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WHAT LIES BENEATH THE INTERNATIONALIZATION OF FIRMS IN A REGIONAL INNOVATION SYSTEM?

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Abstract

The aim of the paper is to identify the internationalization models of SME industrial district firms within a very integrated and dynamic Regional Innovation System (RIS) of Italy. By doing so, we investigate which are the strategies of firms embedded in a RIS to access global suppliers and markets. Accordingly, this paper explores the role of SMEs firms' dynamic capabilities, its linkage with the industry investments in ICT (information and communication technologies) and the impact of the utilization of regional knowledge intensive business services (KIBS) in shaping the degree of internationalization of local firms.

The analysis is based on a survey addressed during 2004 to entrepreneurs or managers of a sample of 125 SMEs firms operating in 7 industrial districts (biomedical, ceramics, shipbuilding, footwear, textile, plastics and packaging) of the Emilia Romagna.

The results coming from a structural equation model revealed factors that impact on firms' degree of internationalization in the input (relocalisation of foreign purchases through global value chains) and in the output dimension (export sales). Some interesting insights on what lies beneath the internationalization of firms in a very dynamic regional innovation system like that one of Emilia Romagna are provided.

INTRODUCTION

The aim of the paper is to identify the most efficient internationalization strategies of SMEs firms belonging to various industrial districts localized in a particularly dynamic Regional Innovation System (RIS) like that one of the Emilia Romagna, one of the most affluent and industrialized regions of Italy. By doing so, we investigate which are the strategies adopted by SMEs industrial district firms to access global suppliers and to enter into foreign markets. Our analysis has selected three important elements that could be considered potentially ideal explanatory factors in influencing the degree of internationalization of local SMEs: the presence of firms' specific dynamic capabilities, the presence of a high (sectoral) level of investment in

Information and Communication Technologies (ICT) and the recourse of district SMEs to external regionally-based consultants, thus to regional Knowledge Intensive Business Service (KIBS).

Several recent studies tackled the importance for firms to be open, establishing global production or research networks. Internationalization strategies appear as positively associated with higher competitiveness, both related to cost reduction (through outsourcing of less strategic activities to low labor cost countries) and knowledge procurement strategies (through R&D agreements or research collaborations with advanced partners). The development of dense relationships with other actors (such as suppliers of intermediary goods, clients and customers, competitors, universities and research institutes) located in the proximity of the district or outside appears to be a key factor to manage the uncertainty generated by the innovative pressure and by the global competition. Traditionally, it is acknowledged that SMEs suffer for the liability of foreignness and they are constrained by resource poverty. However, the fact that SMEs do not work in isolation but they belong to highly connected industrial systems, like the Italian industrial districts, could in principle moderate the negative impact of the small size in preventing the path towards the internationalization. The same could be hypothesized as regards the positive impact of an existing dynamic regional innovation system. While, traditionally, small firms do not find many innovation sources internally, or they lack of the resources to invest in in-house innovation search, the existence of many knowledgeable local-regional technical knowledge suppliers in the region could facilitate the access and incorporation of new knowledge inputs into the SMEs production cycle. Accordingly, firms belonging to industrial districts operating into a dynamic RIS could overcome the economical barriers that prevent them to develop abroad, and to reach high degrees of internationalization. Few contributions shed light

on the factors that are more likely to be linked with a high degree of internationalization both in the input (recourse to foreign suppliers) and in the output (exports) dimension. The paper fills this gap exploring the strategies which are more likely to impact positively on internationalization. Considering the factors that we selected as being important in pushing forwards this process, we question if is it the firms' dynamic capabilities alone, is the industry ICT intensity, is the strong role of regional KIBS, or is a combination of them that more efficiently sustain the degree of internationalization?

The analysis is based on a survey addressed during 2004 to entrepreneurs or managers of a sample of 125 firms operating in 7 Emilia Romagna industrial districts (biomedical, ceramics, shipbuilding, footwear, textile, plastics and packaging). The results coming from a structural equation model confirmed the importance of the selected factors in having an impact on firms' internationalization.

The paper proceeds as follows. Firstly, it illustrates the theoretical background, and puts forward three testable hypotheses. Secondly, it describes the methodology applied and the empirical evidences. Finally, some conclusive remarks are proposed.

THEORY AND HYPOTHESES

Dynamic Capabilities and internationalization strategies

In this section the role of firm specific dynamic capabilities in the determination of firms' internationalization performances is investigated. This approach captures the antecedent learning and knowledge building processes that precede internationalization (Uppsala model that explains how the internationalization process begins (Andersen, 1993). Scholars have examined

the role of firm variables, such as international entrepreneurial orientation and market knowledge, in order to conceptualize the firm internationalization process, with a specific focus on the global born firm phenomenon (Oviatt & McDougall, 2005). In particular, the international entrepreneurial orientation of the founders was considered important (Knight & Cavusgil, 1996; Oviatt & McDougall, 1997) but also the entrepreneur-manager's prior international experience (Zahra, Ireland, & Hitt, 2000; Autio and Sapienza, 2000). The liability of foreigners (Zaheer, 1995) is moderated by age, managerial experience and resource fungibility. Other contributions have underlined the drivers beneath the success of the firm internationalization strategies: availability of specific resources (Cuervo-Cazurra et al., 2007), ability to implement firm diversification and concentration strategies (Saarenketo et al., 2008), resources-base versatility, accumulated expertise and network dependence (Tuppura et al., 2008). It has been suggested that prior business experience leads to greater absorptive capacity in the firm (Cohen & Levinthal, 1990) and thus, this brings additional knowledge that accelerates market entry. However, both these perspectives are static. They fail to capture the whole knowledge acquisition processes and changes in attitudes. The incompleteness of these conceptualizations points to the need for a stronger conceptualization that incorporates a more comprehensive understanding of knowledge, as provided by a dynamic capabilities framework (Teece, Pisano, & Shuen, 1997; Zollo & Winter, 2002). We argue that innovation needs to be centrally located in any comprehensive attempt to model internationalization, regardless of the nature of the industry in which the firm competes. For this reason we think that this approach may also be applied in the case of the analysis of the internationalisation process of SMEs district firms.

The concept of capabilities is rooted on the evolutionary economics approach, which emphasizes knowledge creation, variety and selection. Nelson and Winter (1982) defined

capabilities as “the nature and sources of continuity in the behavioural patterns of an individual organisation” (p. 96), in other words as “routine” or “program”, which “refer to a repetitive pattern of activity in an entire organisation” or to “an individual skill”. In their conceptualisation routines are knowledge repertoire, a set of skills that a particular member of the organisation can use in order to perform a task avoiding costly and time consuming decision processes. A crucial aspect is the ability to choose the appropriate routine and when to perform it (Nelson, 1992; 1994). Blueprints are only a small part of what is needed to be stored in the organisational memory of a firm, in order to reproduce and replicate a task effectively. Innovation occurs in the Nelson and Winter framework, when the process of searching and exploring ends up with a change in routines (p. 128). “Routine” is an ambiguous surrogate for capabilities because it is an executable program for repeated performance in some selected context learned by an organisation in response to selective pressure, while the concept of capabilities refers to the organisational knowledge that lies behind the executed performance (Loasby, 1999). The concept of capabilities is strictly related to the firm strategic behavior and to the entrepreneurial imagination (Augier and Teece, 2008; Witt, 1996). Capabilities have a cumulative nature and they are path-dependent. In other words, firms may be victims of their past history, become inertial, and experiment lock-in effects (a successful organization will tend to conserve its capability even if the context would require some adjustment or replacement - Fransman, 1994). In order to develop their capabilities, firms invest in knowledge and in the development of new technology through R&D and innovation search processing of exploration and exploitation (Cohen and Levinthal, 1990).

Dynamic capabilities (Teece, Pisano, and Shuen, 1997) are the antecedent organizational and strategic routines by which managers alter their firms’ resource base through acquiring,

shedding, integrating, and recombining resources to generate "fresh value-creating strategies that cannot be easily duplicated by competing firms" (Eisenhardt and Martin, 2000, p. 1105). The dynamic capabilities view (Weerawardena et al., 2007), has evolved from the static resource-based view (RBV) of competitive strategy. It provides a theoretical foundation to capture the evolution of these capabilities. The RBV suggests that firms in the same industry perform differently because they differ in their resources and capabilities (e.g. Wernerfelt, 1984). However, the dynamic capabilities view suggests distinguishing capabilities from resource. Competences and capabilities are assets that typically must be built by firms because they cannot be bought. Dynamic capabilities (Zollo and Winter, 2002) are also connected to organisational learning (Argyris and Schön, 1978; Levitt and March, 1988). Organisational learning is viewed as routine-based, history-dependent, and target-oriented. Firms must learn from multiple sources, and that knowledge results from various learning processes. Organizational learning is therefore connected to investment in related complementarities (Teece, 1987; 1989). Researchers have argued that storing new knowledge and using stored knowledge are key components of organizational learning, and they have investigated the tools (or social mechanisms) used by firms as memory systems, like social networks, ICT intranet, electronic bulletins and knowledge centers (Olivera, 2000).

Dynamic capabilities also reflect the ability of firms to "create, extend, or modify" their knowledge base in order to respond to changing technologies and markets. We build upon the definition given by Zollo and Winter (2002), who identify dynamic capabilities as the organizational collective activity of generating and modifying operating routines through the exploitation of learning mechanisms. Accordingly, firm strategic decision making is the result of internal knowledge creation process (Eisenhardt and Martin, 2000).

Scattered contributions have explored the relationships between the firm-specific dynamic capabilities and the entry timing in new markets (Lee, 2008), both in terms of product innovation and internationalization. The relevance of dynamic capabilities as a determinant of internationalization strategies has been recently discussed by Petersen et al. (2003) and Sapienza et al. (2006), who have proved that an early internationalization strategy can be triggered by the prompt adjustment of the firm resources configuration to support the cross border activity. A co-evolution pattern between internationalization and dynamic capabilities has been discussed (Pajunen and Manula, 2008).

Aligning with the finding of this brief theoretical review, the first hypothesis is put forward.

Hypothesis 1. The firm specific dynamic capabilities of acquiring, creating and transferring knowledge assets impact positively and significantly to the degree of internationalization of industrial districts SMEs.

Regional innovation systems (RIS) and Knowledge intensive business services (KIBS): their influence on the internationalization strategies of SMEs

RIS is one of the most influential concepts developed in the context of regional science studies, which has grown rapidly since the middle of the 1990s (Asheim et al., 2003; Braczyk et al., 1998; De la Mothe & Paquet, 1998; Howells, 1999; Cooke et al., 1997). The notion of RIS lies on the crossroads of two main bodies of literature: evolutionary theories of economic and technical change, which conceptualize innovation as the result of complex, non-linear social processes, stimulated and nurtured by several actors and factors within and outside the firm (Freeman, 1995; Edquist 1997), and theories of regionalization and clustering, which emphasize that economic growth and innovation do not take place in abstract spaces, but are locally rooted,

in industrial districts (Becattini et al., 2009) or, more generally in clusters (Porter 1998; Cooke 2002), thanks to the advantages of spatial proximity, social embeddedness, interaction with local institutions, and knowledge spillovers (Camagni 1991; Maskell & Malmberg 1999; Storper 1997). As Asheim and Gertler (2005) pointed out: regional innovation systems are not sufficient on their own to remain competitive in a globalizing economy. Local firms have therefore some incentives to access also national and supra national innovation systems. This line of reasoning is followed to a point where the regional innovation system expands beyond its own boundaries through a process of economic integration and globalization. External linkages with customers and clients in international markets are crucial to the commercial success of innovative new products. (Coenen et al., 2004; Asheim and Isaksen, 2002; Archibugi and Michie, 1997; Carlsson B. 2006). Access to knowledge flows can occur around nodes of excellence interconnected by global networks (Feldman, 2004; Cooke, 2004). Doloreux (2004) investigated empirically the dimension of distant knowledge flows in a RIS, providing evidence that in the Ottawa and Beauce regions of Canada "*firms rely as much on external networks of customers and suppliers, as those based in their own region."* (Doloreux 2004, p. 491).

Autio (1998) illustrates RIS as composed by two interdependent sub-systems embedded in a common regional socioeconomic and cultural setting. The industry sub-system, which includes the companies, their clients, suppliers and competitors, and the institutional sub-system, which consists of various institutions that are engaged in the production and diffusion of knowledge and skills such as public research institutions, technology mediating organisations, universities and other educational institutions. Key actors of the institutional sub-system are KIBS. KIBS may be defined as "consultancy" firms in a broad sense (Miles I. 2005); more generally "KIBS can be described as firms performing, mainly for other firms, services encompassing a high intellectual

value-added" (Muller, 2001, p. 2). KIBS provide customized problem solving assistance to their clients, through tacit and codified knowledge exchange. Besides, KIBS play a two-fold role, acting as external knowledge source for their client firms and introducing internal innovations (Den Hertog, 2000; Miles 2005; Toivonen, 2004; Muller & Zenker, 2001; Wood, 2005). It has been observed that the interactions between KIBS and local small firms stimulate the generation and diffusion of knowledge within a regional innovation system (Muller & Zenker, 2001). Considering the importance of long distance collaborations for the innovation process, we expect also to find that the more the firm relies on KIBS, the more it embarks in interactions with distant clients and suppliers. Wood (2006, p.53) maintains, in fact, that the quality of KIBS depends on the access they offer to national and international sources of innovation. This is particularly true for SMEs, which often do not have the strength to face autonomously international business relationships. Interactions with KIBS are for them the best way to stay competitive through market internationalization and FDI. KIBS work as gatekeepers of knowledge which is further distributed within the regional system (Cheng & Yu; 2008).

Therefore we add on this debate by putting forward our second hypothesis.

Hypothesis 2. The use of KIBS for industrial district SMEs in a dynamic RIS impacts positively and significantly to the degree of internationalization .

Investments in information and communication technology (ICT) evaluated at industry level and their impact on internationalization strategies

Many authors (Gilmore and Pine, 2000; Weill and Vitale, 2001; Pilat, 2003) argue that ICTs have given to small firms new ways to communicate and coordinate over short and long distances. Accordingly, the use of web based technologies are an opportunity to build and

maintain an international competitive advantage (Eid *et al.* 2002; Hamill and Gregory, 1997; Poon and Jevons,1997). Indeed, a positive correlation between Internet access and a firm's market potential is claimed by many authors (Samiee, 1998; Porter, 2001; Piscitello and Sgobbi, 2004; Loane *et al.* 2007; OECD (2004a), Hamill and Gregory, 1997; Bennett, 1997, 1998; Etemad and El Trash, 2003). The availability of low cost Internet access is particularly important for SMEs, which have now the opportunity to acquire and exchange information internationally at a rather low cost. These technologies, in fact, reduce the liabilities of foreignness, lowering marketing and communication costs. ICTs indeed allow the establishment of contacts with distant clients and suppliers (Huber, 1990; Coltman *et al.*, 1999), allowing SMEs to overcome the limitation of their small size, helping them to approach successfully new and larger markets, regardless of the industry they belong to (Austrade, 2002). Some detailed empirical studies offered uncontroversial evidence. Raymond et al. (2005), in a survey on manufacturing SMEs in Canada, found that the use of e-business explains the 5 per cent of their export performance. Lal, studing the Indian textile industry (2002, 2004), found a positive correlation between IT adoption and export performance. However, other research works have denied the existence of a close relationship between ICT adoption and export performance. For instance, some international studies have underlined (OECD, 2004a,b; Schreyer 1996, Sakai 2002) that SMEs represent more than 50% of national GDP - and 60% of employment - but they contribute only between one quarter and one third of manufactured exports. In addition to that, as discussed by Mata et al. (1995), the concept of IT as a powerful competitive weapon, despite the fact that it has been strongly emphasized in the literature, is still not well-explained. ICT investment can be very risky and the performance of ICT application might be at the beginning over-valuated, ICT proprietary technologies can be copied from competitors, technical IT skills rapidly diffuse in the

environment. Thus, for the authors only managerial ICT skills might perhaps be sources of sustained competitiveness in firms. All things considered, in order to shed light on this dozy issue we put forward our third hypothesis.

Hypothesis 3. The use and investments in ICT impact positively and significantly on the degree of internationalization of industrial district SMEs.

DATA AND METHODS

The sample

During 2004 we conducted a survey on a set of small and medium industrial district final firms [1] in the Emilia Romagna region, operating in sectors characterized by diverse technology intensity and degree of competitiveness. According to Cooke & Morgan (1998), a strict reading of the literature would suggest that only three regions in the world can be considered true regional innovation systems: Silicon Valley, Emilia-Romagna, and Baden-Württemberg. Moreover, other previous works provided empirical findings which allow us to treat this particular region as a regional innovation system (Belussi *et al.*, 2008). Broadly speaking, we selected a significant pool of firms located in various Emilia Romagna industrial districts in order to illustrate the knowledge access strategy of firms in a context of internationalization. The firms, operating in diverse industries, belong to the following 7 districts: the biomedical district of Mirandola (18 firms), the ceramics district of Sassuolo (29 firms), the footwear district of San Mauro Pascoli (18 firms), the packaging district of Val d'Enza (13 firms), the plastics district of Correggio (10 firms), the shipbuilding district located along the High Adriatic coast (17 firms), and the textile

[1] A final district firm is a firm operating at the end of the industry value chain which sells finished products.

district of Carpi (20 firms). We decided to exclude by the sample the larger leading firms, to focus our attention to the median firm of our sample, and thus to the more interesting cases of non-leading firms, which might manifest (or not) a large propensity towards internationalization.

The snowball sampling method was selected to draw our sample of firms. According to Atkinson and Flint (2001) snowball sampling can be applied as a formal methodology for making inferences about hidden and/or hard-to-reach populations. Snowball method begins considering a small amount of actors. The initial set of actors was chosen selecting for each cluster the top ten firms, (in terms of size, age and turnover) excluding the few well-known local leaders. The choice was supported by suggestions provided by local policy makers and trade associations. The sample was then created by asking every respondent the name of one or more players who might be inserted in the study, because considered relevant to increase the understanding of the district dynamics. This process is based on the assumption that exist a link between the initial sample and the target population (Berg, 1988). The process stopped when the sample covered all the final firms of the district, The snowball method has problems of representativeness, due to selection process of initial set (Atkinson & Flint, 2001). The size of the sample for every cluster solves these problems.

The table below (Table 1) shows some descriptive statistics for our firms: they are mainly medium size (more than 69 employees) and mature (about 20 years old) firms. Furthermore, the analysis reveals differences between districts in terms of size, sales and age of the firms. The average size ranges from 19 employees in the textile district of Carpi to 210 in the plastics cluster of Correggio. The oldest firms are located in the plastics district of Correggio (34 years old), whereas the youngest ones belong to the biomedical district of Mirandola (13 years old). In term of sales the best result, on average, comes from the plastics district of Correggio (27.96 mln

euro) and the worst comes from the biomedical district (1.71 mln euro). Table 2 shows a grouping breakdown of the principle variables utilised in our analysis. We calculated the average value by district firm of the items referred to internationalisation, presence of dynamic capabilities, use of ICT and utilisation of technological intensive business services (KIBS), as presented in Appendix 2.

[Insert Table 1and 2 here]

All firms operating in the footwear and textile districts are low-tech. The great majority (more than 85%) of ceramics, plastics and shipbuilding district firms are medium-tech. In the biomedical and packaging districts it is possible to find both medium (70%) and low-tech (30%) firms.

Firms differ according to size, sales, age as well as industry belonging, giving rise to a heterogeneous sample where to test properly our hypotheses.

Data were collected on the basis of a questionnaire, which was kept relatively short in order to obtain a high response rate. It was formed by two parts. The first part contained self-explicatory questions, and was sent by e-mail[2]. It was oriented to collect structural information, such as the contact details, the prevalent economic activities (ATECO codes), sales, age and size of the

[2] Firms were previously contacted by phone or mail in order to solicit their participations and to provide them with a background of the research project and a description of the questionnaire.

firm[3], the level of industry competitiveness, the percentage of export sales and purchases by foreign suppliers. The second part, which contained more complex items, was delivered through face to face interviews to firms' entrepreneurs or managers. It was structured into three sub-parts: 1) Relevance and type of links with external actors of the Emilia Romagna the regional system, 2) Assessment of the ICT sectoral average utilisation, 3) Assessment of firm's specificity in knowledge management procedures and in product development strategies. The items belonging to the second part were measured on a five-point Likert-type scale, ranging from "absolutely non important" to "remarkably important". While the first draft of the questionnaire was based on existing literature, the final version derived by discussing each item with academics and practitioners operating in the field, and consequently testing it in a pilot study. During the snowball process we contacted by telephone 300 enterprises and sent by e-mail the first part of the questionnaire. A total number of 125 questionnaires were returned by the firms that were subsequently interviewed on the second part of the questionnaire.

Structural Equation Model

Structural equation modeling (SEM) grows out of and serves purposes similar to multiple regression, but in a more powerful way, which takes into account the modeling of interactions, nonlinearities, correlated independents, measurement error, correlated error terms, multiple latent independents each measured by multiple indicators, and one or more latent dependents also each

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[3] The structural data concerning sales, age, and size of the firm were controlled, where available (8 out of 125 firms) with the information obtained by the AIDA database; whereas difference were noticed, AIDA source was considered.

with multiple indicators. SEM allows for the simultaneous estimation of the "cause and effect" relationships between the exogenous variables, and the various levels of the endogenous variables (Steensma and Lyles, 2000). In addition, it provides also more refined measures of latent constructs, which are measured with multiple observed variables.

The structural equation modeling process centers around two steps: validating a proposed measurement model developed on the basis of theory and fitting the structural model. In our work the former was accomplished through confirmatory factor analysis[4]: each variable in the model is conceptualized as a latent one, measured by multiple indicators. The objective of this first step is to establish how well the indicators measure the corresponding latent variables. Figure 1 shows the structural theoretical model that we further estimated. The hypothesized model (Figure 1) consisted of ten exogenous (independent) variables and two endogenous (dependent) variables. Variables entered in the factor analysis are listed and described in Appendix 3.

[Insert Figure 1 here]

[4] Factor analysis is a statistical method used to test whether a set of observed variables may be indicator of a smaller set of unobserved variables (called latent variables or factors). It is possible to distinguish between two categories of factor analysis: the Exploratory Factor Analysis (EFA), which is used to explore relational patterns in the data, and the Confirmatory Factor Analysis (CFA), which is used to test explicitly some stated hypotheses. Long (1983) suggested that EFA is most appropriate when there are none or few knowledge about data whereas CFA is a powerful tool when a model, or at least some relations between the variables have already been well established in the literature. As already observed in previous sections, many relations have been hypothesised and enunciated in the literature, therefore CFA better applies.

In order to test our hypotheses we estimated a path model using Measured Variable Path Analysis in LISREL 8.54 (Jöreskog & Sörbom, 2001), which allows for the estimation of the relative importance of alternative paths of influence, and also measures the direct and indirect effects that one variable has on another (Shook *et al.*, 2004). LISREL provides both an overall assessment of the fit of a hypothesized path model to the data and test of individual hypotheses.

Measures

In order to test the hypotheses, we developed a set of measures based on the items of the questionnaire (See Appendix 1). The measures used are the following:

- *Dynamic Capabilities.* Dynamic capabilities were measured with a three-item Lykert-type scale adapted from literature (Cohen and Levinthal, 1990). The construct consists of four indicators: "ability to manage the knowledge at firm level", "importance of spontaneous learning at firm level" and "importance of formal learning at firm level".
- *Technological Knowledge Intensive Business Services.* Technological Knowledge Intensive Business Services was measured with a three-item Lykert-type scale adapted from literature (Miles; 2003, 2005). The construct consists of three indicators: "availability and readiness to acquire technology process in the Region", "availability and readiness to access to R&D facilities in the Region" and "availability and readiness to access to IT related services in the Region".
- *Use and investments in ICT.* The use and investments in ICT was measured with a four-item Lykert-type scale adapted from literature. The construct consists of 4 indicators: "importance to use ICT technologies to connect with clients and suppliers at industry level", "importance to invest in ICT for management purposes at industry level",

"importance to have developed an e-commerce strategy at industry level" and "importance to invest in ICT to improve the network efficiency at industry level".

- *Degree of internationalization.* It was captured by two indicators: export sales (measured as percentage of total sales) and foreign purchases (measured as percentage of total purchases). Both were rescaled as continuous variables ranging from 0 to 5.

Reliability analysis

The prime consideration in selecting indicators is whether they are theoretically sound and reliably measured. Reliability indicates the extent to which different items, measures, or assessments are consistent with one another. Table 3 shows the Cronbach's alpha for all the variables. The alpha for the Dynamic Capabilities construct (DC1, DC2, DC3) is only slightly lower than 0.60 the cut-off value suggested by Bagozzi and Yi (1988)[5]. The alpha for ICT and T-KIBS constructs is above 0.60, which indicates that the items form a scale with reasonable internal consistency reliability.

[Insert Table 3 here]

VALIDATION

[5] The reliability analysis gives better result for Dynamic Capabilities measure whether calculate excluding from the sample the firm with missing data and equally meaningful for the other measures. The Cronbach's Alpha scores: 0.61 for DC; 0.737 for ICT and 0.652.

Before discussing the tests of the specific hypotheses from the structural equation model, it is important to evaluate the overall fit of the theoretical model to the data. We assessed the overall fit of the model to the data using the Full Information Maximum Likelihood (FIML) method that is suitable for missing data and Root Mean Square Error of Approximation (RMSEA) (Jöreskog & Sörbom, 2001). The chi-square statistic is oversensitive to sample size and it could suggest that a model does not adequately fit the data even when it fits. According to Kline (1998), in order to reduce the sensitivity of the chi-square statistic to sample size, it is recommended to use the rule " X^2/df lower than 3" to decide the acceptability of the chi-square value. The FIML X^2 (47; N=125) = 63.10 P=0.058. FIML X^2 divided by the degrees of freedom was 1.34, suggesting adequate fit of the model to the data. The RMSEA is 0.053 and the 90 percent confidence interval is from 0.0 to 0.084. The point estimate of RMSEA is slightly above 0.05 as well as the upper confidence limit is only slightly above the 0.08 value suggested by Browne & Cudeck (1993). These indexes suggest a reasonable fit of the model to the data. However, the objective of this study was not to achieve the "better fitting" model, but rather to assess the relationships among the different latent variables[6].

[6] The assessment of the overall fit of the model to the data using excluding from the sample the firm with missing data gives a better fitting. Furthermore, the RMSEA is 0.05 and the CFI is 0.95 (Hu & Bentler, 1999). Another indication that the model fits well is that the ECVI for the model (1.51) is less than the ECVI for the saturated model (2.0). In fact, the confidence interval for ECVI is from 1.40 to 1.81. We conclude that the model fits well and represents a reasonably close approximation in the population (Browne & Cudeck, 1993).

RESULTS

The means, standard deviations, and correlations among all variables entered in the SEM model appear in Appendix 3.

[Insert Figure 2 here]

SEM results are presented in Figure 2.

Let us start with some general comments. Our descriptive variables are presented in Table 2. The dependent variables included in the model ES and FP show that industrial districts SMEs of Emilia Romagna have reached a high degree of internationalization, both in terms of export flows (on average they export 56.9% of sales) and as propensity to interact with foreign suppliers and subcontractors (on average they declare a share of foreign purchases of 47.4% on total purchases). These positive results are largely spread in all district firms, with the minor exception of the biomedical district of Mirandola, where, however, the leading local firms (excluded by our sample), like Gambro, Baxter and Fresenius, are some of the largest global MNCs, and SMEs district firms deal with them interacting more at local level than on a global scale. The items referred to dynamic capabilities issues, on a 1-5 scale, score on average a not-too-high rank. However, improving the existing routines (2.4) appears higher than informal (2.0) or formal (1.8) learning. The recourse to dynamic capability appears to be lower in shipbuilding and in textile firms. The evaluation of firms about the spread of ICT among their competitors in their specific sectors is quite significant: it appears evident that we are witness, within the Italian districts, such as already emerged in others research works (Belussi, 2005), of an ample and intense process of technology diffusion, both to connect clients and suppliers (3.2), for management purposes (3.2), to improve network efficiency (3.0), and to deal with e-commerce

(2.9). Also the use of technological KIBS emerges at the same time as widely diffused, both in terms of external technological acquisitions (3.1), access to R&D facilities (2.9), and access to ICT related services (2.4).

Let us turn to our structural equation model. Can we establish a theoretical link between the degree of internationalization and the independent variables above described? The advantage in using our LISREL methodology is related to the possibility of cluster our variables and to create some other latent aggregate variables, as proposed in Fig.1. In addition to that we can also measure the interdependence among the latent variables as calculated in Fig.2. In other words, we can try to disentangle the complex relationships between the use of ICT and the capabilities autonomously developed by the SMEs district firms. How exactly do the firm's (learning / dynamic) capabilities interact with the effect of ICT? Do firms with high capabilities gain higher benefits from ICT, or do high capabilities lead to high ICT?

Let us discuss Hypothesis 1. It predicts a positive impact of firm dynamic capabilities on the success of firm internationalization strategies. The results of SEM show that there is a significant positive correlation between the three factors we analyzed as determinants for internationalization strategies: firm dynamic capabilities, export and foreign purchases. Furthermore, there is to note that the dynamic capabilities factor has the highest coefficient.

Hypothesis 2 predicts a positive correlation between the availability of regional technological KIBS and the success of internationalization strategies. Results show that regional technological KIBS impact significantly only on export performances and not on foreign purchases. Internationalization processes, in terms of ability to develop global supply chains or to acquire sophisticated technological inputs from suppliers are related to the building of firms –specific capabilities. They can not simply be acquired by intermediated service firms. KIBS, on the

contrary, play a role in supporting export flows. Thus, more complex organizational forms of internationalizations require internal capabilities, while the capabilities to leverage export flows are more transactional, and can be bought on markets. These results are in line with the findings of others contributions (Saarenketo et al., 2004).

Hypothesis 3 predicts a positive impact of ICT adoption on internationalization performance. The evidence reported in Fig. 2 point out that the tendency to invest on ICT does not significantly impact on the firm degree of internationalizations. This is probably because ICT investments are location-specific but not firm-specific, so they do not offer a distinguishable set of unique competitive advantages. This point of view supports the findings of Mata et al. (1995), while it is in slight contrast with the writing of Prashantham and Young, which seem to believe more on the unconditioned positive impact of ICT on firms' international performance (2004).

A striking result of our research is the evaluation of the combined effect of all tree factors/latent variables. In fact, a strong correlation between the three factors emerges in Fig.2. Therefore, we can argue that dynamic capabilities appear a necessary condition for firms to lever on ICT intensity and to use productively the available knowledge and technology provided by KIBS in order to improve their internationalization performance.

In conclusion, among the three variables analyzed, the dynamic capabilities issue appears to be the most important factor, whereas regional T-KIBS and ICT adoption at industry level appear to play only a complementary, even if significant, role.

CONCLUSIONS

This study, empirically driven, has provided some interesting evidence on the role played by different factors in influencing the degree of internationalization of industrial district SMEs in a particularly dynamic regional innovation system. Internationalization processes were measured through two indicators: the propensity of firms to export and the use of foreign suppliers. Considering the small size of our firms we did not study the potential role of FDI. The empirical context chosen is the Emilia Romagna region of Italy, an appropriate empirical laboratory where to analyze the evolution of industrial district firms and they process of internationalization. Having chosen a significant sample, involving 125 final firms operating in 7 different low-tech and medium tech districts, we maintain that our results have a generalization power and they hold also for other Italian or European regions.

Our paper offers an original contribution, based on the operationalisation of the concept of dynamic capabilities (see Apendix 1 and 2), together with the analysis of the location specific explanatory factors situated behind the internationalizations performance. Out of all factors examined, dynamic capabilities (linked to the existence of high levels of informal and formal learning, and to the issue of the improvement of the existing routines) proved to be the most influential factor. ICT investments did not come out as a significant factor. However, when ICT investments are combined with a high level of internal dynamic capabilities, they create a synergic effect. The connections to technical KIBs located in the region appear positively linked with the degree of internationalization, but mainly they affect the export of firms (and less the extent of the use of foreign suppliers and subcontractors). However, regional technical KIBs in our investigation appear also a complementary asset for enhancing firm internal dynamic capabilities. Industrial district SMEs, which often do not possess enough internal resources to

initiate a self-sustained pattern of competence building, can be supported in their development by external knowledgeable agents (external to the firm, internal to the regional innovation system), which activate positive externalities. Although our research attempted to make a significant contribution to the debate on the internationalization strategies of SMEs, there are some points in need of further investigation. First we acknowledge that our sample of firms limits our study only to one regional innovation system; a comparison between different RISs is desirable. Firms are clearly located within multi-level innovation systems, and for this reason it would be worth also addressing our analysis to national contexts. Moreover, our structural equation model investigates only some of the potential factors affecting the internationalization performance of industrial district SMEs. A larger sample of firms might allow exploring better the role of other factors. A final note is due to the collected information: our model relied on respondents' perceptions, and it is not based on objective quantitative measurements.

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Appendix 1: Scale items

Dynamic Capabilities:

- Which tool of knowledge management are used by the firm? From 1 (every one is responsible of his learning and knowledge is not shared between employees) to 5 (there is a continuous process revision and improvement of routines related to externalization, codification, sharing and storing of the knowledge).
- How many of these spontaneous learning activities are implemented?
    - On-the-job training;
    - On-the-job training with the supervision of experts;
    - Clients/Supplier Interaction;
    - Use of consultants;
    - Imitation of strategies and product of competitors.
- How many of these formal learning activities are implemented?
    - Internal training;
    - External training;
    - Benchmarking activities;
    - Participation to institutional project and initiatives promoted by local and/or industry association;
    - Visit to "best practice" companies.

Technological Knowledge Intensive Business Services (T-KIBS):

- Availability and readiness to acquire technology process in the region from 1 (=completely unsatisfied) to 5 (=completely satisfied);
- Availability and readiness to access to R&D facilities in the region from 1 (=completely unsatisfied) to 5 (=completely satisfied);
- Availability and readiness to access to IT related services in the region from 1 (=completely unsatisfied) to 5 (=completely satisfied).

Use and investments in ICT:

- How important is at industry level use ICT technologies to connect with clients and suppliers?
- How important is at industry level invest in ICT for management purposes?
- How important is at industry level have developed an e-commerce strategy?
- How important is at industry level invest in ICT to improve the network efficiency?

Firm Internationalization Performance:

- Which is the percentage of export sales?
- Which is the percentage of foreign purchase?

Appendix 2: Variables description – Variable and label[7]

1. Firm Items – Dynamic Capabilities

DC 1: Ability to manage and improve the knowledge at firm level improving the existing routines;

DC 2: Importance of spontaneous learning at firm level (number of spontaneous learning activities that are doing at firm level);

DC 3: Importance of formal learning at firm level (number of formal learning activities that are doing at firm level like R&D investment).

2. Regional Items - Technological Knowledge Intensive Business Services (T-KIBS)

TK 1: Availability and readiness to acquire external technology process;

TK 2: Availability and readiness to access to external R&D facilities;

TK 3: Availability and readiness to access to external ICT related services.

3. Industry Items - Use and investments in ICT

ICT 1: Importance in the sector to use ICT technologies to connect with clients and suppliers;

ICT 2: Importance in the sector to invest in ICT for management purposes;

ICT 3: Importance in the sector to have developed an e-commerce strategy;

ICT 4: Importance in the sector to invest in ICT to improve the network efficiency;

4. Dependent Variables - Firm degree of Internationalization

ES: Export sales (percentage total sales rescaled as continuous variable from 0 to 5);

FP: Foreign purchases (percentage of total purchases rescaled as continuous variable from 0 to 5).

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[7] Where it is not specified differently these items were linked to a five point Likert-type scale.

Appendix 3: Means, Standard Deviations, and Correlations Between Variables

Means, Standard Deviations, and Correlations Between Variables

	DC1	DC2	DC3	TK1	TK2	TK3	ICT1	ICT2	ICT3	ICT4	ES	FP
DC1	1.00											
DC2	0.25**	1.00										
DC3	0.42**	0.29**	1.00									
TK1	0.29**	0.00	0.214*	1.00								
TK2	0.20*	0.01	0.29**	0.40**	1.00							
TK3	0.01	-0.11	0.00	0.43**	0.398**	1.00						
ICT1	0.01	-0.09	0.01	0.48**	0.40**	0.56**	1.00					
ICT2	0.00	0.01	0.01	0.00	0.10	0.08	0.26**	1.00				
ICT3	0.00	0.01	0.31**	0.24*	0.12	0.08	0.25**	0.33**	1.00			
ICT4	0.25*	-0.01	0.35**	0.198*	0.091	0.01	0.10	0.38**	0.36**	1.00		
ES	0.34**	0.01	0.317**	0.198*	0.11	0.07	0.056	0.08	0.35**	0.29**	1.00	
FP	0.33**	0.025	0.41**	0.12	0.11	0.22*	0.10	0.09	0.09	0.33**	0.33**	1.00
Mean	2.52	2.09	1.90	3.19	3.28	2.86	2.99	3.13	3.12	2.47	1.65	0.71
SD	1.01	0.97	1.10	0.91	0.98	1.17	1.15	1.06	1.29	1.10	1.57	1.08

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Tables and figures

Table 1: Description of the sample by cluster

	N	Size	Sales (Mln Euro)	Age
Biomedical Cluster	18	25.94	1.71	13.00
Footwear Cluster	18	58.61	9.44	17.94
Ceramic Cluster	29	132.66	27.96	22.28
Shipbuilding Cluster	17	23.53	7.98	16.71
Packaging Cluster	13	33.08	7.98	23.77
Plastics Cluster	10	210.50	31.90	34.10
Textile Cluster	20	18.60	3.36	18.78

Table 3: Reliability Analysis for Independent Variables

	DC	ICT	TK
Cronbach's Alpha	0.592	0.770	0.629

Table 2: Average variables' value by district

Variables	Biomedical	Ceramic	Shipbuilding	Packaging	Plastic	Textile	Footware	Total
ES	30,929	63,556	58,750	54,667	54,500	69,588	66,583	56,939
FP	23,571	33,778	78,750	26,833	55,000	66,647	47,500	47,440
DC1	2,643	2,889	1,875	2,750	2,250	1,941	2,417	2,395
DC2	2,571	2,148	1,750	2,000	2,000	1,353	2,000	1,975
DC3	2,000	2,556	1,125	2,083	2,000	1,412	1,500	1,811
ICT1	3,000	3,778	2,375	3,583	3,500	3,176	2,917	3,190
ICT2	3,143	3,815	2,375	2,583	3,750	3,294	3,750	3,244
ICT3	2,357	3,000	2,750	2,917	3,667	2,941	2,750	2,912
ICT4	2,357	3,692	2,500	2,833	3,750	3,118	2,667	2,988
TK1	2,286	3,269	3,714	3,100	3,750	2,941	2,778	3,120
TK2	2,286	4,148	2,750	3,250	3,000	2,824	2,364	2,946
TK3	2,000	2,500	2,000	2,889	2,333	2,412	2,583	2,388

Figure 1: Proposed Model

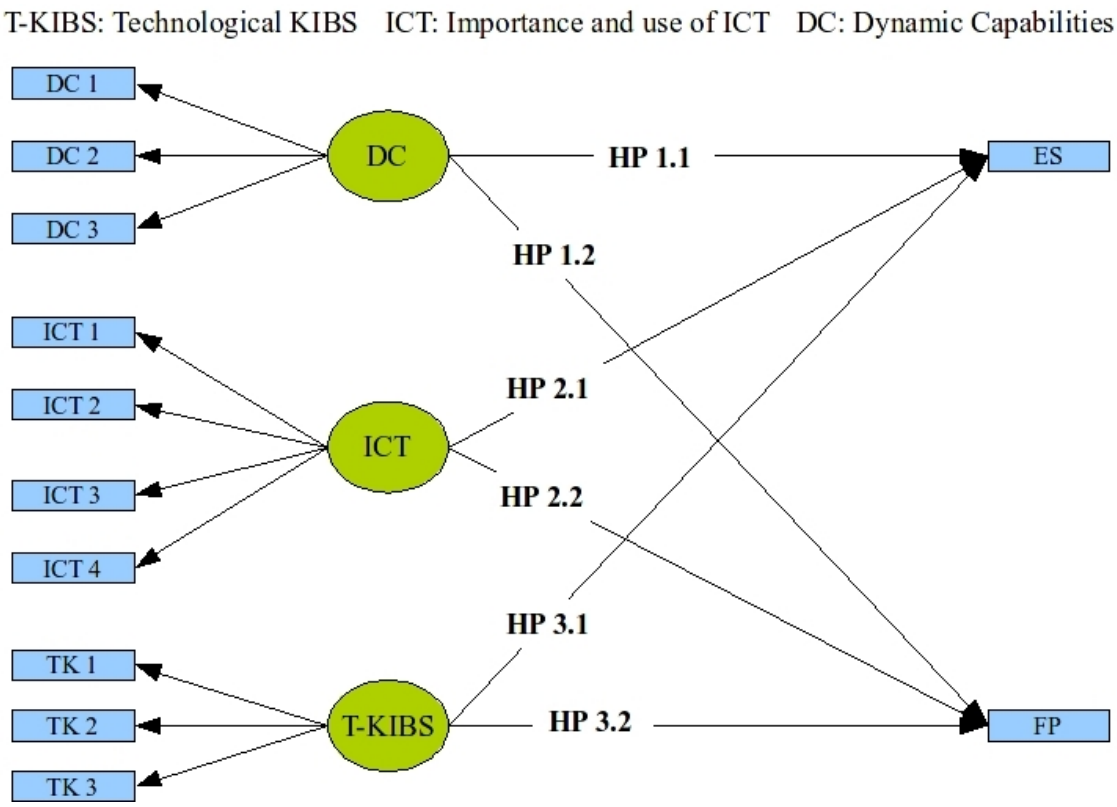
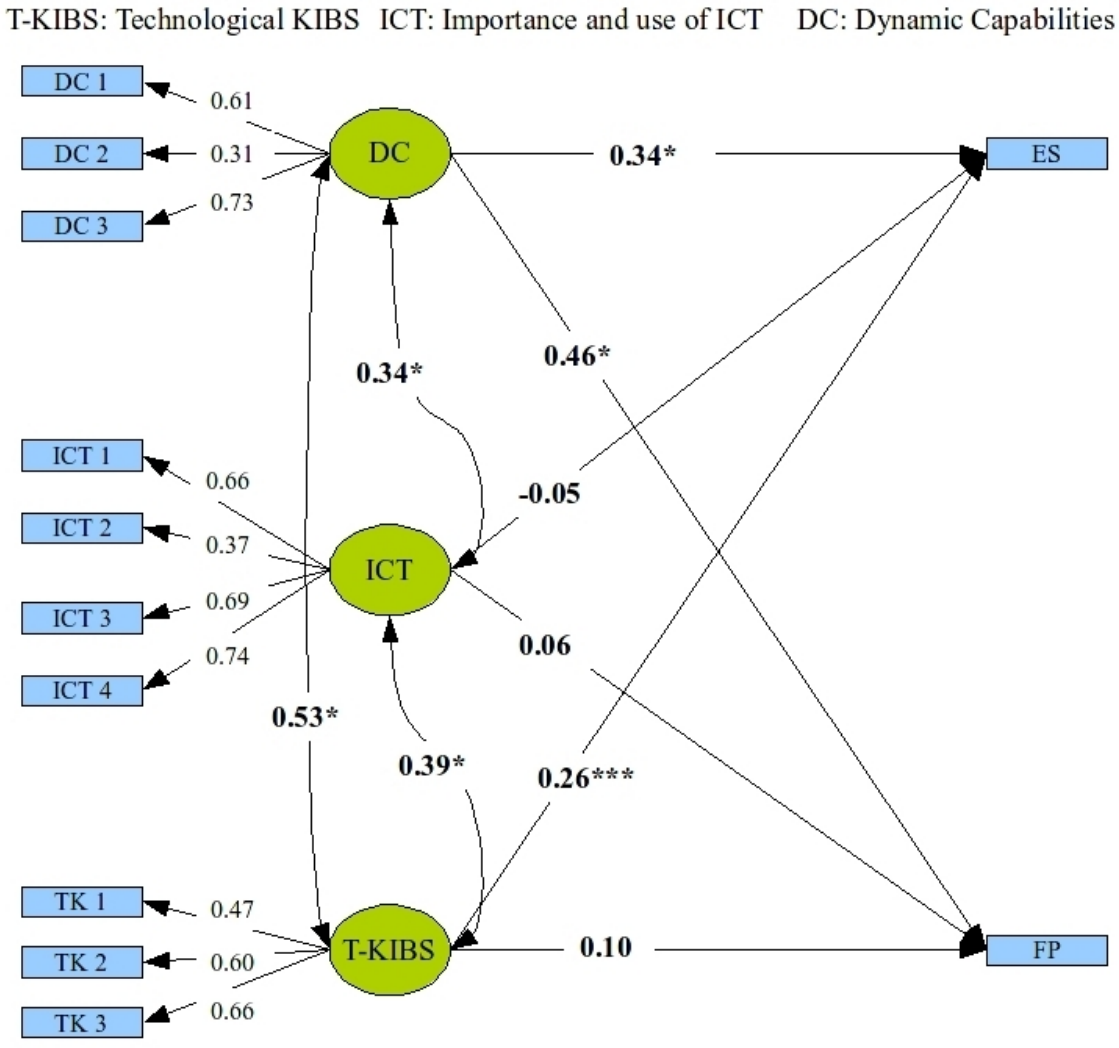


Figure 2: Path Coefficients for the Hypothesized Model



* p<0.01 ** p<0.05 *** p<0.1

Chi-Square=63,10 , df=47, P-value=0.05831, RMSEA=0.053