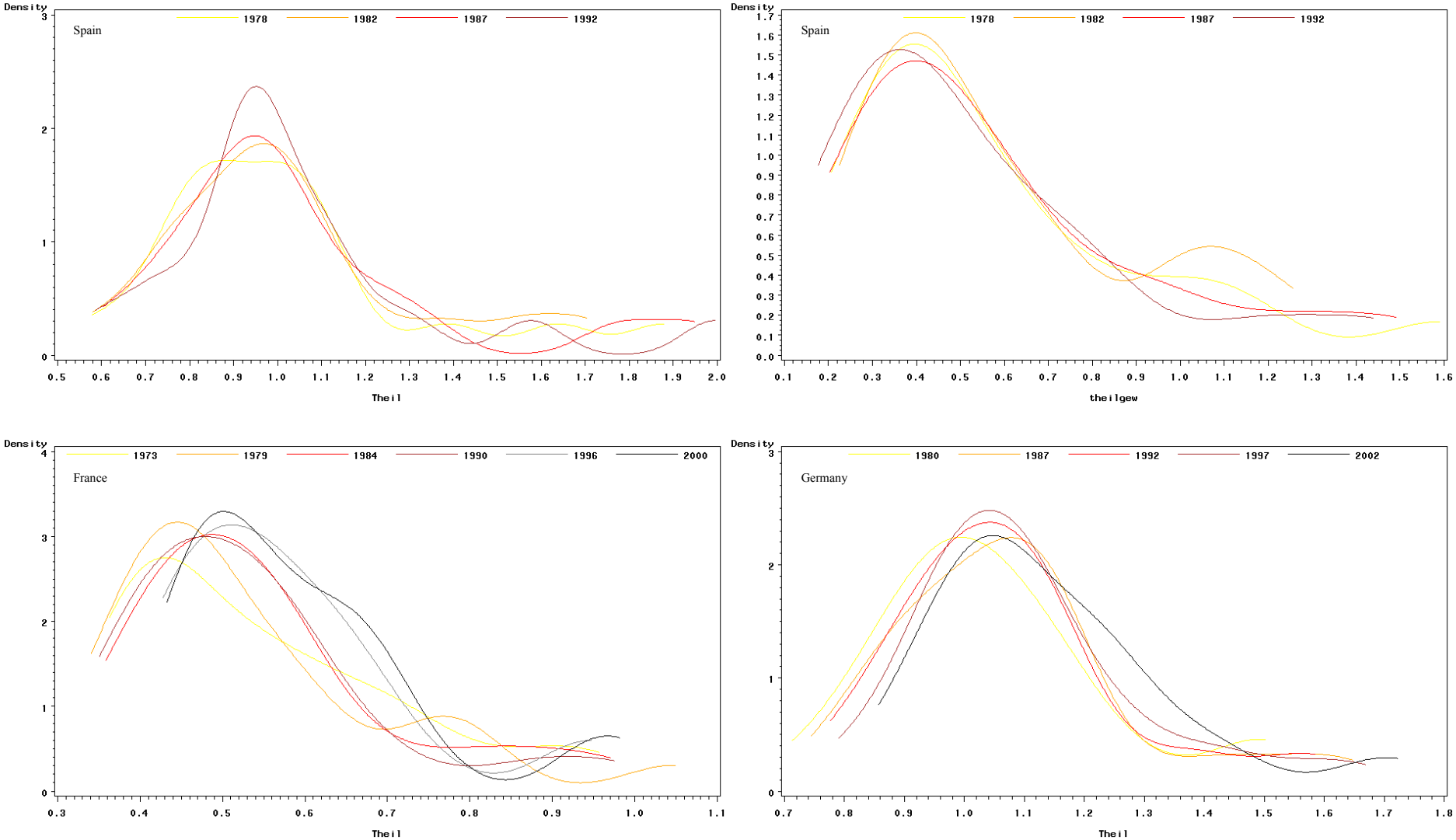




Sources:

A comprised illustration of regional specialization and its change over time be drawn from a kernel density function for degrees of specialization. These functions demonstrate the density of various degrees of regional specialization. Figure 5-2 offers Kernel density functions for the regions of all countries in the sample. They confirms the findings of a large number of similarly specialized regions (indicated by the one-peaked functions) with few outliers. Mostly the peak did not change its position significantly over time, that is, on average, European regions maintained their degree of specialization. Some graphs indicate a certain growth of the peak over time, seemingly indicating a convergence of regions towards the same specialization degree. Yet once again this result depends on what Theil index is taken as the basis of the analysis. …. At any rate the movement is slow.

Figure 5-2: Kernel density estimates of regional specialization for various years



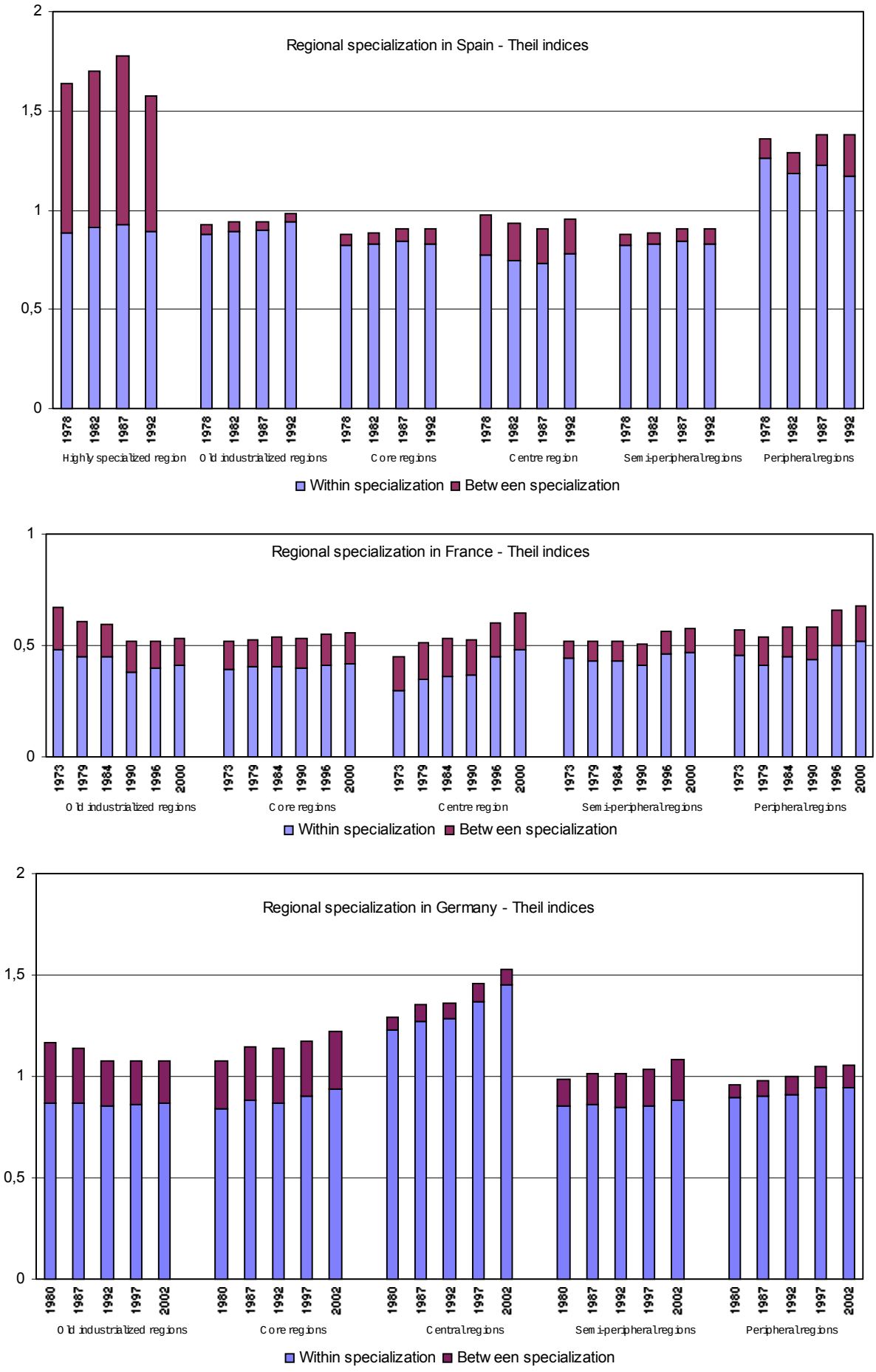
Finally, in order to detect whether the specialization of the European is driven mainly by the the groups of industries with similar trade related characteristics, a useful property specific to the Theil index is exploited (figure 5-3): The total regional specialization is decomposed in a component describing the specialization degree on the four groups of industries (between index), and a component describing the specialization degree within these type classes of industries (within index). The results for the different region classes is surprisingly clear: almost all variation of total specialization stems from specialization within the industry types; specialization with respect to the four industry types offers not much explanation for total specialization. Moreover, there is no uniform pattern: some of the regions that are specialized on resource dependent industries like the highly specialized Spanish region Asturias and the old industrialized regions of France and Germany reveal a bit higher influence of the between specialization than other regions and thus support expectations derived from traditional trade theory, others don't, like the old industrialized regions of Spain. Also, some of the region classes specialized on IRS industries, like the center regions of Spain and France reveal a higher influence of the between specialization and thus support expectations derived from NEG, others don't, like the central regions of Germany.

Also, once more, these findings must be compared to those based on a decomposition of the weighted Theil index (to be continued)

6. Conclusion

The results indicate that most European regions, with few outliers, exhibit moderate degrees of specialization even in the initial year and, on average, few change during the observation period. Initial specialization degrees seem to exhibit little influence on the subsequent evolution of regions and industries. More particularly, a high initial specialization on certain sectors or industries, e.g., resource dependent industries or high IRS industries, does not seem to entail a specific reaction on the subsequent evolution of specialization. (to be continued)

Figure 5-3: Decomposition of regional specialization



Appendices

Table : Types of industries in Spain,– Results of classification

Ind. Class	Spain - Branches	Resource depend.	Internal IRS	Weighted Theil index 1978
	Resource intensive industries			
2241-2249	PRODUCCION Y PRIMERA TRANSFORMACION DE METALES NO FERREOS(2241-2249)	1	high	0.2418
2210-2230	SIDERURGIA Y PRIMERA TRANSFORMACION DEL HIERRO Y DEL ACERO(2210-2230)	1	high	0.8933
21	MINERALES METALICOS(2110,2120)	1	high	1.0237
1300	REFINO DE PETROLEO	1	medium	1.0917
1220,14	HIDROCARBUROS Y MINERALES RADIOACTIVOS	1	high	1.1132
1110-1130	COMBUSTIBLES SOLIDOS(1110-1130)	1	high	1.8764
1140	COQUERIAS(1140)	1	high	1.9975
	High IRS industries			
3820	AERONAVES(3820)	0	high	1.5944
3300	MAQUINAS DE OFICINA	0	high	0.8137
3511-3552	MATERIAL ELECTRONICO(3511-3552)	0	high	0.7141
2513	QUIMICA INORGANICA(2513)	0	high	0.7070
2516	FIBRAS ARTIFICIALES Y SINTETICAS(2516)	0	high	0.5409
3910-3990	INSTRUMENTOS DE PRECISION, OPTICA Y SIMILARES(3910-3990)	0	high	0.4283
2511,2512	PETROQUIMICA Y QUIMICA ORGANICA(2511,2512)	0	high	0.3421
2410	MATERIALES DE CONSTRUCCION EN TIERRA COCIDA(2410)	0	high	0.2715
3410-3460	MAQUINARIA Y MATERIAL ELECTRICO(3410-3460)	0	high	0.2470
3610-3630	AUTOMOVILES, PIEZAS Y ACCESORIOS(3610-3630)	0	high	0.1858
4211,4212	CACAO, CHOCOLATE Y PRODUCTOS DE CONFITERIA(4211,4212)	0	high	0.1416
2421-2423	CEMENTOS, CALES Y YESOS(2421-2423)	0	high	0.1263
	Footloose industries			
4260	SIDRERIA(4260)	0	low	2.5785
4150	CONSERVAS VEGETALES(4150)	0	low	1.4838
4200	AZUCAR(4200)	0	low	1.4676
4160	CONSERVAS DE PESCADO(4160)	0	low	1.3445
4241,4242	ALCOHOLES(4241,4242)	0	low	1.3295
4290	TABACO(4290)	0	low	1.2801
4510,452	CALZADO(4510,4520)	0	low	1.2495
4660	INDUSTRIA DEL CORCHO(4660)	0	low	1.0913
4110-4124	ACEITES Y GRASAS(4110-4124)	0	low	0.9754
3710,372	CONSTRUCCION NAVAL(3710,3720)	0	medium	0.9331
2536	ACEITES ESENCIALES Y AROMAS(2536)	0	low	0.8923
4360	ACABADOS TEXTILES(4360)	0	low	0.8576
4920	INSTRUMENTOS DE MUSICA(4920)	0	low	0.8390
4243	LICORES(4243)	0	low	0.7185
2541,2542	PRODUCTOS FARMACEUTICOS(2541,2542)	0	medium	0.6525
4251-4259	VINO(4251-4259)	0	low	0.6460
4941,4942	JUEGOS Y JUGUETES(4941,4942)	0	low	0.6383
4311-4340	PREPARACION, HILADO Y TEJIDO(4311-4340)	0	low	0.6066
4610	ASERRADO DE MADERA(4610)	0	low	0.6010
2554	MATERIAL FOTOGRAFICO SENSIBLE(2554)	0	low	0.5737
2514,2515	MATERIAS PLASTICAS Y CAUCHO	0	medium	0.5309
4911,4912	JOYERIA Y BISUTERIA(4911,4912)	0	low	0.5076
4371-4399	ALFOMBRAS Y OTROS(4371-4399)	0	low	0.4921
4351-4354	GENEROS DE PUNTO(4351-4354)	0	low	0.4814
4170	MOLINERIA(4170)	0	medium	0.4696
3830,389	MATERIAL DE TRANSPORTE DIVERSO(3830,3890)	0	medium	0.4629
1520	GAS(1520)	0	medium	0.4625
4670	JUNCO, CA¥A, CESTERIA, BROCHAS Y CEPILLOS(4670)	0	low	0.4583
4811-4819	TRANSFORMACION DEL CAUCHO(4811-4819)	0	low	0.4482
3111,3112	FUNDICIONES METALICAS(3111,3112)	0	medium	0.4452
4560	PELETERIA(4560)	0	low	0.4420
2471-2479	PRODUCTOS CERAMICOS(2471-2479)	0	medium	0.4220
4951,4959	MANUFACTURAS DIVERSAS(4951,4959)	0	low	0.3374
4270	CERVEZA(4270)	0	low	0.3300
2553-2559	OTROS PRODUCTOS QUIMICOS DE CONSUMO(2553-2559)	0	medium	0.3189
2521,2522	ABONOS Y PLAGUICIDAS(2521,2522)	0	low	0.3182
4410	CURTIDOS(4410)	0	low	0.3127
4421-4429	CUERO(4421-4429)	0	low	0.3064
2551,2552	JABONES, DETERGENTES Y PERFUMERIA(2551,2552)	0	medium	0.2968
23	MINERALES NO METALICOS Y CANTERAS(2311-2399)	0	low	0.2835
4930	LABORATORIOS FOTOGRAFICOS(4930)	0	low	0.2726
3120,313	FORJA Y OTROS TRATAMIENTOS DE METALES(3120,3130)	0	medium	0.2716
3211,3212	MAQUINARIA AGRICOLA(3211,3212)	0	medium	0.2605
4220	PRODUCTOS DE ALIMENTACION ANIMAL(4220)	0	low	0.2403
16	AGUA(1600)	0	medium	0.2299
2533,2534	PINTURAS, BARNICES Y TINTAS(2533,2534)	0	medium	0.2291
3810	MATERIAL FERROVIARIO(3810)	0	medium	0.2259
4710,472	PASTA PAPELERA, PAPEL Y CARTON(4710,4720)	0	low	0.2250
4731-4739	TRANSFORMACION DE PAPEL Y CARTON(4731-4739)	0	low	0.2107
3221-3299	MAQUINARIA INDUSTRIAL(3221-3299)	0	medium	0.1917
4181-4239	PRODUCTOS ALIMENTICIOS DIVERSOS(4181-4239)	0	low	0.1905
4741-4759	ARTES GRAFICAS Y EDICION(4741-4759)	0	low	0.1814
4540	CONFECCION A MEDIDA(4540)	0	low	0.1679
2531-2539	OTROS PRODUCTOS QUIMICOS INDUSTRIALES(2531-2539)	0	low	0.1627
4131-4133	MATADEROS E INDUSTRIAS CARNICAS(4131-4133)	0	low	0.1518
4821,4822	TRANSFORMACION DE MATERIAS PLASTICAS(4821,4822)	0	low	0.1373
4531-4559	CONFECCION EN SERIE(4531-4559)	0	low	0.1230
4191,4192	PAN, BOLLERIA, PASTELERIA Y GALLETAS(4191,4192)	0	low	0.1209
3161-3169	ARTICULOS METALICOS(3161-3169)	0	low	0.1179
3191,3199	TALLERES MECANICOS(3191,3199)	0	low	0.1172
4620-4650	INDUSTRIA DE LA MADERA(4620-4650)	0	low	0.1170
2431-2434	HORMIGON Y DERIVADOS DEL CEMENTO(2431-2434)	0	low	0.1129
4681-4685	MUEBLES DE MADERA(4681-4685)	0	low	0.1039
1510	ENERGIA ELECTRICA(1510)	0	medium	0.1033
4141-4144	INDUSTRIAS LACTEAS(4141-4144)	0	low	0.0992
4281,4282	BEBIDAS ANALCOHOLICAS(4281,4282)	0	low	0.0928
2461-2465	VIDRIO Y SUS MANUFACTURAS(2461-2465)	0	medium	0.0894
2440-2490	PIEDRA NATURAL, ABRASIVOS Y OTROS PRODUCTOS MINERALES NO METALICOS	0	low	0.0429
3141-3150	CARPINTERIA METALICA, ESTRUCTURAS Y CALDERERIA(3141-3150)	0	low	0.0425

Table : Types of industries in France,– Results of classification

Ind. Class.	France - Industry	Adjusted Theil index	Resource dependency	Internal IRS
	Resource dependent industries			
04	Comb.min.sol.,coséfact.	1,2342258	1	hi
05	Pétrole,gaz naturel	0,3931671	1	hi
09	Extraction et préparation de minerai de fer	2,2971318	1	hi
10	Sidérurgie	1,0187021	1	hi
11./.1105	Tréfilage, étirage, profilage, laminage	0,7055814	1	lo
1105	Fabr. de tubes	0,4448038	1	hi
12	Extraction de minerais non ferreux	1,5757809	1	im
130	Prod. de mét. non-ferr.	0,7245746	1	im
131	Transf. de mét. non-ferr.	0,2938969	1	im
14	Prod. de min. div.	2,1711506	1	lo
	Industries with high IRS			
1501-1505,07-09	Mat. de constr.	0,113482	0	hi
1506	Chaux et ciments	0,1651608	0	hi
171	Chimie minéralique	0,201864	0	hi
172	Chimie organique	0,2325873	0	hi
27	Mach. de bureau, mat. de trait. de l'inform.	0,5130456	0	hi
2911-14	Mat. d' équipement courant faible	0,3786604	0	hi
2915-22	Mat. dest. au grand public	0,3065605	0	hi
3111-15	Constr. automobile	0,208036	0	hi
3121	Mat. ferroviaire	0,4296925	0	hi
33	Constr. aéronautique	0,6995109	0	hi
3402,06-07	App. de mesurer, méc. de haute préc.	0,24889	0	hi
3403-05	Instr. optique	0,4096664	0	hi
3401	Horlogérie	1,655746	0	hi
5101,20	Imprimerie de presse	0,2243825	0	hi
5110-11	Imprimerie de labeur	0,1333581	0	hi
5112,30	Édition	0,6165216	0	hi
	Footloose industries			
32	Constr. navale	1,4134562	0	im
52./.5204	Caoutchouc	1,3532346	0	im
39./.3907	Travail du grain	1,0193569	0	im
5204	Amiante	0,8382825	0	im
3116,17	Cycles et motorcycles	0,767178	0	lo
5406,07,09,10	Ind. div.	0,7221683	0	im
46	Chaussures	0,706124	0	lo
37	Fabr. de conserves	0,6274993	0	lo
1811	Parfumerie	0,6088607	0	im
43	Fils et fibres artific. et synthétiques	0,5546312	0	im
30	Équipement ménager	0,4898014	0	im
19	Pharmacie	0,3961215	0	im
22	Mach. agricoles	0,3948682	0	im
44	Ind. textile	0,3751979	0	lo
45	Cuir	0,3580157	0	lo
40./.4011,12	Alimentaires div.	0,3532621	0	lo
35	Ind. de la viande	0,3486646	0	lo
49./4904	Ameublement	0,3093141	0	lo
5404	Bijouterie	0,3045932	0	lo
5405	Instr. de musique	0,3015357	0	lo
41	Boissons, alcools	0,2945933	0	lo
36	Ind. laitière	0,2854381	0	lo
1510-13	Ind. céramique	0,2818748	0	im
5408	Brosserie	0,2729026	0	lo
5001, 02	Prod. de papier	0,2343072	0	im
48	Trav. mécanique du bois	0,2254201	0	lo
5401-03	Jeux, Jouets	0,2227725	0	im
2101-05	Métallurg., Act. de sous-traitance	0,2219339	0	lo
1801-10	Parachimie	0,2179914	0	im
16	Verre	0,2075711	0	im
38	Boulangerie, Pâtisserie	0,2018107	0	lo
4011,12	Corps gras	0,1959378	0	lo
7	Distrib. de gaz	0,1898941	0	im
4904	Literie	0,1676209	0	lo
2810-16	Mat. électrique	0,1675972	0	im
25	Mat. de manut., pour les mines, sidérurgie	0,1674798	0	im
23	Machines-outils	0,1627887	0	im
20	Fonderie	0,1533678	0	im
3907	Prod. amylaces	0,1363412	0	lo
4708-15	Ind. annexes	0,1307079	0	lo
2817-22	Mat. d' install.	0,1251917	0	lo
5003-06	Transf. de papier	0,1104602	0	im
6	Électricité	0,0926896	0	im
53	Transf. de mat. plastiques	0,0921811	0	im
4701-07	Confection	0,0772394	0	lo
2106-17	Articles métallique	0,0762465	0	lo
24	Équipement ind.	0,0512124	0	im

Table: Classification of Spanish regions

Regions	Agriculture	Building and construction	Recovery. trade. lodging and catering	Transport and communi-cation	Credit and insurance	Other market services	Non-market services	Manufac-turing	Resource intensive industries	Industries with high IRS	Concentrated footloose industries	Dispersed footloose industries
	Shares in percent of total economy (value added)								Shares in percent of total manufacturing (employment)			
	Highly specialized regions											
Asturias	5.06	8.32	16.59	4.85	4.75	11.67	10.75	**43.07**	**54.03**	3.10	6.45	36.42
	Old industrialized regions											
Cantabria	6.80	6.16	16.88	**6.75**	5.13	13.30	10.63	**41.15**	**16.38**	**18.14**	11.96	53.52
Navarra	7.70	7.03	13.50	**8.28**	4.18	12.23	9.12	**45.67**	**6.84**	**18.79**	13.92	60.45
	Centre region											
Madrid	0.55	7.72	17.71	7.45	**9.12**	**20.02**	**14.56**	23.42	1.04	**29.67**	6.02	63.26
	Core regions											
PaisVasco	2.81	4.98	13.11	4.36	5.05	13.59	7.64	51.28	13.98	14.53	5.74	65.76
Rioja	9.51	6.86	12.10	4.10	5.75	10.67	8.66	51.86	0.38	7.08	33.05	59.49
Aragon	11.00	7.69	16.56	4.86	5.77	13.41	10.80	40.91	6.43	15.29	8.40	69.88
Castilla yLeón	12.39	8.09	16.24	5.28	5.38	12.93	11.70	40.38	9.64	18.55	9.45	62.36
Cataluña	3.32	7.67	16.11	4.90	6.36	15.90	6.77	42.29	1.56	17.68	17.22	63.53
Co. Valenciana	6.10	8.72	19.44	5.22	5.24	15.96	9.55	35.86	2.64	7.54	20.74	69.08
	Semi-peripheral regions											
Galicia	**11.97**	**10.29**	18.40	5.27	5.44	11.74	**11.64**	37.23	4.18	12.02	**23.90**	59.90
Castilla la Mancha	**17.51**	**9.89**	14.57	5.11	4.41	10.45	**10.57**	45.00	3.03	14.67	**17.30**	65.01
Extremadura	**17.48**	**10.33**	20.03	4.86	5.79	12.80	**16.13**	30.05	1.93	3.43	**19.82**	74.82
Andalucía	**11.51**	**10.02**	18.90	5.71	4.37	12.81	**14.67**	33.52	5.06	12.25	**23.05**	59.63
	Peripheral regions											
Baleares	3.79	7.76	**42.48**	5.52	5.17	16.34	6.88	15.84	0.36	2.51	**28.58**	68.56
Murcia	8.43	8.65	**15.93**	7.38	4.01	13.50	10.44	40.09	4.89	5.13	**29.95**	60.03
Canarias	8.25	9.89	**29.22**	8.02	4.56	15.70	12.86	19.74	4.96	6.33	**24.18**	64.53
Ceuta y Melilla	1.17	10.16	**31.92**	7.83	5.46	11.05	22.56	11.02	0.00	5.66	**25.82**	68.52
	Total											
Spain	6.94	8.30	17.93	5.67	5.81	14.77	10.89	29.70	6.69	15.25	15.24	62.83

Source: Hallet. – INE, Encuesta Industrial (EIG).

Table: Types of regions – Results of cluster analysis

Regions	Agricultural, forestry and fishery products	Building and construction	Recovery, repair, trade, lodging and catering services	Transport and communication services	Services of credit and insurance institutions	Other market services	Non-market services	Resource dependent industries with high IRS	Industries with high IRS	Industries with intermediate IRS	Industries with low IRS
Centre region											
Ile_de_F	0,48	5,61	15,44	6,56	6,71	25,82	12,24	1,83	5,84	74,13	18,21
Old industrialized regions											
Hte_Norm	3,16	6,57	11,35	9,45	2,11	15,20	10,29	2,42	7,87	65,03	24,68
Nord-PdC	2,49	6,82	13,35	5,87	2,99	17,46	11,70	11,20	4,27	45,77	38,76
Lorraine	3,72	7,28	11,84	5,76	2,78	18,13	14,37	31,58	4,48	37,07	26,87
Core regions											
Champagn	12,15	5,51	11,77	4,35	2,55	16,07	12,55	6,87	7,03	39,52	46,58
Picardie	7,41	5,78	11,89	4,78	2,45	17,32	11,56	5,14	8,27	50,54	36,05
Bourgogn	8,36	6,76	13,74	4,54	2,79	16,04	13,26	10,94	9,93	53,93	25,20
Alsace	3,55	6,26	14,60	4,85	3,43	18,37	12,16	6,66	6,13	52,75	34,46
Fr-Comte	5,16	5,80	10,57	4,00	2,86	15,79	12,61	1,65	2,21	69,93	26,21
Rhone-Al	3,05	7,60	13,54	4,94	3,22	19,67	11,50	4,20	6,84	55,71	33,24
Semi-peripheral regions											
Centre	8,29	7,75	12,96	4,30	3,33	17,22	13,86	0,92	15,83	55,88	27,37
Bsse_Nor	8,65	7,93	13,34	3,83	3,11	18,60	13,55	8,28	14,50	42,90	34,32
P_d_l_Lo	7,43	8,73	13,06	4,57	2,49	18,99	11,04	2,21	20,12	43,75	33,92
Aquitain	5,72	7,18	14,02	5,18	3,32	18,67	14,89	0,89	15,81	50,94	32,37
Auvergne	6,77	6,63	12,42	4,10	2,58	18,66	14,71	4,11	33,28	39,07	23,54
Peripheral regions											
Bretagne	8,36	8,92	15,15	4,63	3,42	19,30	16,64	1,33	10,90	45,64	42,13
Poitou-C	8,49	8,30	14,93	4,40	3,68	17,34	15,84	0,45	10,44	51,52	37,60
Midi-Pyr	6,57	7,85	14,74	4,69	3,76	20,27	16,51	5,73	9,70	48,14	36,42
Limousin	7,15	7,88	13,60	4,33	3,24	18,83	16,41	1,33	8,74	57,44	32,49
Languedo	9,75	8,69	14,24	5,69	3,52	21,30	17,09	5,87	9,67	45,65	38,80
Prov-CdA	3,22	9,54	16,80	7,72	3,73	21,51	17,11	4,22	12,53	57,85	25,40