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THE INDUSTRY LOCATION IN SPAIN: NEW METHODS FOR MEASURING INDUSTRIAL AGGLOMERATION

Abstract

A range of quantitative techniques have been employed by researchers in economic geography and other social science disciplines to measure and, spatially, define agglomerations of industrial activity. However, the application of these techniques in the literature results in a low consistency level. Because of this, new quantitative techniques have introduced solutions to solve the problems founded in the location's analysis.

One of these problems is the discrimination between geographic concentration arising from individual plants locating near to each other and that due to the concentration in an industrial structure. A relevant limitation of traditional location indices is the absence of data about the differences in the size distribution of firms between geographic units. Recent papers by Ellison and Glaeser (1997) and Maurel and Sédillot (1999) have proposed indices designed to measure agglomerations or geographic concentrations in excess of that which would be expected given industrial concentrations. These measures are all based on the distribution of activity over discrete geographic units.

Another problem is the use of arbitrary cut-off values for determining what level of industrial specialization defines an agglomeration. O'Donoghue and Gleave (2004) have proposed a new measure, the 'standardized location quotient (SLQ)', which recognizes agglomerations as being comprised of locations with statistically significant location quotient values for the industry/activity under analysis.

In the empirical analysis the municipality, the micro level of administrative regions (NUTS-5) in Spain, will be used as territorial unit. The data will be provided by the Industrial Register (Ministry of Industry, 2000) that contains information about the population of production plants in Spain at two and/or three-digit industry level. This includes the location of the plant (given by municipality), the plant's three-digit industrial classification and the number of employees.

So, the objective of this work will be to identify spatial agglomerations within the Spanish industrial sectors using all these new contributions to the spatial analysis and, as a secondary objective, to compare the difference of the results obtained with each quantitative technique. The results will offer a wide view of the geographic concentration and agglomeration of industrial activity in Spain.

Keywords: industrial agglomeration, spatial concentration, new techniques.

JEL: L60, O18, R12

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1. Introduction

The development of new forms of industrial organization is a process associated to changes in the spatial definition of the territory. One of this new forms is the industrial district as an agglomeration of a high number of small enterprises (and, in a lower number medium enterprises) of the same industrial sector in a local geographic area.

The phenomenon of the industrial districts (and the associated concept of local productive systems) has been studied by researchers of the economic and geographic field. And related with the concept of industrial district or local productive system is the question about how to identify and measure this type of industrial concentration in the territory.

This question arises because the definition and delimitation of the territorial boundaries of the industrial districts is, nowadays, not complete. Several studies, in the past, have used provincial or regional data; actually, it's more accurate to use data at local level. The results of the empirical studies about the evidence of the different social and economic development in the Italian regions since the 70's imply to avoid the use of the trust and intuition in order to identify industrial districts. So, it becomes necessary the use of a significative research unit in the process of identification of industrial districts.

So, a local productive system can be described as an area with a high level of specialization of the industry and the significative absence of a big enterprise, that is, there is a prevalence of small enterprises (and medium but with a lower relative weight). What are the advantages of these areas? The presence of highly specialized enterprises in a geographic area can generate positive externalities in order to influence in the location of new enterprises. In fact, the know-how, the economic and technical relationships between enterprises and entrepreneurships or the nearby to the markets are

competitive factors that can be supported and promoted if the public administration through the creation of an enterprises network of institutions as training centres or technological centres.

The following analysis is based in an exhaustive statistic work with the objective of identifying the agglomeration of specialized enterprises in one economic sector. This first analysis will allow us to approach to an identification of the local productive systems based in their specialization and a high density of enterprises of the same sector.

This paper is structured in three parts. In the first part, we review the main aspects of the theory about the industrial organization model based in the spatial concentration of specialized small and medium enterprises. In the second part, we present the main indicators about the spatial concentration of the economic activity and the most used methodologies in the identification of local productive systems and industrial districts. In the third part, we analyse the industrial location in Spain using the new contributions to the spatial analysis and, as a secondary objective, to compare the results obtained with each technique.

2. The industrial district: an industrial organization model.

The crisis of the massive production system, also called fordism production, moves the attention of the researchers to a new industrialization model based in the differentiation of the product. Basically, the evolution of the production organization from the internal to the external coordination of small and medium enterprises is produced inside a territory characterized by the presence of local institutions and a local labour market. And therefore, the territorial division of the productive activity contributes to the growth of some small and medium sized towns and also of some rural areas (Piore and Sabel, 1990). According to this, some authors studied the unusual dynamic of regional economies where the weight of the industry was higher than in other regions of the world. Some of these regions were called “industrial districts” (Pyke and Sengenberger, 1992, 13), retrieving a concept first introduced by Alfred Marshall at the beginning of the XX century. In Marshall’s analysis of the industrial district, the small enterprises can get the same advantages, in terms of scale economies, as a big enterprise if they are concentrated

in a specific territory, the production process is divided in phases and there is only one local labour market.
So, the Marshallian argument defends the relation between the economic success of a national economy and the development of specialized industrial concentrations and it's based in his studies about the British economic growth and its leadership during the XIX century founded in the development of several industries, located and concentrated in concrete areas of the United Kingdom as the cotton textile industry in Lancashire, the cutlery industry in Sheffield or the machinery industry in West Midlands.

Following with his contributions, Marshall adds the idea of "industrial atmosphere" into the location theory and he defines it as a group of formal and informal customs, practical and traditions related with the industry and integrated in the social and cultural background of the area. This concept, that is so abstract and can't be estimated, is a key factor for the industrial region because, Marshall argues, generates advantages in production and commerce.

But these contributions of Marshall didn't have continuity because the successful development of the fordism way of production. His ideas about the industrial districts would be recovered in the 70's with the analysis of the Italian regional development carried out by Giacomo Becattini. In his analysis, Becattini founds several integrated territorial systems, in the so called "Third Italy" (North-East-Centre), with a predominance of small enterprises. And these enterprises are part of traditional industrial sectors as textile, clothing, footwear or furniture. In these areas, the indicators as the growth rate of add value, investment, productivity and employment shows the industrial dynamism (Triglia, 1993, 216). The following contributions of authors as Bellandi (1986), Sforzi (1987, 1992), Triglia (1993) or Brusco (1992) help to expand, mainly in Southern Europe, the concept of industrial district not only in the economic field but also introduce this concept into the programmes of policy-makers.

Becattini (1992) defines the industrial district as a social and territorial entity characterized by the active presence of a social community and a group of enterprises located in a natural and historically established area. This social community has a homogeneous system of values and perspectives (same dialect, customs, expectations...). These values are spread through the district and through generations by the customs and

the institutional system (markets, enterprises, technical schools or universities, unions, political parties, entrepreneurships associations...). Also, the relationships face to face are very common and, this way, the people interact every day developing a common culture developing rules of trust and mutual character (reciprocity).

Therefore, in the industrial district definition, the concentration, in a specific area, of specialized enterprises has a positive influence in the local community and gets high levels of confidence and cooperation in the industrial sector. That is the reason why the industrial districts compete with the rest of the sector's enterprises trying to offer a high level of quality and innovation.

Therefore, the local community is the place where the social and cultural environment is born and influence in the industrial organization adopted. However, an industrial concentration in a geographical area is not enough to recognize the existence of an industrial district (Sforzi and Lorenzini, 2002).

Alternatively to the industrial district, Porter introduces the concept of "cluster" as the natural union of enterprises of a concrete sector with other industries or related sector. In this enterprises' union there are surrounding a high number of support services companies generating synergies, externalities, cooperation and technology diffusion; and with all these characteristics, the cluster can obtain competitive advantages.

The difference between the industrial district and the cluster is the presence, in the first, of a complex system of interdependences; that is, the industrial district is an industrial organization model with economic, social and cultural dimensions where the industry has relationships not only between the enterprises and entrepreneurships but also with the society and policy-makers.

With these elements, the industrial districts have been analysed in order to understand how the relationships inside them are and how the information and innovations are diffused. This diffusion is easily done because of the relationships network of the industrial district based in confidence and trust; this allow to the industrial district to design, in common, technological strategies to compete in the global markets. So, the

territorial dynamism of the industrial districts depends not only on the economy but also in the social and cultural relations between people and enterprises.
As we said before, a simple concentration of enterprises in the territory were not enough to be considered as an industrial district. In fact, the birth and growth of an industrial district means the synthesis of variables like technology or markets within a specific territory. Thus, this is how the competitive advantages are generated inside the industrial districts. In short, the competition not lies in the company, resides in the activity carried out by the whole industry of the area. So, if there are competitive elements in the territory, the companies will find their competitive skills.

And, so, the territory becomes in a crucial factor for the success of the industrial district and its quality is essential in the appropriate mixture of the technology with a concrete culture, the enterprise's discovery of the appropriate environment, the transformation of competition into cooperation in the market. This mixture moves the economic forces and this is how the industrial district's society evolves.

Thereby, the territorial dimension is recovered in the basic structure of the economic thought (Becattini and Rullani, 1996). And most of the literature comes from Italian researchers who study the NorthEast and Middle Italian industrial districts and after the investigations were extended to other countries. The works by the International Institute of Labour Studies (IILS) in their "New Industrial Organization" programme deal with a wide range of historical, theoretical, empirical, political and institutional aspects related with the industrial districts. Other works, also, had as objective to study the relevancy of the industrial district principles in order to achieve the economic development of concrete regions and the influence in the public policy. In brief, the concept of industrial district has increased the interest about to study the industrial evolution through the territory.

The use of the administrative division in the traditional analysis of the productive activity is one of the main problems at the early stages. This is because if an industrial organization model based in flexible specialization, as the industrial district, the election of the administrative division as a spatial unit can't be correct.

In this sense, the enterprises have relationships not only with others in the same town but also in closer towns, inside their region, or, also, in the whole country. In fact, Sforzi finds

that the industrial district has its own spatial unit. This unit is determined by the interdependences between enterprises and the society, so, the industrial district can be considered as spatial unit useful for the economic analysis.

The methodologies applied have tried to delimitate the industrial district in the territory in order to use it as an alternative and significative analysis unit in front of the traditional use of the industrial sector and the enterprise as main units. Next, we review the main contributions in the field of the spatial analysis.

3. Spatial concentration indices of the economic activity.

The identification of an industrial concentration in the territory is a first stage in the process of industrial districts' analysis. The industrial sectors with a high weight in the total employment of that sector concentrated in nearby municipalities are candidates to be an industrial district.

In the economic literature are several indices to analyse the territorial concentration of the economic activity as the Gini index, the Hirschman-Herfindhal index, the location coefficient and the Ellison-Glaeser index. But it's important to highlight the difference in the results when these indices are calculated in different territorial environments, so, the analysis unit may be the key when we study the dynamic of the industrial concentration.

In the empirical works about the analysis of the spatial distribution of the manufacturing activities and their location dynamics, it can find a consensus about the use of local units as the most suitable analysis unit. In some of the studies carried out in United States conclude that the State isn't it the correct analysis unit because of its size. In Spain, De Lucio (1998) indicates how the analysis done using the province may be not significative because of the difference between these administrative units in size and spatial distribution of the economic activity. So, the differences between the administrative divisions used in the economic statistics are an important restriction when the objective is to use other analysis units.

In fact, the industrial district can't be restricted spatially to a region or a concrete town. In the district, all the enterprises interact with the society, and it doesn't depend on the territorial administrative division. So, the industrial district is a system of towns with a

certain concentration of labour specialized in one sector. With this definition, the municipality, as administrative unit, doesn't reflect the local economic area, so, it would be useful to consider a territorial unit of analysis between the municipality and the province. This way, the idea of economic unit would be represented in a better way.

One way to solve this problem would be to use the concept of local labour markets because delimitates the economic areas in relation with the movements of the workers from their homes to their works. For the Spanish case, this concept hasn't been used because the no availability of regional data. Another option is using techniques to collect the influence of the space in the location of the industrial activities adding, in the valuation of the territorial concentration index, information of the closer geographical areas.

The indices above mentioned describe the location of a geographical area, municipality or province without references about its spatial location and analyses the territorial units as isolated units without any connexion with its closest areas. This way, it was impossible to estimate if the employment level in a concrete area was influenced by the employment level of a nearby area, resulting in a productive area specialized in one sector. However, it's possible to calculate indicators that reflect, in a more realistic way, the concept of a significative economic area. These indicators are the spatial autocorrelation used in the spatial econometrics. These indices add the neighbouring areas of the municipality in order to calculate the spatial concentration of the productive activities and, therefore, allow to contrast if it's significative the influence of the neighbour areas in the territorial distribution of the activity in one municipality. One of these indicators is the I Moran autocorrelation statistic that shows if the location of an economic variable in the territory is influenced by the existence of the same activity in neighbour areas.

The Ellison-Glaeser index, that we will used in the empirical analysis, introduces the establishments' size as a variable and, also, establish the employment level in one area weighted in relation with the total employment level of the territory. This index is defined as follows:

$$\gamma_{EG} = \frac{\sum_{i=1}^{M}\left(s_i^2 - x_i^2\right) - \left(1 - \sum_{i=1}^{M} x_i^2\right)^2 H}{\left(1 - \sum_{i=1}^{M} x_i^2\right)\left(1 - H\right)}$$

with si (i=1,…,M) = share of industry's employment in region I; xi (i=1,….,M) = share of total employment in region i and $H = \sum_{j=1}^{N} z_j^2$ is the Herfindahl-Hirschman index of the plant size distribution.

Another contribution to the spatial analysis is the proposal of Maurel and Sédillot (1999). This index was designed to measure agglomeration, that is, a geographic concentration in excess of that which would be expected given industrial concentration. The empirical index proposed by Maurel and Sédillot is defined as:

$$\hat{\gamma} = \frac{G - H}{1 - H}$$

where H is the industry Herfindahl index defined as:

$$H = \sum_{j=1}^{N} z_j^2$$

and z_j is the share of plant *j* in total industry employment, given *N* plants in the industry. G is part of the Ellison-Glaeser index's definition above seen and is defined as:

$$G = \frac{\sum_{i=1}^{M} s_i^2 - \sum_{i=1}^{M} x_i^2}{1 - \sum_{i=1}^{M} x_i^2}$$

where s_i is the share of total industry employment in region *i* and x_i is the proportion of aggregate employment in region *i*.

So, the Maurel-Sédillot index has two components: G as a measure of the geographic concentration and H reflecting industrial concentration. In general, this index represents the difference between the two components and, therefore, the degree of geographic concentration in excess of that which is due to industrial concentration.

O'Donoghue and Gleave (2004) introduce a new measure, the "Standardized Location Quotient" (SLQ), based in the Location Quotient (LQ). The LQ measures the ratio

between the local and national percentage of employment in a concrete industrial sector. If the value of LQ is 1, the local area has the same percentage of employment than the national average for that industrial sector. If and industry has a high weight in the total employment of the local area then the LQ value will be more than 1 and less than 1 in the opposite situation. When the objective is to identify local productive systems, industrial districts or clusters the problem is which the LQ cut-off value is for defining one of them. In several empirical works, the authors define, arbitrarily, the cut-off value.

Also, the LQ doesn't provide information about the absolute size of the local industries. Trying to solve these problems, O'Donoghue and Gleave propose the SLQ based on aggregate data and solving the problem of the cut-off value for LQ introducing the 5% confidence level for the statistically significant residuals. The SLQ would be calculated as follows: first, LQ is estimated for the industry analysed at the defined aggregation level; secondly, the LQ values are tested using the Kolmogorov-Smirnov test in order to know if these values has a normal distribution at the 5% confidence level. If the distribution is not normal, the LQ values can be transformed logarithmically. And, finally, in a third step, the LQs must be converted into z-values. This way, the identification of the locations with an exceptional industrial concentration will be done when the residual values lie beyond 1.96 standard deviations from the mean. As O'Donoghue and Gleave argue the cut-off is not arbitrary because it represents the 5% level of statistical significance, a level really used by the researchers. So, the results obtained by this methodology can be named the SLQ. Also, the authors consider that if the LQ distributions are, in general, asymmetric a one-tailed approach can be used and, therefore, the significative locations would be those with a z-value over 1.65.

4. The measuring of the industrial agglomeration in Spain

The aim is to study the industrial agglomeration in Spain using the Ellison-Glaeser index, the Location Quotient (LQ) and the Standardized Location Quotient (SLQ) proposed by O'Donoghue and Gleave. Through the estimation of these indexes we will obtain the industrial sectors with a high concentration of one activity in the Spanish territory. Using sectorial and municipality data for the whole country, we will estimate the indexes mentioned above. As a preliminary result, we can say that the industrial sector of manufacturing of office machinery and computers will be selected for a special study as the most concentred in the territory.

In the first phase, the Ellison-Glaeser index will be estimated due to this index takes into account the establishments' size as a variable and, also, establishes the employment level in one area weighted in relation with the total employment level of the territory. In a second phase, we choose the industrial activity with the high value for the Ellison-Glaeser index (EG) and, then, with the data associated to this sector we will calculate the LQ and the SLQ in order to classify the municipalities considering their LQ and SLQ values.

The sectorial classification of the industry we use in this analysis is the classification of the Spanish National Institute of Statistics (INE) with a level of division of two-digits and three-digits. This classification establishes 23 industrial sectors at two-digit level and 103 activities if we consider a three-digit division. All these categories have their correspondence with the Statistical Classification of Economic Activities in the European Community (NACE) revised in the 2002.

The database is provided by the National Industrial Register of the former Science and Technology Ministry (nowadays, Ministry of Industry) for the year 2000. The structure of this database is very useful for the researcher because provides individual information for each industrial enterprises, so, secondary variables can be calculated or estimated about number of establishments and industrial employment using the municipality as the smallest spatial unit.

As spatial unit, it will be used the municipality, that is, the local level (NUTS-5). Exactly, we will consider the municipalities with, at least, one industrial establishment in the analysis' period. Therefore, the analysis will be stressed in 7001 municipalities of more than 8000 that compose the Spanish municipalities map.

In the Table 1 a two-digit division is used for the 23 industrial sectors (that includes 103 industrial activities) and the EG index is classified in four quartiles in order to know the industrial sectors with the highest values at the fourth quartile. In this sense, if we observe the column for the last quartile there are two significative groups of industrial sectors. The first group is composed by those sectors with the highest value for Q4 which means that most of the activities in these sectors (that is, considering a three-digit

division) are highly concentrated in the territory. These industrial sectors would be Manufacture of tobacco; Manufacture of wearing apparel; dressing and dyeing of fur; Tanning and dressing of leather, manufacture of luggage, handbags, saddlery, harness and footwear; Publishing, printing and reproduction of recorded media; Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of office machinery and computers and Manufacture of radio, television and communication equipment and apparatus. In a second group, we can include those sectors with a significative value for Q4, meaning that there is a high proportion of enterprises of these activities that have a high EG index value, as Manufacture of textiles and textile products, Manufacture of chemicals and chemical products, Manufacture of machinery and equipment n.e.c. and Manufacture of furniture; manufacturing n.e.c. Finally, in the last column, the range for the EG index values vary from a negative value (-0.0075) to the maximum at 0.1845.

In Table 2 we use a three-digit division in order to deep in the knowledge about the information provided by the EG index. In fact, from the 103 industrial activities included in the three-digit division we only analyse those with an EG value over the average EG for the whole industry. So then, if the average of the EG index is 0.0204, the industrial activities with a higher value are presented in this Table 2. As we can see, only 24 of 103 industrial activities have an EG value over the average. In first place, we find the manufacture of office machinery and computers with an EG value of 0.1845, which is the maximum value for Q4 in the Table 1.

Considering the industrial activities with the highest values we can highlight that there are two types of industrial activities. First, those included in the industrial activities related with the high-technology as manufacture of office machinery and computers, manufacture of man-made fibres or manufacture of aircraft and spacecraft. And, in a second group, we can include those activities where the weight of small and medium-sized enterprises (SMEs) is very high as textile weaving, manufacture of ceramic tiles and flags or manufacture of footwear. In these activities, several studies have analysed the existence of industrial districts or local productive systems due to this significative weight of the SMEs.

Because of the secondary objective of this work were the use of the methodology proposed by O'Donoghue and Gleave, we select the industrial activity with the highest

EG value and we estimate the Location Quotient and the Standardized Location Quotient in order to know in which municipalities there is a high concentration of this activity.

The results appear in Table 3 for the manufacture of office machinery and computers. The structure of the table shows, first, the level of employment and the participation of each municipality in the total employment level (measured in percentage). The other three columns show the results for the LQ, the logarithmic transformation of the LQ values and, finally, the Z-values associated to them, that is, the SLQ as defined by O'Donoghue and Gleave. The municipalities have been classified by their SLQ value and we take the cut-off value of 1.65 to establish those municipalities with the highest concentration of the office machinery and computers manufacturing. Also, in the Graph 1 and Graph 2, it can be observed the distribution of the LQ and SLQ (z-values). As we can see, the transformation of the LQ values provides an asymmetric distribution, so, as we have said in the section 2, the selected cut-off value has been 1.65.

The results show that the municipalities of Toledo (Castilla-La Mancha Region), San Fernando (Andalusian Region), El Escorial (Madrid Region) and La Pobla de Vallbona (Valencian Region) have their SLQ value over the 1.64 cut-off value. These four municipalities concentrate the 25% of the total employment.

As we can see, the main municipality is La Pobla de Vallbona in the Valencian Region. In this territory, is concentred almost the 20% of the total employment of office machinery and computers manufacturing and its SLQ value doubles the Toledo' SLQ value.

In conclusion, using this new methodology we can analyse the concentration of the industry and the results are consistent with those obtained with other methodologies (see Santa María, Giner and Fuster, 2004, for the application of other methodologies).

Conclusions

In conclusion, the analysis of the industrial agglomeration in Spain shows how the industry is, in general, concentred in the territory. If we consider a two-digit division of the industrial activity we have found that several traditional industries as the textile industry are very concentrated in the territory and this situation is associated with the existence of industrial districts or local productive systems (Santa María, Giner and Fuster, 2004). But if we take a three-digit division of the industrial activities we can conclude that there is an industrial concentration of activities associated to high-technology industry (as the activity analysed with the estimation of the LQ and SLQ) but also of activities associated to traditional manufactures as textiles or wearing apparel.

We have found that using the Ellison-Glaeser index, the results show how several industries are highly concentrated in the territory and these activities are associated to traditional and high-tech activities. In an analysis based in a three-digit division we have found the same conclusion because the first six industrial activities are or traditional activities or related to medium-high technology activities. So, the high weight in number of enterprises and employment level shows the importance of these sectors in their own territories and, so, these areas have a high specialization in these industrial activities.

Finally, we have tried to study the industrial agglomeration in the Spanish territory applying new methodologies; however, to acquire more knowledge about these areas it is necessary to combine these quantitative methodologies with other qualitative methods with the objective of understanding why these industrial activities are so concentrated in the territory.

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Table 1. Ellison-Glaeser Index with two-digit division of industrial activities.

CNAE2	INDUSTRIAL ACTIVITY	Nº CNAE3	Q1	Q2	Q3	Q4	
15	Manufacture of food products and beverages	9	22,2	44,4	22,2	11,1	100,0
16	Manufacture of tobacco	1	0,0	0,0	0,0	**100,0**	100,0
17	Manufacture of textiles and textile products	7	0,0	0,0	57,1	42,9	100,0
18	Manufacture of wearing apparel; dressing and dyeing of fur	3	0,0	33,3	0,0	**66,7**	100,0
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	3	0,0	0,0	0,0	**100,0**	100,0
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	5	0,0	60,0	40,0	0,0	100,0
21	Manufacture of pulp, paper and paper products	2	0,0	50,0	50,0	0,0	100,0
22	Publishing, printing and reproduction of recorded media	3	0,0	0,0	33,3	**66,7**	100,0
23	Manufacture of coke, refined petroleum products and nuclear fuel	3	0,0	33,3	0,0	**66,7**	100,0
24	Manufacture of chemicals and chemical products	7	28,6	28,6	14,3	28,6	100,0
25	Manufacture of rubber and plastic products	2	100,0	0,0	0,0	0,0	100,0
26	Manufacture of other non-metallic mineral products	8	25,0	37,5	25,0	12,5	100,0
27	Manufacture of basic metals	5	0,0	80,0	20,0	0,0	100,0
28	Manufacture of fabricated metal products, except machinery and equipment	7	85,7	14,3	0,0	0,0	100,0
29	Manufacture of machinery and equipment n.e.c.	7	28,6	28,6	14,3	28,6	100,0
30	Manufacture of office machinery and computers	1	0,0	0,0	0,0	**100,0**	100,0
31	Manufacture of electrical machinery and apparatus n.e.c.	6	50,0	0,0	50,0	0,0	100,0
32	Manufacture of radio, television and communication equipment and apparatus	3	0,0	0,0	33,3	**66,7**	100,0
33	Manufacture of medical, precision and optical instruments, watches and clocks	5	40,0	0,0	40,0	20,0	100,0
34	Manufacture of motor vehicles, trailers and semi-trailers	3	0,0	66,7	33,3	0,0	100,0
35	Manufacture of other transport equipment	5	20,0	20,0	40,0	20,0	100,0
36	Manufacture of furniture; manufacturing n.e.c	6	33,3	0,0	33,3	33,3	100,0
37	Recycling	2	50,0	50,0	0,0	0,0	100,0
Total		103	24,3	25,2	25,2	25,2	100,0
		Minimum	-0,0075	0,0042	0,0091	0,0190	
		Maximum	0,0041	0,0086	0,0186	0,1845	

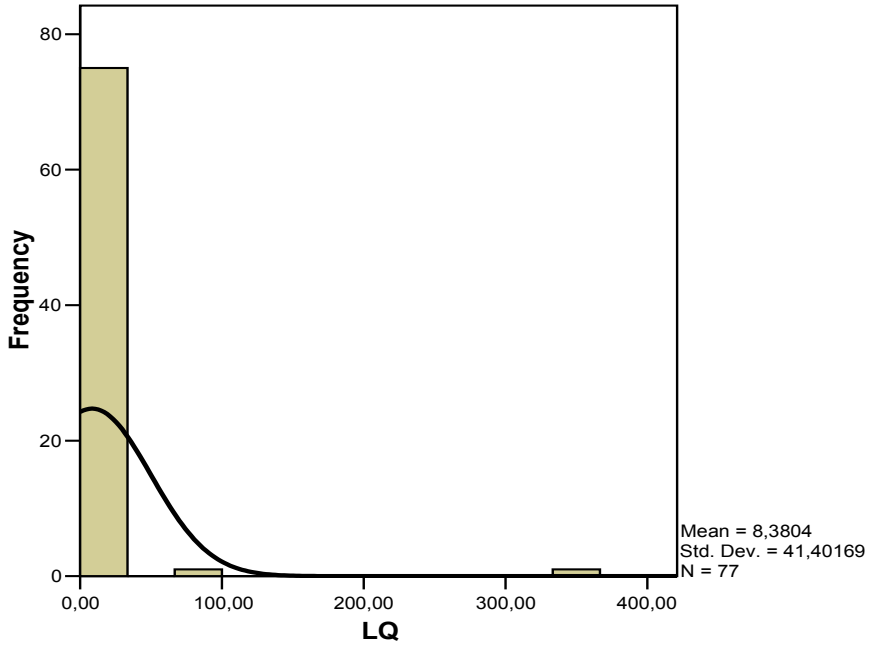
Source: Industrial Register (2000) and authors elaboration.

Table 2. Ellison-Glaeser Index with three-digit division of industrial activities.

CNAE	INDUSTRIAL ACTIVITY	EG
300	Manufacture of office machinery and computers	0,1845
223	Reproduction of recorded media	0,1533
172	Textile weaving	0,1112
263	Manufacture of ceramic tiles and flags	0,0959
296	Manufacture of weapons and ammunition	0,0882
193	Manufacture of footwear	0,0875
247	Manufacture of man-made fibres	0,0759
353	Manufacture of aircraft and spacecraft	0,0751
221	Publishing	0,0740
362	Manufacture of jewellery and related articles	0,0608
183	Dressing and dyeing of fur; manufacture of articles of fur	0,0554
192	Manufacture of luggage, handbags and the like, saddlery and harness	0,0542
173	Finishing of textiles	0,0507
365	Manufacture of games and toys	0,0491
181	Manufacture of leather clothes	0,0474
160	Manufacture of tobacco products	0,0417
232	Manufacture of refined petroleum products	0,0339
294	Manufacture of machine tools	0,0310
233	Processing of nuclear fuel	0,0310
331	Manufacture of medical and surgical equipment and orthopaedic appliances	0,0310
322	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	0,0309
244	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	0,0236
323	Manufacture of television and radio receivers, sound or video recording or reproducing apparatus and associated goods	0,0226
153	Processing and preserving of fruit and vegetables	0,0212
	AVERAGE	0,0204

Source: Industrial Register (2000) and authors elaboration.

Graph1. Distribution of the LQ values



Graph 2. Distribution of the SLQ values (z-values)

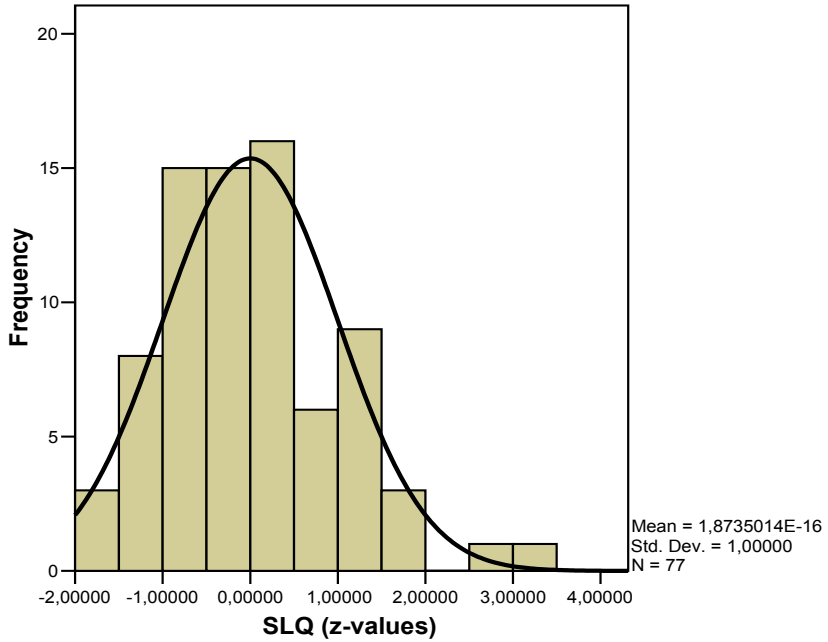


Table 3. LQ and SLQ values for Manufacture of office machinery and computers.

MUNICIPALITY	TOTAL EMPLOYMENT	% EMPLOYMENT	LQ	Ln(LQ)	Z-VALUE (SLQ)
38 MUNICIPALITIES	534	8,5	<1		
BADALONA	34	0,5	1,01	0,01	-0,09
VILLANUEVA DE LA SERENA	2	0,0	1,03	0,02	-0,08
VALENCIA	98	1,6	1,05	0,05	-0,07
AZUQUECA DE HENARES	7	0,1	1,20	0,18	0,01
EIVISSA	2	0,0	1,23	0,21	0,03
GETAFE	30	0,5	1,23	0,21	0,03
LEGANES	22	0,3	1,35	0,30	0,08
MASSANASSA	4	0,1	1,37	0,31	0,09
POZUELO DE ALARCON	5	0,1	1,56	0,45	0,17
TORTOSA	7	0,1	1,77	0,57	0,25
GETXO	3	0,0	1,93	0,66	0,30
PAIPORTA	11	0,2	2,02	0,70	0,32
HUESCA	13	0,2	2,03	0,71	0,33
PALMA DE MALLORCA	69	1,1	2,07	0,73	0,34
TARRAGONA	32	0,5	2,17	0,77	0,37
CAMARGO	18	0,3	2,18	0,78	0,37
LEON	23	0,4	2,38	0,87	0,42
SANT VICENC DELS HORTS	17	0,3	2,68	0,99	0,50
VILLANUEVA DEL PARDILLO	1	0,0	2,69	0,99	0,50
COLMENAR VIEJO	22	0,3	3,00	1,10	0,56
ALCOBENDAS	67	1,1	3,48	1,25	0,65
MOLINS DE REI	19	0,3	3,50	1,25	0,65
ZAMUDIO	27	0,4	3,99	1,38	0,73
ANDOAIN	28	0,4	4,07	1,40	0,74
FUENTE EL SAZ DE JARAMA	4	0,1	5,40	1,69	0,91
TORREJON DE ARDOZ	159	2,5	6,26	1,83	1,00
COSLADA	81	1,3	6,81	1,92	1,05
MELILLA	18	0,3	7,38	2,00	1,10
EIBAR	121	1,9	7,60	2,03	1,12
FOIOS	15	0,2	8,69	2,16	1,20
TORRES DE LA ALAMEDA	12	0,2	10,28	2,33	1,30
BOECILLO	5	0,1	10,33	2,34	1,30
MADRID	3028	48,0	10,67	2,37	1,32
CERDANYOLA DEL VALLES	103	1,6	12,21	2,50	1,40
CASTELLBISBAL	179	2,8	15,97	2,77	1,56
TOLEDO	**173**	**2,7**	**19,18**	**2,95**	**1,67**
SAN FERNANDO	**65**	**1,0**	**22,21**	**3,10**	**1,76**
ESCORIAL (EL)	**16**	**0,3**	**78,73**	**4,37**	**2,52**
POBLA DE VALLBONA (LA)	**1230**	**19,5**	**357,00**	**5,88**	**3,43**
	6304	100,0			

Source: Industrial Register (2000) and authors elaboration.