THE DYNAMIC EVOLUTION OF PROXIMITY EFFECT: A STUDY ON THE PRODUCTIVITY IN TEXTILE INDUSTRY

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Abstract

This paper tests the evolution of the relationship between localization and proximity and your effect for a sample of 10,490 Spanish textile firms in the period 2001-06. Using coefficients of specialization two levels of geographical disaggregation are distinguished: (i) the provincial cluster; and (ii) the industrial district.

The results obtained show a positive and significant impact of the specialization level on productivity, both for industrial districts and provincial cluster (in this case only when the levels of specialization are high enough). In general, the effect is higher for industrial districts than for provincial cluster, although in both cases it decreases over time. Given that in most EU countries the textile industry has a tendency to be geographically concentrated in industrial districts, the results carry important strategic and policy implications.

Key words: globalization, district effect, specialization coefficient, productivity, textile-apparel industry.

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1. INTRODUCTION

The role of localization and proximity for manufacturing firms has been studied since Alfred Marshall. According to Marshall (1890), the organization of an industry around a geographical concentration could bring certain advantages to firms located in that concentration, to which outsider firms would not have access. Those advantages would stem from three main factors: a pool of skilled labour, infrastructures and entrepreneurship. In turn, they would originate higher rates of innovation, higher levels of commercial development and higher productivity.

Among the extensive work of sociologists, geographers and economists on the determinants, formation and impact of proximity effect, two important contributions are those of M. Porter and G. Becattini. Porter (1990, 1998), the proponent of the concept of "industrial cluster", analysed the productive specialization of certain territories that were mostly delimited following a politic or administrative criterion, such as the tile cluster of Sassuolo (Italy). Using this example, he observed that the competitiveness of individual firms was higher in a cluster because it depended on several factors that were specific to the actual territory where the firms were located, such as: a) the conditions of access to labour force or infrastructure, b) the conditions of demand and their dynamics, c) the complementary and support sectors and d) the strategic rivalry between firms, which depends on the conditions existent in the cluster. The work of Porter has since been the basis of subsequent studies and has been used to guide economic policy (McDonald, 2007; Zourek, 2007).

Simultaneously, Becattini (1979, 2004) proposed a unit of analysis called "industrial district". It was defined as a reality characterized by a geographically defined area and centred around a type of production mainly composed of a large number of SMEs, a flexible organization of production that allows satisfying a differentiated demand and strong linkages between economic and non-economic (sociological, cultural and ethical) factors. This geographic area would go beyond a strict concentration of firms along

geographical and sectorial dimensions to incorporate a sociological component. To sum up, units defined like this wouldn´t have to coincide with some other arbitrary or administrative delimitation, and also it would involve an additional factor, which is the strong presence of that activity in the area. Therefore, in line with some other works, the industrial district could be viewed as a particular type of cluster (i. e. Hervás-Oliver and Albors-Garrigós, 2008).

The work of Marshall, Porter and Becattini originated a noticeable growth of research on the topic in the last 15 years, which has been directed at a number of strands: a) conceptualization and typologies of the territories, sometimes not very clear (Gordon and McCann, 2000), b) characterization of "preconditions" for its emergence (Soler and Hernandez, 2001), c) the analysis of the effect caused by this concentrations (Signorini, 1994ab; Molina-Morales and Martinez, 2004) and d) the study of the evolutionary dynamics of this effect or influence in this particular territories (Cairncross, 1997; DeMartino et al. 2006; Sedita and Belusi, 2009).

Nevertheless, empirical research related to this topic is still scarce and confusing; in some sense, it is due to the dynamism of the changes in the competitive environment, and also because of a more static view of the proximity effect (Becattini, 2002). The previous literature in business presents this weakness, which is especially noticeable for two reasons: 1) the role of localization and proximity is being questioned and 2) in most EU countries the manufacturing industry tends to be geographically concentrated in industrial clusters/districts.

With the objective of testing the evolution and the sign of the relationship between localization and proximity and your effect of firm performance, this paper analyzes a sample of 10,490 Spanish textile firms in the period 2001-06. The choice of sector (textile industry) and time period reflects a context of rapid change following the end of the World Trade Organization's system of quotas in this industry (2006 was the last year for which data was fully available in the SABI database). Using coefficients of specialization two levels of geographical disaggregation are distinguished: (i) the province level (provincial cluster); and (ii) the township level (industrial district). The results obtained carry important academic, strategic and policy implications.

2. CONCEPTUAL BENCHMARK

Recently, the issue of localization and proximity of economic activity has again been highlighted in academic literature (Dei Ottati, 2002; Mc Donald et al. 2007). This renewal of interest has been fostered by the economic miracle of some geographical agglomerations, such as the Silicon Valley or the *Terza Italia*, but also by strategic considerations. On one hand, it was suggested that certain production systems could minimize the obstacles faced by small firms. On the other hand, it was recognized that higher openness to imports from low-wage countries would require more flexible production models. These issues are of particular concern in the textile industry, typically characterized by being located in spatial agglomerations (Goglio, 2002). As Table 1 shows, the level of concentration found in Europe is very high. Moreover, Italy and Spain have the largest number of NUTS2 regions in the European Union Top20, according to the number of textile firms presented in the NUTS2 region.

Table 1: Top20 of EU-15 NUTS2 regions in number of textile firms (2001-05)

Region	Firms	Region	Firms
1. Catalunya (ES)	3943	11. Campania (IT)	949
2. Lombardia (IT)	3800	12. Puglia (IT)	919
3. Toscana (IT)	2832	13. Leics, Rutland & Northants (UK)	861
4. Norte (PT)	2623	14. Piemonte (IT)	845
5. Ile de France (FR)	2074	15. West Vlaanderen (BE)	707
6. Comunidad Valenciana (ES)	1920	16. West Yorkshire (UK)	701
7. Veneto (IT)	1595	17. Castilla La Mancha (ES)	676
8. Outer London (UK)	1590	18. Galicia (ES)	645
9. Emilia Romagna (IT)	1315	19. Greater Manchester (UK)	641
10. Comunidad de Madrid (ES)	961	20. Lazio (IT)	590

Source: own elaboration based on Eurostat (2007), *SABI-Amadeus (2008).*

However, due to the important challenges that industrial clusters/districts are facing nowadays (Cairncross, 1997; DeMartino et al. 2006; Sedita and Belusi, 2009) a discussion about the role played this units is arising. The source of those challenges can be found in the fast and unstoppable advances in information technologies, market deregulation and large reductions in transport costs, which together constitute what is commonly called globalization (Dicken, 2003). Put together, these aspects define a new and more intensely competitive scenario and, in this way, globalization has become one of the phenomena that better explains the recent slowdown in some traditional industrial sectors in the EU (Buckley and Ghauri 2004). On the other side, an emergent part of the research is warning about the fact that these geographic areas are losing their influence

due to the effect of globalization; and although these works consider industrial districts as dynamic units that evolve in time and space (Sedita and Belussi, 2009), there is barely a real effect on manufacturing activities like textile industry.

One of the most influential contributions in the study of the proximity effect is the research from Signorini (1994ab), based on a sample of 500 textile firms, of which two-thirds were located in the Prato-Biella area (Emilia Romagna). Using data from the firm registry (Central de Balances), Signorini investigated the level of specialization, size, profitability and productivity of district firms and concluded that geographical concentration had a positive impact on those variables.

Recently, studies have generalized the findings of Signorini about the rewards of the geographical proximity and have established that, within a particular industrial sector, the firms located in a industrial district (a particular type of cluster) have more competitive advantages than those located outside. In spite of a few critiques to the limitations of the methodology (Paniccia, 1998; Tattara, 2001; Staber, 2007), there is a large number of studies that have presented empirical evidence with respect to the configuration of industry (Steinle and Schiele, 2002), the specific social and organizational characteristics of the territory (Dei Ottati, 2002) or the superior competitiveness of the firms in a district (Bagella and Becchetti, 2000; Paniccia, 2002). Traditionally these variables have been quantified through economic and financial indicators of the firm such as productivity or profitability (Becattini 2004).

Some evidence of the district effect in the Spanish textile-apparel industry is presented by Costa and Viladecans (1999), Soler and Hernandez (2001) and Pla-Barber and Puig (2009). The first study finds a positive district effect on export intensity. The second work provides some empirical evidence for that effect on firms' efficiency and profitability. The third validates the superior international performance of textile firms located in the district of Alcoi-Ontinyent.

One of the objectives of this paper is to test the effect of the relationship between localization and performance using productivity as an indicator of performance, and geographical location (level of proximity) as the localization variable. Accordingly, the following hypothesis is formulated:

Hypothesis 1: a higher degree of geographical agglomeration of textile firms corresponds to a higher productivity.

Although the district location is expected to be a necessary condition to achieve a better performance, it may not be a sufficient one. The business environment is changing rapidly. The improvements in information and communication technologies, reduction in transport costs and market deregulation,[1] which is commonly called globalization (Dicken, 2003; Buckley and Ghauri, 2004), led some authors to talk about the "death of distance" (Carincross, 1997; DeMartino et al. 2006). As a consequence, local factors lose ground to global factors (Marques, 2005). An important argument to support this idea is that globalization weakens the formal and informal networks implicit in the district, such that, as firms become increasingly open to foreign markets, the level of integration and collaboration within the territory is reduced (Sedita and Belussi, 2009).

Besides, although industrial clusters/districts create innovative environments that reduce the intense global competition generated by deregulation, sometimes the links to firms located outside the territory are necessary to increase the probability of survival (Steinle and Schiele, 2002; Cooke and Leydesdorff, 2006). In the short run, this aspect would also debilitate your influence. Recent studies in the Spanish textile-apparel industry such as Pla-Barber and Puig (2009) have shown that the effect of territorial concentration, under the form of industrial districts, on internationalization strategy has been losing its importance. This finding could be indicating that proximity effect is having difficulties in responding to the new competitive environment.

[1] Textile trade among WTO (*World Trade Organization*) members is regulated by the Agreement on Textiles and Clothing, which replaced the Multifiber Agreement when the WTO replaced the GATT in 1995. This agreement implemented the progressive reduction of import quotas imposed by the EU and North America to a number of low-wage countries. The schedule is as follows: 16% of products in 1995, 17% in 1998 (mostly clothing articles), 18% in 2002 (again clothing articles), and the remaining 49% in 2005 (affecting more evenly different types of textiles). Due to the spectacular growth of imports from Asia in the beginning of 2005, the EU was lobbied to activate a safeguard clause and the US followed suit, so that in practice some quotas were reactivated and there is not as yet a complete liberalization in the sector.

As another of the objectives of this paper is to test the sign of the evolution of the proximity effect using productivity as an indicator of performance, the following hypothesis is formulated:

Hypothesis 2: the higher productivity related to geographic agglomerations is being eroded over time.

In this paper we argue the concept of "industrial district" differs from that of "cluster" in that the former combines important structural elements that are absent from the latter: community of people, system of relationships and the localized process of division of labour (Becattini, 1979, 2004). As the previous literature has exposed, the industrial district model allows a way of organizing production in a territory (Piore and Sabel, 1984) that helps explaining its success by means of vertical disintegration and flexible specialization of production by each firm, as well as an important network of relationships established among neighbouring firms (Lazerson and Lorenzoni, 1999; Hadjikhani and Ghauri, 2001; Dei Ottati, 2002; Pietrobelli and Olarte, 2002).

Moreover, we also argue that there is a strong link between globalization, as a dynamic environment, and performance, measured through productivity. As we have propounded, this link gives as a result what some authors named "the death of the distance" (Cairncross, 1997). Despite this fact, industrial districts have a particular model of industrial organization that makes them more efficient, flexible and innovative (Dei Ottati, 2002; Paniccia, 2002) so we can consider these districts exert a positive moderating role on the globalization, and that this effect is more significant and positive than the one produced by other type of geographic agglomerations, for instance industrial clusters. Given that our final aim is to measure the different evolution of the proximity effect using productivity as an indicator of performance, the previous argument is resumed in the following hypothesis:

Hypothesis 3: the erosion of the higher productivity related to geographic agglomerations will be less in companies located in an industrial district than in companies in an industrial cluster.

3. STUDY DESIGN

Having explained the hypotheses to be tested, this section describes the methodology used in this study. First we describe the data used, defining the population and sample selection criteria. Second, we explain the construction of geographical aggregates at two levels: (i) the province level or industrial cluster, using coefficients of specialization[2] (*CE* hereafter), and (ii) the township level, taking the coefficients of specialization and using them to identify an industrial district. Finally, we define the variables to be used and explain the techniques of analysis.

The population of the study is composed of Spanish firms in the textile-apparel sector (codes 17 and 18 of CNAE 93 and NACE Rev.1). We cannot capture data for every single firm, even with the use of primary data such as that obtained by surveys, as it is well known that not all firms respond. We can, however, attempt to have a sample that is as large and as representative as possible. The most comprehensive database existing for Spanish firms is the SABI database[3] ("Sistema de Análisis de Balances Ibérico" – Iberian System of Balance Sheet Analysis), which is compiled jointly by Bureau Van Dijk and Informa using data collected from the "Registro Mercantil" – Public Company Registry. In fact, the Amadeus database compiled by Bureau Van Dijk for European firms replicates the information contained in the SABI database for Spain and Portugal.

From this population we extract a sample based on a number of criteria. First, we define the time period as 2001-06. Our sample starts in 2001 because this year precedes the implementation of the third phase of the WTO Agreement on Textiles and Clothing

[2] The CE is a statistic that measures the presence of an activity (in this case the textile-apparel sector) in a territory with respect to the presence of that sector in the whole reference sample. It is defined as: $CE_{ij} = \frac{E_{ij} / E_j}{E_i / E_n}$, where E_{ij} is employment in sector i in location j, E_j is total employment in location j, E_i is total employment in sector i, E_n is total employment in the country (in this case Spain). A CE above 1 for a particular area indicates that area is more specialized than the sample average (in this case the Spanish average).

[3] The SABI database contains information on over 550,000 Spanish firms and 65,000 Portuguese firms of various sizes (small to large), whilst others such as the Cabsa database contains data for the 5,000 largest Spanish firms. The use of SABI brings additional advantages, such as the level of disaggregation at both the geographical and sectoral levels. Finally, the SABI database has been widely used on research about Spanish firms (Escriba-Esteve et al., 2008; Puig et al., 2009; Tomás-Miquel et al., 2009).

(ATC), details of which were given in footnote 1. The last year used in the analysis is 2006 for two reasons: on one hand, because it was the last year for which data was fully available in the SABI database; on the other hand, it is the second year of full implementation of the ATC. Second, we based our sampling on the declaration of main activity by the company, so that we considered only those firms returned under the primary code of "textiles" (subsectors 17.1 to 17.7) and "apparel" (subsector 18.2). In this way, we have excluded those firms that, although present in those subsectors, have declared another to be their main activity (for example, sales, machinery, chemicals or leather). According to the data extraction done in December 2008, the number of firms registered having their main activity in the subsectors 17 and 18.2 of the textile-apparel sector added up to 10,490 firms.

The empirical analysis is carried out for two levels of geographical disaggregation: provinces and townships. The exact area of each geographical unit was identified according to 2001 industrial employment data extracted from Spain's National Statistical Institute (Instituto Nacional de Estadística - INE) in June 2007.[4] The CEs for the Spanish textile industry were obtained from that employment data and used as independent variable at the two geographical levels already mentioned: provincial clusters and township district. The definition of provincial clusters is straightforward: provinces with CE higher than 1 (although we further distinguish those that have a CE higher than 2). The definition of industrial district requires additional criteria that are well established in the literature: a) existence of a large number of SMEs in the territory; b) sectoral specialization of the territory; c) a strong relationship between production activity and social aspects of the territory (Puig et al., 2008).

As a consequence, the first stage of the methodology is common to both levels of geographical disaggregation: identification of the main concentration areas at the province and township levels using CEs. Table 2 shows the results at the province level. There are seven provinces with specialization levels that are more than twice the average Spanish levels (among these, the highest specialization levels can be found in Toledo, Barcelona, Ciudad Real and A Coruña).

[4] As census data is taken every ten years, 2001 is the latest year for which employment data is available at the required level of disaggregation.

Table 2: Coefficients of specialization for the textile-apparel industry at the province level

Province	CE	Province	CE	Province	CE	Province	CE
Toledo	3.44	Burgos	1.16	Ávila	0.56	Huelva	0.18
Barcelona	2.59	Pontevedra	1.10	León	0.55	Segovia	0.18
Ciudad Real	2.55	Zaragoza	0.99	Sevilla	0.55	Las Palmas G. C.	0.17
A Coruña	2.53	Málaga	0.98	Zamora	0.50	La Rioja	0.16
Albacete	2.41	Córdoba	0.89	Valladolid	0.48	Cádiz	0.15
Alicante	2.14	Palencia	0.83	Cantabria	0.41	Ceuta-Melilla	0.11
Girona	2.07	Tarragona	0.81	Badajoz	0.40	Navarra	0.08
Valencia	1.64	Cuenca	0.80	Guadalajara	0.37	Guipúzcoa	0.04
Orense	1.58	Soria	0.80	Lugo	0.37	Madrid	0.04
Teruel	1.39	Cáceres	0.76	Asturias	0.31	Vizcaya	0.03
Jaén	1.27	Granada	0.71	Murcia	0.29	Álava	0.02
Lérida	1.27	Huesca	0.69	Baleares	0.26		
Castellón	1.23	Salamanca	0.67	Almería	0.19		

Source: own elaboration based on INE (2004).

Table 3 shows similar results at the township level. Given the number of townships, the table only presents those with a CE higher than 10. This threshold is regarded in the literature as indicating high dependency (O'Donoghue and Gleave, 2004). At the township level, Barcelona, Alicante and Valencia (B, A, and V) townships are well-represented. Other provinces with the highest CEs in Table 2 (for example, A Coruña) are not visible in Table 3 and so do not meet the requirements for the existence of a true industrial district.

Table 3: Coefficients of specialization for the textile-apparel industry at the township level (for CE>10)

Township	CE	Township	CE	Township	CE
Villafranca del Cid (CS)	29.98	Olost (B)	17.15	Igualada (B)	11.67
Banyeres de Mariola (A)	28.25	Hostalric (GI)	15.73	Avinyó (B)	11.51
S. Bartomeu del Grau (B)	28.15	S. Marg. de Montbui (B)	14.01	Beneixama (A)	11.49
Agullent (V)	27.52	Òdena (B)	13.77	Velada (TO)	11.48
Albaida (V)	24.45	Sonseca (TO)	13.60	Bihar (A)	11.31
Bocairent (V)	19.96	Alcoy/Alcoi (A)	12.75	Mataró (B)	10.86
Ontinyent (V)	19.30	Montaverner (V)	12.68	Mediona (B)	10.83
Prats de Lluçanès (B)	19.10	Canals (V)	12.56	Alfarrasí (V)	10.78
Atzeneta d´Albaida (V)	18.90	Alcúdia Crespins (V)	12.51	Tordera (B)	10.76
Vilanova del Camí (B)	18.56	Aielo de Malferit (V)	12.44	Anglès (B)	10.74
Muro de Alcoy (A)	18.08	Navarcles (B)	11.94	Crevillent (A)	10.61
Cocentaina (A)	17.99	Pobla de Lillet (B)	11.78	Cercs (B)	10.61

Source: own elaboration based on INE (2004).

For the establishment of an industrial district, the second step in the analysis, geographical continuity is important (Sforzi, 1990), as without this territorial element

the criterion of tight social networking cannot realistically be met. In Table 3, one of the most relevant geographically continuous aggregate in Spain is composed of Agullent, Albaida, Alcoi, Banyeres de Mariola, Bocairent, Cocentaina, Muro and Ontinyent. Together, these townships form the industrial district of Alcoi-Ontinyent[5].

The objective of the paper is the study of the influence of geographical proximity on productivity (the dependent variable). SABI provides direct data for this variable, which is defined as the contribution of employees towards the final account results and is calculated by the following formula:

$$\frac{\text{Sales - Costs of Goods Sold - Other Operating Expenses}}{\text{Cost of Employees}}$$

This variable has been chosen in accordance to our hypotheses and has also been used in a large number of previous studies of the "district effect" (Signorini, 1994b; Soler and Hernandez, 2000; Brasili and Ricci, 2001; Becattini and Dei Ottati, 2006). The independent variables of interest, also represented in our hypotheses, correspond to the geographical units described in Tables 2 and 3 and are operationalized by means of two indicator variables: (i) provincial cluster, taking the value 2 if CE>2, 1 if 1<CE<2, and 0 otherwise; (ii) industrial district, taking the value 1 if a firm is located in the industrial district and 0 otherwise.

[5] This area is located into two different provinces of the Comunidad Valenciana region (Alicante and Valencia) with CEs of 2.14 and 1.64, respectively. The Alcoi-Ontinyent industrial district had previously been identified in the literature (Ybarra, 1991; Cluster Competitividad, 1999; Puig, 2007; Tomás-Miquel et al., 2009). This district employs over 15,000 people (8.5% of total employment in the Spanish textile-apparel sector and 9.5% of the sample firms).

4. HYPOTHESES TESTING

In order to test the two hypotheses explained previously we start by carrying out a correlation analysis for the period 2001-06. The analysis of the evolution of the correlation between productivity and geographical proximity gives an indication of the uneven effect of globalization on firms that agglomerate geographically to varying degrees (whether in provincial clusters or in industrial districts). This is even more important if considering that the sample period has brought the worldwide liberalization of trade in textiles and clothing due to the phasing-out and, in 2005, the end of the WTO Agreement on Textiles and Clothing (WTO, 2008).

The mean productivity[6] and its correlation with the CE at province level for each sample year are shown in Table 4. Although mean productivity had been decreasing between 2001 and 2005, there seems to be a recovery in 2006, with an increase in mean productivity. However, this being the last year of the sample, we cannot state whether the trend of the previous five years was finally reversed or whether 2006 is an outlier. Moreover, Table 4 shows that between 2001 and 2004 the correlation between productivity and specialization was positive and significant.

Table 4: Means and correlations of productivity

Year	Mean	Correlation with CE
2001	0.265	0.054**
2002	0.232	0.044**
2003	0.205	0.034**
2004	0.182	0.033**
2005	0.165	0.016
2006	0.180	0.018

** significant at 5%.

Source: own elaboration based on SABI (2008).

Hypothesis 1 established a positive relationship between the level of geographic specialization and productivity. Table 5 considers three groups at the province level (low, medium and high specialization) and two at the township level (firms located in the Alcoi-Ontinyent industrial district or outside). The results in Table 5 show that the mean productivity of those manufacturers located in more specialized provinces is significantly higher and similarly at the township level. Hence they support Hypothesis 1.

[6] Productivity is logged as customary in the literature in order to preserve statistical properties (log-normality) which are necessary for regression analysis.

Table 5: Means testing for productivity according to specialization levels

	Province level			Township level	
Year	**Low**	**Medium**	**High**	**Non-District**	**District**
2001	0.215	0.263*	0.291**	0.251	0.411**
2002	0.181	0.240*	0.256**	0.219	0.364**
2003	0.162	0.224**	0.223**	0.194	0.327**
2004	0.145	0.188*	0.201**	0.171	0.314**
2005	0.140	0.165*	0.178*	0.154	0.274**
2006	0.147	0.217**	0.187*	0.170	0.282**

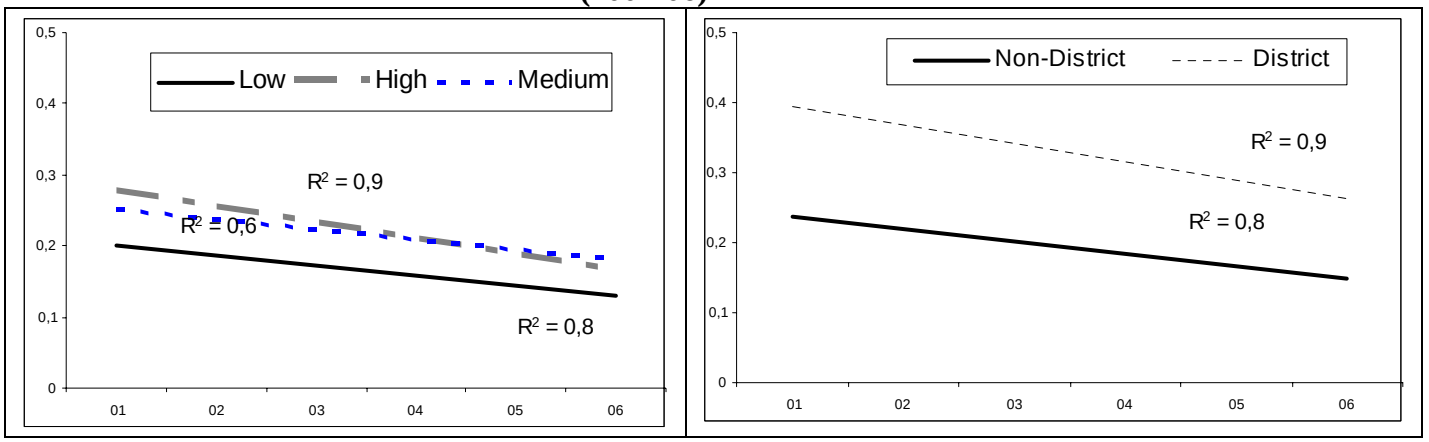
Mean difference with the least specialized group as comparison: ** significant at 5%; * significant at 1%.

Source: own elaboration based on SABI (2008).

Hypothesis 2 stated that the advantages of agglomeration were being eroded over time. Hypothesis 3 proposed that industrial districts suffered this erosion in a lesser extent than clusters. Given the worldwide liberalization process in the textile sector during the sample years, changes in manufacturing firm performance are expected over time as adjustments to globalization take place (Nassimbeni, 2003; Buxey, 2005). The results in Table 5 for each year in the sample also support the hypothesis 2: the degree of correlation between agglomeration and productivity decreases over time as globalization advances. Although industrial districts show a much better productivity, they also suffered a highest rate of erosion in 2001-06 (0.41 to 0.28 (-46.4%)).

The data of Table 5 is represented graphically in Figure 1 (R^2 is a goodness-of-fit measure). Although productivity is always higher in more specialized areas, the difference decreases over time.

Figure 1: Evolution of the correlation between productivity and specialization (2001-06)



Source: own elaboration based on SABI (2008).

The main critique that can be made to the correlation analysis above is that other factors that may influence productivity in textile industry are not being accounted for (Puig et al., 2009). To overcome this critique, multiple regression analysis is used to see if the results obtained still persist after accounting for those other factors. The variables in the SABI database that could be used as controls are: subsector, experience,[7] internationalization, assets, and number of employees. The last three are highly correlated with experience, as shown in a test of partial correlation. Besides, when including experience, internationalization, assets, and number of employees separately, experience has the highest coefficient, so we include experience in the results presented here and exclude the other three variables. Additionally, we consider five subsectors but in this paper each subsector dummy coefficient is defined as a deviation from the sample average. The subsector and experience are important controls, as the distribution of firms inside and outside the agglomerations differs according to subsectors and experience, and more substantially for the subsectors than for experience (Table 6).

Table 6: Distribution of firms inside and outside agglomerations according to subsector and experience

Controls	Province level			Township level	
	Low	Medium	High	Non-District	District
Subsector 1	8.0%	17.8%	22.6%	14.8%	47.9%
Subsector 2	4.3%	5.3%	9.7%	7.0%	11.3%
Subsector 3	18.2%	22.8%	13.8%	15.8%	24.8%
Subsector 4	4.4%	9.2%	11.7%	9.2%	7.8%
Subsector 5	65.2%	44.8%	42.3%	53.2%	8.3%
Experience	12.4	13.2	14.3	13.4	15.9

Source: own elaboration based on SABI (2008).

The results of a panel regression are shown in Table 7 for 2001-06. Taking into account the subsector of activity does decrease the magnitude of the impact of geographical agglomeration, whether the geographical unit is the province or the township. However, the agglomeration effect remains significant.

[7] Experience is measured as the number of years the firm has been in activity.

Table 7: Panel regression for productivity (2001-06)

	Province level			Township level		
	(1)	(2)	(3)	(1)	(2)	(3)
1< CE < 2	0.058*** (0.016)	0.039** (0.016)	0.039** (0.016)			
CE > 2	0.066*** (0.012)	0.047*** (0.012)	0.046*** (0.012)			
District				0.137*** (0.019)	0.104*** (0.019)	0.103*** (0.019)
Subsector 1		0.053*** (0.011)	0.051*** (0.011)		0.047*** (0.011)	0.044*** (0.011)
Subsector 2		-0.066*** (0.016)	-0.066*** (0.016)		-0.064*** (0.016)	-0.065*** (0.016)
Subsector 3		0.014 (0.011)	0.015 (0.011)		0.008 (0.011)	0.009 (0.011)
Subsector 4		0.052*** (0.014)	0.052*** (0.014)		0.061*** (0.014)	0.061*** (0.014)
Subsector 5		-0.054*** (0.009)	-0.051*** (0.009)		-0.051*** (0.009)	-0.049*** (0.009)
Experience			0.001** (0.000)			0.001** (0.000)
Constant	0.133*** (0.009)	0.161*** (0.011)	0.145*** (0.013)	0.167*** (0.005)	0.184*** (0.007)	0.168*** (0.010)
Observations	38965	38965	38965	38965	38965	38965
Number of firms	8957	8957	8957	8957	8957	8957
Chi-square test	33.47***	120.84***	126.05***	54.06***	134.25***	139.53***
Regression method: panel regression with random effects. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%						

Source: own elaboration based on SABI (2008).

Table 8 shows how this effect has changed from year to year using the preferred model from Table 7 (model 3, which accounts for the subsector of activity and firm experience, and shows the highest chi-square test). Only the coefficients of interest are shown in Table 8, but those of control variables do not change qualitatively.[8] The results show that, when other factors that influence productivity are accounted for, a high level of geographical agglomeration is required for this variable to have a significant impact on productivity. The impact is strongest at the township level, although it shows a tendency to be eroded over time (table 8.B). A similar tendency is detected at the province level, although with a weaker impact that is not always significant for coefficients of specialization lower than 2 (table 8.A).

[8] The full results are available from the authors.

Table 8: Cross-sectional regression for productivity (province or township coefficients controlling for differences in subsector and experience)

	2001	2002	2003	2004	2005	2006
A: Provincial level (Industrial Cluster)						
1< CE < 2	0.019 (0.018)	0.039** (0.019)	0.046** (0.019)	0.027 (0.020)	0.012 (0.021)	0.057** (0.025)
CE > 2	0.041*** (0.014)	0.052*** (0.014)	0.045*** (0.015)	0.039** (0.016)	0.033** (0.016)	0.031* (0.019)
Number of firms	6604	7113	7059	6733	6417	5039
F-test	25.66***	14.23***	9.24***	7.61***	6.50***	4.77***
B: Township level (Industrial District)						
District	0.110*** (0.020)	0.110*** (0.022)	0.111*** (0.023)	0.118*** (0.025)	0.100*** (0.025)	0.087*** (0.028)
Number of firms	6604	7113	7059	6733	6417	5039
F-test	33.28***	18.50***	12.95***	11.75***	9.50***	6.22***
Regression method: OLS with robust standard errors. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.						

Source: own elaboration based on SABI (2008).

5. CONCLUSIONS

This paper investigated the impact of geographical agglomeration on productivity for a traditional manufacturing industry (textile-apparel) in a country (Spain) where this type of manufacturing has had great importance from the economic, social and political point of view. This is done for a period of intense liberalization in the textile sector (2001-06). Two levels of geographical disaggregation are distinguished: provinces and townships. We consider the existence of clusters in provinces with coefficients of specialization (CE) higher than 1 and further distinguish those with CE higher than 2. We define an industrial district as a particular type of cluster that is observed for very high specialization levels (CE > 10) in contiguous townships, forming a continuous geographical space that is very specialized in the textile industry.

The results from correlation and regression analysis show that firms located in highly specialized geographical areas are more productive, although when controlling for the various textile subsectors and firm experience we find that the level of territorial specialization has to be high enough for the effect to exist. For this reason, we argue that an organizational model based in industrial district is much more competitive than in a cluster. These findings have some important implications both for executives, and scholars: the concept of cluster at the province level is not sufficient and agglomerations should be defined at a finer level of territorial disaggregation, such as the township level. In this case, the concept of industrial district becomes more relevant as it meets more stringent criteria. As a consequence, those studies that look at clusters at a less disaggregated geographical level are likely to find weaker support for the advantages of agglomeration. It is only at the very local township level that these advantages become apparent.

On the other hand, the paper shows, as suggested in the work of Becattini (2002), Dunford (2006), Pla-Barber and Puig (2009) and Sedita and Belussi (2009), that the agglomeration advantage is dynamic. Hence, globalization can either strengthen or, as is found here, weaken the advantages of agglomerating. We find that the influence of agglomeration on productivity decreases over time, although less in clusters than in industrial districts.

In spite of this last result, and as a general conclusion of this research, we consider that the replication of the organizational model of the industrial district can be recommended at the strategic level. This strategy implies the specialization in core competencies in order to gain flexibility and the cooperation between enterprises and institutions (Technological Institutes, Associations of Entrepreneurs, Universities, etc). This proposal is compatible with other actions such as a greater commitment to international markets, international subcontracting and others described in Giuli (1997), Stenng (2001), IFM (2007) or Zourek et al. (2007).

If globalization is changing the district and cluster effects in the textile industry over time, as our results show, it seems clear that at the policy level it would be advisable to support those strategies institutionally and to favour the adjustment of industrial districts in terms of employment levels and creation of conditions that enhance competitiveness. For example, the development of cooperation programmes or the promotion of information and communication technologies would allow higher levels of flexibility and innovation. Additionally, the textile sector in Spain is highly concentrated and it is a labour-intensive sector that employs a large number of workers. Hence, the survival of textile districts impacts also on the economic performance of the regions where they are located, in terms of employment and income. At this level, there is a role for regional policy to support regional development through instruments such as the European Fund for Regional Development and the European Social Fund (Oxelheim and Ghauri 2004).

In particular, they can be used to attract knowledge-intensive multinationals to the district and increase cooperation between them and local firms, in this way turning globalisation and localisation into complements and allowing local firms to move up the value-chain into more knowledge-intensive subsectors. The establishment of selective linkages with external firms is particularly important during periods of rapid technological change or intense global competition, but at the same time district firms need to take a collective approach to those linkages so that their complementarities with the district persist (Cooke and Leydesdorff, 2006; DeMartino et al., 2006).

These results are naturally subject to a number of limitations concerning the data and the definition of geographical areas of agglomeration. Firstly, our conclusions were derived from a sample of Spanish firms in the textile sector. We do not know if the

results can be generalized to other countries and traditional manufacturing sectors, although some evidence points in that direction. Secondly, the delimitation of the clusters and especially of the industrial district remains to some extent arbitrary, although there is no guidance in the literature as to what is the threshold of specialization for a geographical unit to be considered to be inside a district, or whether those thresholds should be weighted with respect to population or type of industry. A future step will be to test the robustness of our results in other traditional sectors (for example, footwear) and other countries (for example, Italy or Portugal). This can also be done for more recent years as data becomes available. And finally, the data do not offer information about other key competitiveness factors in the textile sector, such as innovation, that should be considered in future research. Other information, such as detailed data on costs and revenues, which would allow us to disentangle the causes of the evolution of productivity, is not available either. These questions remain for future research.

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