NEW PRODUCT DEVELOPMENT AND ABSORPTIVE CAPACITY IN

INDUSTRIAL DISTRICTS. A MULTIDIMENSIONAL APPROACH.

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ABSTRACT

This research studies to what extent the absorptive capacity of a firm influences its capacity to exploit new opportunities through new products, particularly in a specific context of industrial districts. We use a multidimensional approach to the absorptive capacity concept to distinguish between identification, assimilation and exploitation of external knowledge. We have studied the population of companies belonging to a Spanish textile district. Findings suggest that information and knowledge which a company receives from external sources provide the company with the necessary abilities to innovate. In our case, the greater the absorptive capacity, the greater the innovation capacity for the company.

KEYWORDS: Absorptive capacity, Knowledge, Industrial district, Innovation, New Product Development

JEL Classification: R11, O18

DESARROLLO DE NUEVOS PRODUCTOS Y CAPACIDAD DE ABSORCIÓN EN DISTRITOS INDUSTRIALES. UNA APROXIMACIÓN MULTIDIMENSIONAL.

RESUMEN

El presente trabajo estudia el efecto de la capacidad de absorción en la empresa sobre el desarrollo de nuevos productos, dentro de un contexto de distrito industrial. Utilizamos una aproximación multidimensional para el concepto de la capacidad de absorción con el objeto de distinguir entre la identificación, asimilación y explotación de conocimiento. Hemos trabajado con empresas pertenecientes al distrito industrial textil español. Los resultados sugieren que las externalidades que la empresa recibe en forma de información y conocimiento de su entorno, junto a las habilidades internas necesarias, benefician su proceso de innovación. De forma particular, el desarrollo de la capacidad de absorción en la empresa favorece su capacidad innovadora.

PALABRAS CLAVE: Capacidad de absorción, Conocimiento, Distrito industrial, Innovación, Desarrollo de nuevos productos

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1. INTRODUCTION

During the last few decades, authors have argued the need for a new paradigm for a firm's strategy based on knowledge (GRANT, 1991). Creation, dissemination and exploitation of knowledge have become critical processes for firms. These arguments have also led to a lot of research focused on the strategic relevance of Knowledge Management. Knowledge management processes mean that certain organizational capacities must be enhanced. Among these capacities, we have focused on those which can be collectively called absorptive capacity. This notion was originally proposed by COHEN and LEVINTHAL (1989). As the same authors argued later (COHEN and LEVINTHAL, 1994) to invest in absorptive capacity allows a firm to forecast technological trends as well to exploit new opportunities, obtaining in this manner time advantages with respect to competitors.

Although we agree that a broad literature on the topic already exists, in our opinion a great number of research questions have yet to be properly addressed. This paper aims to focus on a particular inquiry: to what extent absorptive capacity of the firm influences its capacity to exploit new opportunities through new products, particularly in a specific context such as industrial districts (BECATTINI, 1979). We believe that specific characterization of the industrial district justifies this as a valid field for a study like ours, and we feel that we can contribute to the pool of knowledge on this area.

We have structured the paper as follows: first, we have described the theoretical framework of the research and stated the derived hypotheses. Second, we have described the Spanish textile industrial district in Valencia as the object of the survey. Then, we have presented our results and finally we have discussed them in light of the characteristics of the industrial district.

2. THEORETICAL FRAMEWORK

2.1. The industrial district

The industrial district is a concept that defines a territorial agglomeration of firms. For the purposes of this research we used the definition of BECATTINI (1990: 39) who defined it as a socioeconomic entity characterized by the active presence of a community of people and a population of firms within a natural and historically bounded area.

In this way, the district can be understood as a network of inter-organizational relationships where physical proximity and sense of belonging are decisive elements facilitating trust, reciprocity and other common values (ANTONELLI, 2000). The abovementioned conditions mean that firms in the district share a number of capacities. In fact, capacities are not exclusive to one individual firm but to some extent they are shared between all members of the district. Thus, it can be said that they are "public goods" inside the district. These shared or collective capacities lead the whole district to build their own mechanisms to identify external changes and access new ideas or new opportunities. Local institutions such as local universities, technological institutes and so on, can play the role of the intermediary agents between external sources and internal firms. For instance, MCEVILY and ZAHEER (1999) found an association between the

development of the competitive (innovative) capacities of firms in a cluster and the closeness of the links between firms and the local (regional) institutions.

As a consequence, within the district knowledge resources flow easily, reducing search costs (MASKELL, 2001). Emulation mechanisms and trust and reputation conditions in districts mean that the exploitation of knowledge dynamics differentiate them from individual and isolated firms. In fact, district mechanisms facilitate the learning process, generating beneficial effects for companies that are part of a district.

However, in spite of the importance of the aggregated or district level it sometimes leads to the belief that the individual firm level has no relevancy. On the contrary, firms must design distinct strategies to adapt or complement to operate under district conditions. In fact, although firms enjoy similar easy access to opportunities and services from institutions, it is also true that not all firms possess the adequate dynamic capacities to exploit them and reach the same level of innovation.

Accordingly, some authors have explained how industrial districts can be considered as local configurations characterized by mutual trust, cooperation and entrepreneur spirit. Moreover they are composed of a large number of small local enterprises with specialized and complementary competencies (SAXENIAN, 1994; DAKHLI and DE CLERCQ, 2004).

Recently in district literature authors have postulated different paths for the transformation of the districts. Most have been in favour of opening the district up to external sources and carrying out substantial internal restructuring (BELUSSI et al., 2008). A double-route for district activities in which firms are involved can be identified. Some of these activities may move parts of the district outward, while new

firms come to substitute migrant firms. Firstly, district firms should establish and renew links with external global networks. For instance SAMMARRA (2005) and BIGGIERO (2006) proposed a selective relocation of activities outside the district. Others have proposed a shift from the conventional Marshallian to a new better adapted, hub-and-scope, type of district (GUERRIERI and PIETROBELLI, 2006). Secondly, internally, districts must be able to foster new high added-value activities in order to keep their attractiveness. In fact, a lot of firms must abandon their current activities and product portfolio, and engage in new ones (CORÒ and GRANDINETTI, 1999; HUMPHREY and SCHMITZ, 2002; CHIARVESIO et al., 2003).

This transformation affects districts, meaning that firms may vary significantly in terms of resources and output, putting aside past internal homogeneity (BOSCHMA and TER WAL, 2007). Authors argue the existence of subnetworks inside the districts, with significant differences in terms of network structure characterization (GIULIANI, 2002; GIULIANI and BELL, 2005; MORRISON and RABELLOTTI, 2005). In fact, different company knowledge bases mean companies perform different roles in knowledge networks. In addition, BATHELT et al. (2004) argued against the simplistic association between tacit knowledge for local linkages and explicit knowledge for external linkages, proposing the notion of local buzz and global pipelines to better identify the two categories of knowledge.

The degree of openness of a district is inevitably tied to the degree of extra-district openness of its member firms and institutions. At a district level, the district's absorptive capacity can be defined as the capacity of a district to absorb, diffuse and exploit knowledge external to the district (GIULIANI, 2002; GIULIANI and BELL, 2005; MORRISON, 2008). In districts, consequently external knowledge lies not

merely outside the firm's absorptive capacity (COHEN and LEVINTHAL, 1990), but lies outside both the firm and the district.

2.2. The concept of absorptive capacity

To manage knowledge in firms means the development of a number of dynamic capacities which can be conceptualized as absorptive capacity (COHEN and LEVINTHAL, 1989). Knowledge can be used without relevant costs (LANE et al., 2006) only because firm has already developed abilities related to absorptive capacity (COHEN and LEVINTHAL, 1989).

The concept of absorptive capacity has been defined by COHEN and LEVINTHAL (1989) as the ability of a firm to identify, assimilate and exploit knowledge of the environment. These abilities are extended in COHEN and LEVINTHAL (1990) adding abilities related to the commercial application of the acquired knowledge. Later, COHEN and LEVINTHAL (1994) provided a redefinition of absorptive capacity as an ability which goes further than just exploiting knowledge and includes the ability to anticipate precisely future technological advances. The authors showed that investments in absorptive capacity were associated with a firm's ability to predict technological paths as well as new opportunities, consequently obtaining time advantages with respect to the competition (LANE and LUBATKIN, 1998; VAN DER BOSCH et al., 1999; ZAHRA and GEORGE, 2002).

2.3. Absorptive capacity and innovation

COHEN and LEVINTHAL (1989) referred to the central importance of R&D investment to both generate innovations and develop abilities related to absorptive capacity. In fact, previous research, such as TILTON (1971), EVENSON and KISLEV

(1973), ALLEN (1977) or MOWERY (1983) has considered external knowledge acquisition as a result of R&D. In particular, these authors have analyzed the influence of the R&D effort on access to latest technology as well as on assimilation of new technology for firms.

Although knowledge and innovation come from both internal and external sources, recently certain external factors have received greater attention. These factors refer to external knowledge which firms can receive from the environment in which these firms operate (VAN WAARDEN, 2001). However, exploiting this requires an appropriate absorptive capacity (NIETO and QUEVEDO, 2005).

We can argue that acquisition and use of external sources of information and knowledge, improve when they are exploited appropriately. As a result firms may benefit in terms of development of new products, in particular, those which allow it to improve its competitive position against competitors in the market.

3. HYPOTHESES

We analyze all three dimensions of absorptive capacity and innovation in the context of an industrial district as a single entity. We understand absorptive capacity as defined by COHEN and LEVINTHAL (1989) as the ability to acquire external information and knowledge, and to assimilate and exploit it for commercial purposes. As a consequence we expect that the greater the capacity to assimilate and exploit knowledge, the greater the company's capacity to innovate (STOCK et al., 2001)

Although frequently in the literature we find absorptive capacity defined as one dimensional, we have considered it to be a multidimensional concept, and divided it into three separate dimensions. It now becomes interesting since each of the dimensions

requires distinct organizational processes and thereby we can observe the nature of each of them separately.

Innovation is understood as knowledge converted into new products, processes or services (or significant changes in the existing ones). In particular we consider new product development as a specific type of innovation (DEEDS et al., 2000; TSAI, 2001; YLI_RENKO et al., 2001). Previous research overall has identified a number of factors which directly influence new product development. These include effective internal firm communication, product characteristics and labor organization (BROWN and EISENHARDT, 1995). Specifically, in the literature evidence of association between absorptive capacity and development of new products can be found. Indeed, new product development can be considered to be a good indicator of innovation.

In conclusion, based on the abovementioned arguments, we consider absorptive capacity to be composed of three basic dimensions: identification, assimilation and exploitation. In the context of an industrial district strong interactions between firms makes it particularly interesting to individualize the effect of each of these individual characteristics which absorptive capacity consists of.

3.1. External knowledge identification and innovation

External knowledge identification refers to the capacity of a company to localize and acquire critical external knowledge for its activity. That first dimension can be assimilated to the notion of competitive scanning (MCEVILY and ZAHEER, 1999) which has been associated with the innovative capacity of the firm. Strategic planning means controlling and analyzing the environment to detect there both opportunities and threats.

The capacity of identification is influenced by several factors such as: prior knowledge that a firm has available (COHEN and LEVINTHAL, 1990), as well as, knowledge derived from recent scientific research (ZAHRA and GEORGE, 2002). These routines possess three attributes which have influence on absorptive capacity: intensity, speed and direction. Thus, while the intensity and speed determine quality in the acquisition capacity, direction affects the company's lines of research to obtain external knowledge.

District firms have particular conditions in order to identify external knowledge. Currently, firms in districts in many cases have no direct access to external networks. The existence of a number of local institutions and leading firms supporting the whole district can act as gatekeepers being intermediaries between firms inside and external networks (MALIPIERO et al., 2005).

Without doubt, a company's capacity to identify external knowledge is directly associated to its innovative capacity and consequently with its capacity to create new products. As more and better knowledge sources emerge, the greater the possibility to exchange and combine knowledge associated with innovation.

We can formulate the following hypothesis

Hypothesis 1: Identification capacity will be positively associated with the creation of new products in industrial district firms.

3.2. External knowledge assimilation and innovation

External knowledge assimilation refers to those routines and processes that allow companies to analyze, process, interpret and understand the information and knowledge obtained from external sources (SZULANSKI, 1996). One of the critical points in the assimilation process is to how resolve inconsistency between new knowledge and

existing knowledge bases. External knowledge can be found in specific contexts, but in many cases is not understood and is responded to by people that are not involved in its generation. Consequently, it is difficult to assimilate this knowledge when the firm does not have the tools to do so (TEECE, 1981).

Ability to integrate knowledge is vital for an efficient sustainability in the current environment. Information technologies (ITs) provide a function cost-efficiency for building systematic processes of acquisition, endowment and dissemination of organizational knowledge. However, to gain all the added value potential of organizational knowledge, it is not enough to adopt and exploit existing processes, it is also necessary to update knowledge bases. According to NELSON and WINTER (1982) this assimilation process is highly influenced by the tacit knowledge of the company. However, other works (CHILD, 1984) have emphasized diverse factors such as organizational structure, degree of centralization or the formalization of tasks, responsibilities, power and decisions allocation.

With respect to the industrial district and according to BECATTINI (2001), the learning process is based on contextual knowledge. Contextual knowledge is hidden from the activity where it is generated; in fact it increases with activity and its temporary, social and spatial context. Usually, this type of knowledge is difficult to describe even for the same agents involved, and hence it is also difficult to reproduce at distance, outside of the original context. Contextual knowledge is mostly tacit knowledge in nature. In districts tacit knowledge is relevant, with communities of practice, mutually mobilized organizations using synergies in knowledge searching and learning processes in a cooperative context. Technological knowledge is considered to be a collective good and it is a result of a process combining pieces of information and knowledge that are

owned by various partners. With low costs of transaction and communication, technological externalities can be exploited to establish positive feedback. In this context routines of tacit and explicit knowledge and employee training as factors related the assimilation capacity can be developed at systemic level. In conclusion, external knowledge assimilation is a critical element in the innovation process of industrial districts.

We can formulate the following hypothesis

Hypothesis 2: Assimilation capacity will be positively associated with the creation of new products in the industrial district firms.

3.3 External knowledge exploitation and innovation

COHEN and LEVINTHAL (1990) have emphasized the importance of applying assimilated knowledge. Exploitation dimension refers to routines that permit the firm to improve, enlarge, and make more efficient their existing activities, or create new ones, by means of incorporating the identified and analyzed knowledge for the firm´s activities (TIEMESSEN et al., 1997). This process means interiorizing previous knowledge to obtain new products, processes, abilities, or new firm organization (SPENDER, 1996).

At this phase, the exchanges and combinations of knowledge resources require some specific conditions and capacities related to the use of new knowledge. Consequently, high quality information is required and the capacity to share and cooperate becomes extremely important.

In industrial district literature there is great emphasis that the district should contribute to sustain the innovative capacity of firms and favor the adoption of innovations.

BELLANDI (1989; 1996) pointed out that the agglomeration of small and medium sized firms producing the same product leads to a rapid diffusion of innovation. There is a diffuse innovative capacity defined as a capacity to learn from the experience, (learning by doing), and to innovate from this, rather than an internal R&D department (learning by R&D). The existence of this innovative capacity has generated the notion of I-effect district (BOIX and GALLETO, 2008). At district level it can be defined a capacity to exploit capacity to the external knowledge (GIULIANI, 2002; GIULIANI and BELL, 2005).

We can express the following hypothesis:

Hypothesis 3: Exploitation capacity will be positively associated with the creation of new products in the industrial district firms.

4. EMPIRICAL STUDY

4.1. Setting research

Most research has used R&D intensity as measurement of absorptive capacity and has been applied in particular sectors such as biotechnology or pharmaceuticals making it difficult to generalize. Rarely have authors used other manufacturing sectors (LANE et. al., 2001). Our study is centered on the textile sector.

The textile industry is one of the oldest and most complex manufacturing industries with a great number of activities involved, from yarn production to fabric or knitwear for the final customer. The Spanish textile industry according to the Consejo Intertextil Español had about 220.000 employees, accounting for 7% of total industrial employment, and its contribution to the GDP was 4% in 2006.

In recent years, international trade liberalization and the introduction of new production technologies have allowed companies to increase the productivity of the sector and to move from existing to higher quality and added value activities. At the same time a reduction in employment occurred due to the delocalization of labor intensive activities. In particular, there is an increase in the international trade of yarns and other lower cost textile products which are now manufactured in developing countries. This has affected the domestic sector in a continuous reduction of production levels and number of firms.

Under these circumstances a new segment has appeared in the industry, the so-called textiles for technical use. This product is focused on technological characteristics, with higher R&D intensity requirements rather than aesthetical or decorative requirements as can be the case of textiles for home or knitwear. The frequent destination of these products is other industries and markets rather than traditional ones. Although the usage of technical textiles has increased significantly, not all companies are able to move from current to new technical textile. To do that, firms require certain capacities related to new product development. Thereby, we can assume that the intensity of production in these technical products can be an indicator of new product development.

Textile industrial district

The textile industry in the Valencian region is located in an industrial district in the counties L'Alcoià, El Comtat and L'Alt Vinalopo in the province of Alacant and in La Vall d'Albaida in the province of Valencia. According to the trade association ATEVAL, in 2006 about 37.700 people were employed, with a value of production of 2.150 million Euros accounting for respectively 17% and 19% of the total Spanish sector. The main products are the so-called home textiles, however, in recent years technical textile production has increased considerably.

4.2. Sample collection and data sources

The empirical study has drawn on the entire population of firms belonging to the Valencian textile industrial district. The identification of these firms has been made using ATEVAL's database.

The empirical work covered the period from July to October of 2006 and a questionnaire was the basic data source used. This primary source was complemented with two additional databases ARDAN[i] and SABI[ii] which allowed us to collect data to identify a total of 352 firms, also to control some of the questionnaire answers. Prior to general distribution we ran a pilot questionnaire with five selected respondents who we considered representative of the whole sample. Moreover, the final questionnaire was validated with the opinion of a number of expert researchers in this field.

Finally, the questionnaires responses were obtained through personal interviews to the CEOs of the companies or the R&D department managers, or by members of the research team. The empirical survey resulted in 74 complete and correct questionnaires, a rate of response of 21%. We considered this an acceptable rate and representative of the total population of firms, consequently avoiding the possible bias from non-respondent cases. At the same time the resulting sample was balanced between firms of all size segments, ages, and legal status. Finally, for the sake of simplicity we used the Likert 1-5 scale.

4.3 Variables[iii]

Dependent Variable

Innovation. New product development

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Different approaches can be used to measure a firm's innovative capacity. For several reasons many companies do not protect this knowledge by means of patents (GRANT, 1996) so instead, we follow the recommendation of TUSHMAN and NADLER (1986) who related innovation to new product, service or process creation by business units. Consequently in the context of our research we have associated innovation with the degree to which a firm dedicates its production to technical textiles, since we can assume that this segment implies new products (or a line of new products) for the textile industrial district. Consequently, we have made operative this variable by means of the percentage of products that a company produces for this segment.

Once we had collected the data, we observed some clearly marked intervals with respect to the percentage of technical textile produced by companies. Thus, in a first analysis of the responses we observed that 55% of firms produced less than 5% of this technical use textile. Whereas, 12% of the firms confirmed that the use of technical textile accounted for more than 50% of total production. For the rest of the companies, 33% were included at an interval of up to 30%, observing a lack of cases in the interval between 30 and 50%. With all observations we decided to establish 3 different groups of firms: (1) firms which produce no textile for technical use; (2) firms with combined production (technical and no technical) and finally (3) firms with an intensive manufacturing of technical textile.

INSERT FIGURE 1 ABOUT HERE

Independent variables

Many researchers continue to measure Cohen and Levinthal's absorptive capacity by means of R&D investment and effort. Thus, some measures have been established

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related to R&D investment and total sales (COHEN and LEVINTHAL, 1990; MOWERY et al. 1996; MEEUS et al., 2001; TSAI, 2001). For instance TSAI (2001) showed that R&D intensity (absorptive capacity) had influence on the innovation of the firm. However, GODFREY and HILL (1995) have suggested that there are problems using such a simple indicator for such a complex issue, since R&D investment and effort are more static resources than a process or capacity of the firm. In fact findings in some cases questioned the consistency of these indicators. For instance, MOWERY et al. (1996) and MEEUS et al. (2001) found that it was not a good predictor variable.

Finally, some relevant researchers have formulated the concept of absorptive capacity as a pool of items (SZULANSKI, 1996; JANSEN et al. 2005) in order to obtain more comprehensive measurements and to observe separately different dimensions of absorptive capacity (ZAHRA and GEORGE, 2002; COCKBUM and HENDERSON, 1998; LEONARD-BARTON, 1995).

As a result of the above revision on previous research there is no commonly accepted measurement of the concept. The research using the intensity of R&D, following Cohen and Levinthal, as measurement of the capacity, has serious limitations. For this reason rarely have these authors evaluated the role of the capacity in other areas of the company, such as management, marketing and others (LANE et al., 2001)

In our case we measure absorptive capacity following some precedents, using a multitem scale distinguishing different dimensions of the concept. Next, we describe items used for each dimension we consider.

External knowledge identification

To operationalize external knowledge identification we have created a number of items related to the location of information and intensity of R&D activities of the firm. Firstly, based on BOYNTON et al. (1994), SZULANSKI (1996) and TU et al. (2006) concerning the idea of the acquisition and updating valued knowledge for the firm, we have proposed the first item related to time expended and intensity in using information sources allocated to the localization of external information of the firm.

Items 2, 3 and 4 are related to evaluation of the degree of commitment of the company towards R&D activities. Following NIETO and QUEVEDO (2005), JANSEN et al. (2005) and TU et al. (2006), we formulate the second item, the commitment and concern of the management of the company towards R&D. In agreement with other works, MANGEMATIN and NESTA (1999), ZAHRA and GEORGE (2002), JANSEN et al. (2005) and CALOGHIROU et al. (2004), we ask respondents about R&D and the importance of cooperation for acquisition of knowledge, using the items (3) company's participation in R&D programs (at regional, national or European levels) during the last three years, and (4) percentage spent on R&D in relation to total sales (as innovation effort).

Finally in order to understand the role played by institutions in the industrial district (MOLINA, 2005) we formulate the following item (5) bonds with local institutions in order to collect useful information for the firm (trade associations, university and research institutions, authorities and so on).

External knowledge assimilation

Knowledge assimilation is related to the following four items: One item was based on LANE and LUBATKIN (1998) and JANSEN et al., (2005), referring to the intensive

use of the ICT as a means of internal accumulation and dissemination of information. In this way we asked for the use of internal information and communication systems allowing knowledge to be explicit and documented.

Next we looked for the degree to which firms generate routines to achieve adequate internal communication (SZULANSKI, 1996; JANSEN et al., 2005; TU et al., 2006). We formulate items number 7 and 8: generation of routines to joint tacit knowledge and generation of routines to generate explicit knowledge.

Finally, the education level of the employees can be considered as an indicator of the capacity to assimilate new knowledge adopted by the firm (LANE and LUBATKIN, 1998; LENOX and KING, 2004). Consequently we formulate the following item (9): adequacy of the employees' education level to understand the received knowledge.

External knowledge exploitation

Finally, the third dimension refers to the way a firm exploits knowledge from external sources. Following the idea of transformation and application of the knowledge applied to the objectives of the firm (WONG et al., 1999; JANSEN et al., 2005) and the degree of diversity between the lines of work in the firm (LANE and LUBATKIN, 1998) associating the exploitation of knowledge with the usage of the received knowledge by the firm.

In this way we formulated items 10, 11, 12 and 13, all of which related to the degree in which a firm internalizes the external knowledge analyzing the environment and adapting its strategy, in order to explore possibilities for new products and opportunities.

Control variables

The size of the firm has been frequently used as control variable. A lot of research relating to the size of the firm with innovation can be found. For instance an extensive revision can be found in KAMIEN and SCHWARZ (1975) or ACS and AUDRETSCH (1991). In consequence we can expect that larger firms can show greater absorptive capacity due to greater R&D expenditure. As a rule, size is measured by total revenue or the number of employees. A more sophisticated indicator can be used, such as for instance TSAI (2001), who proposed a sales logarithm in order to smooth the variables. Following this work we establish the control variable as the revenues logarithm of the company expressed in millions of EUROS. We accessed this data thanks to the database SABI.

4.4. Analysis techniques

We run the t-student test for a sample, testing the null hypothesis of the lack of significant differences between mean of the sample and mean of the population. First, we have displayed descriptive statistics, including mean, standard deviation, and Cronbach's Alpha for all variables. The Alpha permits control of internal consistency of scale computing the correlation of items which are included. Next, we run Principal Components Analysis to obtain an aggregation and normalization of the absorptive capacity variables in factors to avoid possible collinearity and reduce the number of items.

Finally and to test the hypotheses we run Ordered Logistic Regression model. This model meets with the characteristics of our variables since it refers to the association between a set of explanatory variables and an ordinal dependent variable, where observations follow a certain order or hierarchy. The model, also called Cumulative Logit Model, estimates the effects of independent variables on the log odds of having

lower scores with respect to higher ones on the dependent variable. We assume that categories are in discrete realization of the continuous distribution of aptitude or opinion. We also assume that it is a normal distribution. To compute all models we used statistic software SPSS version 15.0

5. RESULTS OF THE EMPIRICAL STUDY

The questionnaire respondents were the General Manger of the company in nearly 49% of the cases and other members of the Management staff for the rest of respondents. Using the Student's t-test we check possible bias between sample and population. To do that we carried out three different tests, referring to size (number of employees and total revenues) and age of the companies. We used SABI database as source of this information. The following table shows how for all three cases the associated bilateral significance is higher than 0,05, and can thus be accepted to null hypothesis if the means show equality between sample and population. Thus we can conclude there is no bias between sample and population.

INSERT TABLE 1 ABOUT HERE

Table 2 shows mean and standard deviation for all items considered for absorptive capacity. Then, we compute the Cronbach's Alpha for each sets of items related to the abilities of absorptive capacity. The measurement was free of random errors and the scale produces consistent and stable values. Although no consensus exists, MALHOTRA (1997) considered that values lower than 0,60 indicates a non-satisfactory reliability, thereby in our case the scale has a satisfactory reliability for its internal consistency and for all variables.

INSERT TABLE 2 ABOUT HERE

Factorial analysis lets us know how the initial items are grouped in factors that explain the observed correlations between variables. To test the method used we ran a contrast using the Barlett's Test of Sphericity. In this case, the values allowed us to reject the null hypothesis that these variables are not correlated with the population, confirming the validity of the factorial analysis. Kaiser-Meyer-Olkin's test on sampling adequacy is also an indicator that permits us to compare the magnitude of the observed correlation coefficients with partial correlation coefficients.

INSERT TABLE 3 ABOUT HERE

In our case, the resulting three components explained 63,5% of the variance. The solution permits us to observe interesting aspects about grouping of the items. The first group of items were related to knowledge exploitation, the second to external knowledge identification whereas the third component to knowledge assimilation. Consequently, in the next steps of the analysis we operate with these values instead of the original items.

5.1. Ordered logistic regression model

To confirm hypotheses we run the Ordered Logistic Regression Model, where absorptive capacity's dimensions are associated to innovation as dependent variable. Table 4 shows the results obtained. First of all, the overall significance is captured through the value of the chi-squared test, which contrasts the null hypothesis that coefficients are statistically different to zero. Next, the good fit indicates that the model perfectly fits with the data. And finally, values of the pseudo R-squared (McFadden's test or Nagelkerke's test) are adequate for this type of study, however, we have to be

cautious in evaluating since pseudo R-squared does not explain the variance analogically as the R-squared does in the lineal regression model.

Furthermore, table 4 shows for each independent variable the significance of its contribution to the explanation of the dependent variables. By means of Wald's test we contrast if the coefficient β is significantly different from 0. As can be observed, both Identification and Exploitation components contribute positively and significantly to innovation, thus confirming the hypotheses 1 and 3. This means that identification capacity and exploitation capacity are positively associated with the creation of new products in industrial district firms. In spite of the existence of a district effect on absorptive capacity individual company capacities are critical to explain the innovation results. On the other hand although assimilation coefficient is positive, it was not significantly associated with dependent variable, thus indicating that hypothesis 2 is not confirmed. This means that in this case the individual capacities are not significant enough to explain new product developments. Additionally, the control variable used, size, was not significantly associated to the dependent variable meaning that bigger companies are not necessarily more innovative in terms of the creation of new products.

INSERT TABLE 4 ABOUT HERE

The reasons why identification was the most significant component can be found in the district, where there are a set of local institutions which facilitate connections between firms and external networks which provide access to knowledge and information (MCEVILY and ZAHEER, 1999). Hence, these institutions mitigate search costs associated to external knowledge (MASKELL, 2001) and they play the role of intermediary for the key information knowledge for sustaining competitiveness of small

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firms (GALASKIEWICZ, 1985). This permits firms belonging to the district to benefit from an agglomeration effect to carry out identification activities.

Regarding the lack of significance of the assimilation variable, this can be explained by characteristics of the sample of most SMEs. External knowledge is located in specific contexts and is difficult to understand and replicate for people unconnected with its generation. Thus, it is fundamental to have the tools which allow such comprehension (TEECE, 1981), such as: qualified human capital, and time availability to carry out the assimilation of all the knowledge which firm is capable of gathering.

Finally, the exploitation component results are also significant. This dimension can also benefit from the district's conditions. Knowledge exploitation supposes a need to interiorize identified and analyzed knowledge (TIEMESSEN et al., 1997), being critical the firm's capacity to share and cooperate between both internal units and external firms for these purposes. In this case the context of the district permits the firm to establish mechanisms based on trust, reputation of the networks and strong ties to favor the interchange of knowledge resources (UZZI, 1996; 1997).

6. CONCLUSIONS

This research unites three fundamental aspects for company competitiveness: innovation, territory and knowledge. The paper has attempted to contrast the effect of absorptive capacity on innovation in a context of industrial district. Absorptive capacity has been analyzed through the three dimensions originally defined within the concept (COHEN and LEVINTHAL, 1989): identification, assimilation and exploitation of the external knowledge. This approach permits us to compare the weight of the each of the three abilities on firm innovation.

The industrial district, as a specific form of the industrial environment, conditions and to some extent determines opportunities and restraints which firms can find there. Abilities generally described as distinct from the individual firm, may be partially shared with other firms of the district. In our opinion, our research on absorptive capacity complements the literature on territory.

The significance of the proposed model indicates that for the context we analyzed there was a positive association between absorptive capacity and innovation supporting previous research such as LIU and WHITE (1997), VEUGELERS (1997), COHEN and LEVINTHAL (1990), STOCK et al. (2001) or TSAI (2001). However the individualized analysis of the three dimensions of the absorptive capacity has allowed to us evidence some interesting points. First, external knowledge identification has come to be the most significant component, followed by exploitation, since assimilation although showed as positive association with innovation it has not been significant.

In our opinion, the findings of this research contributes to a better understanding of the mechanisms for firms' access to new innovation and technological opportunities. Particularly, in an environment such as industrial districts, where capacities are partially shared firms should design and develop their individual capacities in a manner to obtain maximum synergies. Frequently, complementary and additive capacities of the individual firm can result in an improvement of the final capacity.

All the above reflection suggests some implications for the industrial policy. Local institutions, as well as leading firms, must favor the existence of external district links allowing access to new ideas and opportunities. This finding coincides with other works where the conclusion has been reached that government can facilitate national growth through the promotion of regional innovation (CAMAGNI, 1992). On the other hand,

individual firms must strengthen ties with both local institutions and the rest of the district participants, improving in this way the conditions of the local environment (MOLINA and MARTÍNEZ, 2004).

This work presents some limitations that we understand can limit generalization of conclusions and that are related to the specificities of the case studied. First, we have analyzed only one industry, which has allowed a better control of the effect of the industry, and has allowed us to particularize the innovation measurement based in new products. It is hard to compare the innovation measurements in different contexts or industries. However, firms are so particular that conclusions can be biased by this and are difficult replicate in other contexts. To overcome these possible limitations and as future research we propose to apply the proposed model to other contexts and districts and to carry out comparison studies. On the other hand, the existence of strong interactions between firms in the district make them an interesting subject for further research, studying the creation and development of capacities at aggregate level, individual level and interactions between them.

7. REFERENCES

ACS Z.J. and AUDRETSCH D.B. (1991) Innovation and technological change: an overview, in ACS Z.J. and AUDRETSCH D.B. (Eds) Innovation and technological change: an international comparison. University of Michigan Press, Ann Arbor, MI.

ALLEN T.J. (1977) Managing the flow of technology. MIT Press, Cambridge.

ANTONELLI C. (2000) Collective Knowledge Communication and Innovation: The Evidence of Technological Districts, Regional Studies 34(6), 535-547.

BATHELT H., MALMBERG A. and MASKELL P. (2004) Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation, Progress in Human Geography 28, 31-56.

BECATTINI G. (1979) Dal settore industriale al distretto industriale. Alcune considerazioni sull'unità di indagine in economia industriale, Revista di Economia e Politica Industriale 1, 7-14.

BECATTINI G. (1990) The marshallian industrial district as a socio-economic notion, in PYKE F., BECATTINI G. and SENGENBERGER W. (Eds) Industrial Districts and Local Economic Regeneration. International Institute for Labor Studies, Geneva.

BECATTINI G. (2001) The caterpillar and the butterfly. An exemplary case of development in the Italy of the industrial districts. Felice Le Monnier, Firenze.

BELLANDI M. (1989) The industrial districts in Marshall, in GOODMAN E. and BAMFORD J. (Eds) Small firms and industrial districts in Italy. Routledge, London.

BELLANDI M. (1996) Innovation and change in the Marshallian industrial districts, European Planning Studies 4(3), 357-68.

BELUSSI F., SAMMARRA A. and RITA SEDITA S. (2008) Managing Long Distance and Localized Learning in the Emilia Romagna Life Science Cluster, European Planning Studies 16(5), 665-692.

BIGGIERO L. (2006) Industrial and knowledge relocation strategies under the challenges of globalization and digitalization: the move of small and medium enterprises among territorial systems, Entrepreneurship & Regional Development 18, 443-471.

BOIX R. and GALLETTO V. (2008) Innovation and industrial districts: a first approach to the measurement and determinants of the I-district effect, Regional Studies, doi: 10.1080/00343400801932342. ISSN 0034-3404.

BOSCHMA R.A., TER WAL A.L.J. (2007) Knowledge Networks and Innovative Performance in an Industrial District: The Case of a Footwear District in the South of Italy, Industry & Innovation 14(2), 177-199.

BOYNTON A., ZMUD R. and JACOBS G. (1994) The influence of IT management practise on IT use in large organizations, MIS Quarterly 18, 299-320.

BROWN S.L. and EISENHARDT K.M. (1995) Product development: Past research, present findings and future directions, Academy of Management Review 20, 343–378.

CALOGHIROU Y., KASTELLI I. and TSAKANIKAS A. (2004) Internal capabilities and external knowledge sources: complements or substitutes for innovative performance?, Technovation 24(1), 29-39.

CAMAGNI R. (1992) Economia urbana: Principi e modelli teorici, La Nuova ItaliaScientifica. Roma.

CHIARVESIO M., DI MARIA L. and MICELLI S. (2003) Innovation and internationalisation of Italian districts: exploitation of global competencies or transfer of local knowledge?, Paper presented at the Regional Studies Association International Conference, Pisa, 12–15 April.

CHILD J. (1984) Organization: A guide to problems and practice. Harper & Row, London.

COCKBURN I. and HENDERSON R. (1998) Absorptive capacity, coauthoring behaviour, and the organization research in drug discovery, Journal of Industrial Economics 46, 157-183.

COHEN W. and LEVINTHAL D. (1989) Innovation and learning: The two faces of R&D, Economic Journal 99, 569-596.

COHEN W. and LEVINTHAL D. (1990) Absorptive capacity: A new perspective on learning and innovation, Administrative Science Quarterly 35(1), 128-152.

COHEN W. and LEVINTHAL D. (1994) Fortune favors the prepared firm, Management Science 40(2), 227-251.

CORÒ G. and GRANDINETTI R. (1999) Evolutionary patterns of Italian industrial districts, Human Systems Management 18, 117-129.

DAKHLI M. and DE CLERCQ D. (2004) Human capital, social capital, and innovation: A multicountry study, Entrepreneurship & Regional Development 16, 107-128.

DEEDS D.L., DECAROLIS D. and COOMBS J. (2000) Dynamic capabilities and new product development in high technology ventures: An empirical analysis of new biotechnology firms, Journal of Business Venturing 15, 211–229.

EVENSON R.E. and KISLEV Y. (1973) Research and productivity in wheat and mainze, Journal of Political Economy 81, 1309-1329.

GALASKIEWICZ J. (1985) Social organization of an urban grants economy. Academic Press, Orlando.

GIULIANI E. (2005) Cluster absorptive capacity—Why do some clusters forge ahead and others lag behind?, European Urban and Regional Studies 12(3), 269–288

GIULIANI E. and BELL M. (2005) The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster, Research Policy 34, 47-68.

GODFREY P.C. and HILL C.W. (1995) The Problem of Unobservables in Strategic Management Research, Strategic Management Journal 16(7), 519-533.

GRANT R.M. (1991) The resource-based Theory of Competitive Advantage: Implications for Strategy formulation, California Management Review 33(3), 114-135.

GRANT R.M. (1996) Prospering in dynamically-competitive environments: Organizational capability as knowledge integration, Organization Science 7(4): 375-387.

GUERRIERI P. and PIETROBELLI C. (2006) Old and new Forms of Clustering and Production Networks in Changing Technological Regimes: Contrasting Evidence from Taiwan and Italy, Science, Technology & Society 11(1), 9-38.

HUMPHREY J. and SCHMITZ H. (2002) How does insertion in global value chains affect upgrading in industrial clusters?, Regional Studies 36, 1017–1027.

JANSEN J., VAN DEN BOSCH F. and VOLBERDA H. (2005) Managing potential and realized absorptive capacity: How do organizational antecedents matter?, Academy of Management Journal 48(6), 999-1015.

KAMIEN M.I. and SCHWARZ N.L. (1975) Market structure and innovation - a survey, Journal of Economic Literature 13, 1-37.

LANE P. and LUBATKIN M. (1998) Relative absorptive capacity and interorganizational learning, Strategic Management Journal 19, 461-477.

LANE P., KOKA B. and PATHAK S. (2006) The reification of absorptive capacity: A critical review and rejuvenation of the construct, Academy of Management Review 31(4), 833-863.

LANE P., SALK J. and LYLES M. (2001) Absorptive capacity, learning, and performance in international joint ventures, Strategic Management Journal 22(12), 1139-1161.

LENOX M. and KING A. (2004) Prospects for developing absorptive capacity through internal information provision, Strategic Management Journal 25, 331–345.

LEONARD-BARTON D.A. (1995) Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation. Harvard Business School Press, Boston.

LIU X. and WHITE R. (1997) The relative contributions of foreign technology and domestic inputs to innovation in Chinese manufacturing industries, Technovation 17, 119-125.

MANGEMATIN V. and NESTA L. (1999) What kind of knowledge can a firm absorb?, International Journal of Technology Management 18(3-4), 149-172.

MALHOTRA N.K. (1997) Marketing Research: An applied Orientation. Prentice-Hall, New York.

MALIPIERO A., MUNARI F. and SOBRERO M. (2005) Focal firms as technological gatekeepers within industrial districts: Knowledge creation and dissemination in the

Italian packaging machinery industry, DRUID Academy Winter 2005 PhD Conference, Aalborg University, Denmark.

MASKELL P. (2001) Towards a knowledge-based theory of the geographical cluster, Industrial and Corporate Change 10(4), 921-943.

MCEVILY B. and ZAHEER A. (1999) Bridging ties: A source of firm heterogeneity in competitive capabilities, Strategic Management Journal 20(12), 1133-1158.

MEEUS M., OERLEMAN L.A. and HAGE J. (2001) Patterns of Interactive Learning in a High Tech Region, Organization Studies 22, 145-172.

MOLINA F.X. (2005) Estrategias de exploración y explotación en las aglomeraciones territoriales de empresas: una aproximación desde la perspectiva del capital social, Cuadernos de Geografía 78, 215-236.

MOLINA F.X. and MARTÍNEZ M.T. (2004) Factors that identify industrial districts. An application in Spanish manufacturing firms, Environment & Planning 36, 111-126.

MORRISON, A. (2008) Gatekeepers of Knowledge within Industrial Districts: Who They Are, How They Interact, Regional Studies 42, 6, 817 – 835.

MORRISON A. and RABELLOTTI R. (2005) Knowledge and information networks: Evidence from an Italian wine local system, WP.174/2005. CESPRI – Università Bocconi, Milano.

MOWERY D.C. (1983) The Relationship Between Intrafirm and Contractual Forms of Industrial Research in American Manufacturing 1900-1940, Explorations in Economic History 20, 351-374.

MOWERY D.C., OXLEY J.E. and SILVERMAN B.S. (1996) Strategic alliances and interfirm knowledge transfer, Strategic Management Journal 17, 77-91.

NELSON R.R. and WINTER S.G. (1982) An evolutionary theory of economic change, Harvard University Press, Cambridge.

NIETO M. and QUEVEDO P. (2005) Absorptive capacity, technological opportunity, knowledge spillovers and innovative effort, Technovation 25, 1141-1157.

SAMMARRA A. (2005) Relocation and the international fragmentation of industrial districts value chain: matching local and global perspectives in BELUSSI F. and SAMMARRA A. (Eds) Industrial Districts, Relocation, and the Governance of the Global Value Chain, CLEUP, Padua.

SAXENIAN A. (1994) Regional advantage: Culture and competition in Silicon Valley and Route 128, Harvard University Press, Cambridge.

SPENDER J. (1996) Making knowledge the basis of a dynamic theory of the firm, Strategic Management Journal 17, 45-62.

STOCK G.N., GREIS N.P. and FISCHER W.A. (2001) Absorptive capacity and new product development, Journal of High Technology Management Research 12(1), 77-91.

SZULANSKI G. (1996) Exploring internal stickiness: Impediments to the transfer of best practice within the firm, Strategic Management Journal 17, 27-43.

TEECE D. (1981) The multinational enterprise: Market failure and market power considerations, Sloan Management Review 22(3), 3-17.

TIEMESSEN I., LANE H., CROSSAN M. and INKPEN A. (1997) Knowledge Management in International Joint Ventures, in: Cooperative Strategies: North American Perspective. Beamish, P. and Killing, J. New Lexington Press, San Francisco.

TILTON J.E. (1971) International Diffusion of Technology: The Case of Semiconductors, Brookings Institution Press, Washington DC.

TSAI W. (2001) Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business unit innovation and performance, Academy of Management Journal 44, 996-1004.

TU Q., VONDEREMBSE M., RAGU-NATHAN T.S. and SHARKEY T. (2006) Absorptive capacity: Enhancing the assimilation of time-based manufacturing practices, Journal of Operations Management 24(5), 692-710.

TUSHMAN M.L. and NADLER D.A. (1986) Organizing for innovation, California Management Review 28(3), 74-92.

UZZI B. (1996) The sources and consequences of embeddedness for the economic performance of organizations, American Sociological Review 61, 674-98.

UZZI B. (1997) Social structure and competition in interfirm networks. The paradox of embeddeness, Administrative Science Quarterly 42, 35-67.

VAN DEN BOSCH F., VOLBERDA H.W. and DE BOER M. (1999) Coevolution of firm absorptive capacity and knowledge environment: Organizational forms and combinative capabilities, Organizational Science 10, 551-568.

VAN WAARDEN F. (2001) Institutions and innovation: the legal environment of innovating firms, Organization Studies 22(5), 765-795.

VEUGELERS R. (1997) Internal R&D expenditures and external technology sourcing. Research Policy 26, 303-315.

WONG V., SHAW V. and SHER P.J. (1999) Intra-firm learning in technology transfer: A study of Taiwanese information technology firms, International Journal of Innovation Management 3, 427-458.

YLI_RENKO H., AUTIO E. and SAPIENZA J.H. (2001) Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms, Strategic Management Journal 22, 587-613.

ZAHRA S. and GEORGE G. (2002) Absorptive capacity: A review, reconceptualization, and extension, Academy of Management Review 27(2), 185-203.

APPENDIX 1

ABSORPTIVE CAPACITY (1-5 point Likert scale)
1.- Time expended and intensity in seeking external information
2.- Company management commitment to R&D activities
3.- Company participation in R&D national and European programs, during the last three years
4.- Company total expenditure dedicated to R&D activities
5.- Information provided by local institutions (trade associations, education and research centers, Public administration, etc.).
6.- ITC intensive use of internal storage and dissemination of organizational knowledge
7.- Routine generation between employees in the implementation and updating of tacit knowledge. For instance, periodical meetings, creation of work teams, etc.
8.- Routine generation between employees in sharing explicit knowledge. For instance, reports, dossiers, technical specificities
9.- Adequate training of employees to assimilate external knowledge to be incorporated in the R&D process
10.- Internalization of knowledge from industrial environment analysis (competitors, customers, providers)

11.- Internalization of knowledge from the environment to undergo strategic analyses, such as the SWOT matrix.
12.- Internalization of knowledge from the environment to create new products in the market place, patents analysis, product benchmarking, etc.
13.- Internalization of knowledge from the environment of the company to identify new opportunities, develop prospective analysis, forecasting technological advances etc.
PRODUCT INNOVATION
14.- Relative proportion of the products indentified as textile for technical use company included in the product portfolio of the company

Table 1. t-test

	Text value	t	Bilateral significance	Means´ differences
Number of employees	28	1,640	,105	6,324
Age	1984	-1,025	,309	-1,392
Total revenues	3.862.000	-,280	,780	-121.459,45

N = 74; significance 0,05

Table 2. Descriptive statistics for absorptive capacity items

	Mean	S. D.	Cronbach's Alpha
Information searching	2,57	1,04	0,856
Management commitment R&D	3,05	1,13	
Programs' participation R&D	2,35	1,43	
Innovator effort	2,36	1,40	
Local institution relationships	2,25	1,30	
Intensive use of ICTs	3,87	1,10	0,791
Tacit knowledge routines	3,10	0,98	
Explicit knowledge routines	3,36	1,11	
Employees training	2,09	0,90	
Environment analysis	3,38	0,83	0,821
Strategic analysis	2,25	0,95	
Product surveys	2,68	0,71	
Opportunities identification	3,07	0,74	

N = 74

Table 3. Factorial analysis

Variables	Components			
	1	2	3	Communality
Information searching	,590			,441
Management commitment R&D	,655			,579
Programs' participation R&D	,824			,681
Innovator effort	,913			,856
Local institution relationships	,854			,772
Intensive use of ICTs			,666	,547
Tacit knowledge routines			,840	,707
Explicit knowledge routines			,674	,700
Employees training			,718	,629
Environment analysis		,753		,747
Strategic analysis		,729		,689
Product surveys		,731		,682

|			
Opportunities identification		,804	,748

Explained variance: 67,517   KMO test: 0,841

Barlett's Test of Sphericity: χ^2 492,605   df: 78   sig. 0,000

Table 4. Fit and results of the Ordered Logistic Regression Model (dependent variable: New product development)

Variable	
Identification	28,336 (0,483)***
Assimilation	2,498 (0,325)
Exploitation	8,180 (0,338)***
Control (logTotalRevenues)	0,640 (0,334)
χ^2 Model	59,281 (4 gl)***
Goodness of the fit	$\chi^2 = 140,637$ (142 gl)***
Nagelkerke Pseudo R^2	0,648
McFadden Pseudo R^2	0,422

N= 74 p< 0,01 ***; p< 0,05**; p<0,1*

Figure 1. Percentage of technical textile

Figure 1. Percentage of technical textile
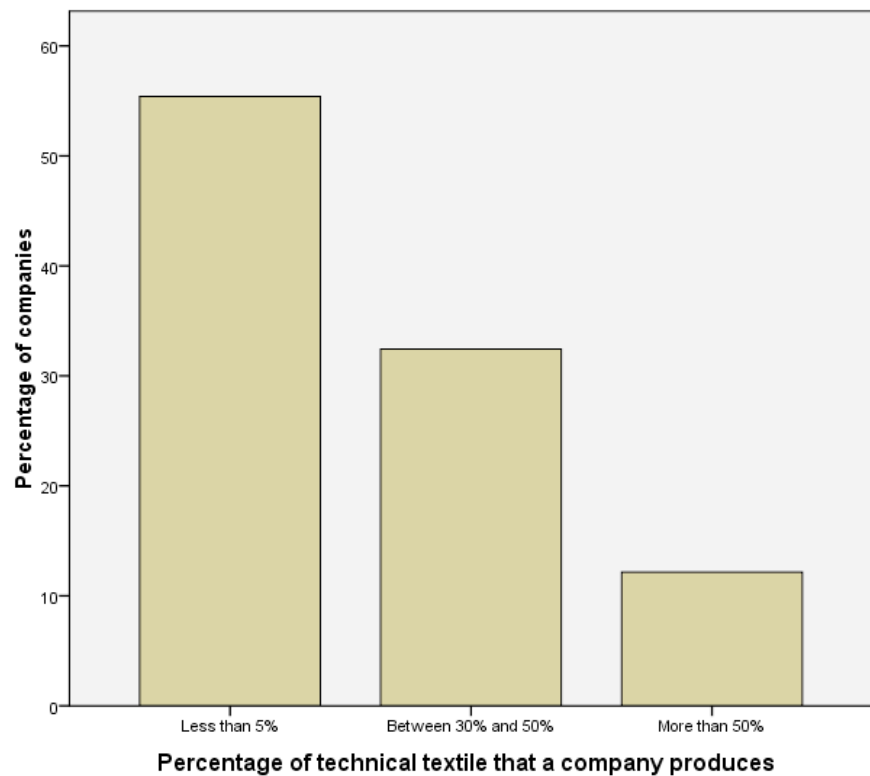
[i] ARDAN Valencia region was a database published by IMPIVA and public industrial policy agency at regional level that provides financial and productive information about all companies located in the Valencia region. We used industrial activities segments involved with textile process.

[ii] SABI was a directory of Spanish and Portuguese companies that collected general information and financial data. In the case of Spain collected more that 95% of the companies of the 17 Spanish regions with total yearly revenues over 360.000-420.000 €.

[iii] See appendix 1 for more information about the variables of the questionnaire.