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How do young entrepreneurial ventures in high-tech sectors react to the global crisis?

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Abstract

The world economy is in the midst of a global crisis of historic breadth and depth, which has thrown young

entrepreneurial ventures operating in high-tech industries into an extreme high-velocity environment. The crisis has simultaneously transformed demand, input prices, credit conditions, relations to stakeholders, and even the political realm, making it necessary for high-tech entrepreneurial ventures to rely on their dynamic capabilities to achieve a new environmental fitness. The present paper addresses two research questions: (i) Do dynamic capabilities relating to new product development and expansion in international markets enable high-tech entrepreneurial ventures to better handle the present crisis, thus resulting in better performance? (ii) What are the antecedents of these dynamic capabilities? We develop a set of hypotheses on the effect of dynamic capabilities on the growth performance of high-tech entrepreneurial ventures in the context of the crisis and on the antecedents of these capabilities. These hypotheses are tested on a sample of 114 Italian high-tech entrepreneurial ventures.

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How do young entrepreneurial ventures in high-tech sectors react to the global crisis?

A dynamic capabilities perspective

1. Introduction

The world economy is in the midst of a global crisis of historic breadth and depth. Until now, the debate about the origins of the crisis and ways to cope with it has mainly been framed within the traditions of macroeconomic discourse and has been dominated by discussions regarding suitable fiscal and monetary policy interventions. By contrast, ideas from management theories have been nearly completely absent from conversations about the crisis (Agarwal *et al*., 2009). *Why* and *how* some firms are handling the global crisis better than others are still largely unexplored issues.

These issues are especially relevant for young entrepreneurial ventures operating in high-tech industries (*high-tech entrepreneurial ventures*). As these firms are unanimously considered important sources of innovation and employment growth, the negative effects that the crisis has on them will have severe repercussions across the entire economic system. Moreover, the most relevant aspects of the current crisis are a severe credit crunch and a major drop in demand (Filippetti and Archibugi, 2010). Access to external capital is highly important for high-tech entrepreneurial ventures to successfully develop their businesses (e.g., Carpenter and Petersen, 2002a). Consequently, the deterioration of financial markets engendered by the crisis is especially worrisome for these firms. Similarly, the drop in global demand has exacerbated competition, thereby making it harder for smaller, less established firms to successfully carry on their business. Nevertheless, high-tech entrepreneurial ventures may be able to navigate rough times better than larger, established firms can (Spencer and Kirchoff, 2006). In fact, the flexibility of their decision-making processes and organizational practices and their learning modes based on improvisation and trial and error (Zahra, Sapienza and Davidsson, 2006) make them *potentially* able to effectively use *dynamic capabilities* to respond to abrupt environmental changes.

In the present paper, we adopt a dynamic capability perspective to examine the reaction to the crisis by high-tech entrepreneurial ventures and its consequences for firm performance. In accordance with Eisenhardt and Martin (2000), we interpret dynamic capabilities as processes to alter firms' collection of resources and we focus on two processes that are crucial for high-tech entrepreneurial ventures: new product development and expansion in international markets.

In particular, we address two research questions: (i) Do dynamic capabilities relating to new product development and expansion in international markets enable high-tech entrepreneurial ventures to better handle the present crisis, thus resulting in superior performance? (ii) What are the antecedents of these dynamic capabilities? In order to answer the first question, we consider the *growth performance* of high-tech entrepreneurial ventures in the context of the crisis. To respond to our second research question, we focus on the links between the aforementioned dynamic capabilities and firms' pre-crisis collection of tangible and intangible resources and associated learning processes (see Zahra *et al*., 2006, for a similar approach).

In our opinion the literature on *dynamic capabilities* has much to offer to improve our understanding of the impact of the crisis on high-tech entrepreneurial ventures. Scholars unanimously agree that dynamic capabilities play a crucial role in *high-velocity environments*, where changes are rapid, nonlinear, and largely unpredictable (Eisenhardt and Martin, 2000, p 1111. See also Zahra *et al., 2006*, p. 919). The current global crisis simultaneously hit multiple industries and countries by abruptly and unpredictably changing demand, input prices, credit conditions, relations to stakeholders, and even the political realm (Campello, Graham and Campbell, 2010). By forging an *extreme* high-velocity environment, the crisis has afforded a natural experiment to study dynamic capabilities in their natural context.

In order to tackle these issues, we developed a set of hypotheses that are tested using a sample of 114 Italian high-tech entrepreneurial ventures. As we highlight in the conclusions, our results contribute to the technological entrepreneurship, the dynamic capabilities and the crisis literatures.

2. Theoretical background and research hypotheses

In this paper, we adhere to Eisenhardt and Martin's (2000, p. 1106) definition of dynamic capabilities as *processes to integrate, reconfigure, gain, and release resources*. Moreover, similar to Barreto (2010, p 271), we view dynamic capabilities as a multidimensional construct. Specifically, taking inspiration from Teece (2007, p. 1319), we disaggregate these processes into the capacities to: (i) sense opportunities and threats, (ii) make decisions so as to seize these opportunities and face these threats, and (iii) alter the configuration of the firms' tangible and intangible resources to maintain competitiveness. Finally, we focus on two identifiable and specific processes: *new product development* and *expansion in international markets*. The new product development process is widely recognized as an important dynamic capability (Eisenhardt and Martin, 2000; see also Brown and Eisenhardt, 1995). This holds especially true for high-tech entrepreneurial ventures, for which a steady stream of innovative products is the primary source of sustainable competitive advantage (Schoonhoven, Eisenhardt, and Lynen, 1990; Deeds, De Carolis, and Coombs, 1999). Likewise, it has been argued that the process of expansion in international markets is a dynamic capability that opens an abundant flow of business opportunities to firms (Bingham and Eisenhardt, 2008), favors organizational and technological learning (Zahra, Ireland and Hitt, 2000), and offers the potential for superior performance (Bingham, Eisenhardt, and Furr, 2007). As is suggested by the literature on international high-tech ventures (Sapienza *et al*., 2006), this dynamic capability is very important for high-tech entrepreneurial ventures.

2.1. Dynamic capabilities in response to the crisis: impact on growth performance

The large, disruptive, and unanticipated changes brought about by the current global crisis are likely to have destroyed the competitive advantage firms enjoyed in the pre-crisis scenario due to their valuable, rare, inimitable, and non-substitutable resources (Barney, 1991). With firms' performance

rapidly deteriorating, the crisis has spurred firms to react[1] by developing and using dynamic capabilities. We contend that, in crisis times, superior growth performance is achieved by the high-tech entrepreneurial ventures that have relied on dynamic capabilities relating to *new product development* and *expansion in international markets*.

The recent literature has challenged the assumption that dynamic capabilities *necessarily* have positive effects on firm performance (Eisenhardt and Martin, 2000, p. 1117). The realization of the potential advantages accruing to dynamic capabilities depends on two factors: the *need for change* and the *wisdom of the chosen changes* (Zahra *et al.*, 2006, pp. 942-943).

The *need for change* is straightforward in crisis times. The pervasiveness and destructiveness of the current crisis make it unlikely that the pre-crisis resource configurations of firms will fit the abruptly changed environmental conditions. This holds particularly true for high-tech entrepreneurial ventures. During the crisis, bank lending has declined substantially (Ivashina and Scharfstein, 2010), while a severe dearth of venture capital has been observed (Block and Sander, 2009).Therefore, the financial constraints of high-tech entrepreneurial ventures (Carpenter and Petersen, 2002b; Hall, 2002) have become even more binding. Moreover, the drop in demand engendered by the crisis has exacerbated competition in high-tech markets, thus accentuating the liability of smallness and youngness of these firms (Bruderl and Schussler, 1990).

Given the need for change engendered by the crisis, the wisdom of the chosen changes is related to a firm's ability to create, *soon* and *astutely* (Eisenhardt and Martin, 2000, p. 1117) a novel resource configuration that fits the changed external contingencies. According to the crisis management literature (Weick, Sutcliffe and Obstfeld, 2005; Maitlis and Sonenshin, 2010), crises bring about a lack of understanding that not only makes it impossible to ascribe meaningful probabilities to the different states of nature but also makes it impossible to identify all of the possible states of nature. In such a framework, the capacity to soon sense the threats and the confidence to make decisions

[1] The fact that firms tend to modify their course of action in response to environmental changes is a long-lived and widely accepted insight from the management literature (Cyert and March, 1963; Thompson, 1967).

when *it is easy to become paralyzed by anxiety* (Eisenhardt and Martin, 2000, p. 1112) crucially influence firm performance. Then, these decisions must be put into practice: firms' tangible and intangible resources must be carefully altered to achieve a new evolutionary fitness with the changed environment (Teece 2007, p.1321).

We argue that high-tech entrepreneurial ventures share peculiar features that make them particularly able to soon and astutely seize the threats generated by the crisis and accordingly alter their pre-crisis resource configurations to achieve superior performance during rough times.

First, firms that operate in moderately dynamic markets usually respond to new contingencies by relying on existing tacit knowledge and established rules of thumb. On the contrary, high-tech entrepreneurial ventures operating in high-velocity markets are likely to have learnt simple routines that are appropriate in situations in which changes are nonlinear, market boundaries are blurred, and sources of competitive advantages are ambiguous and rapidly shifting. These routines can be leveraged in the crisis context to make and implement resource re-configuration decisions without running the risk of falling into the *competence trap* (Levitt and March, 1988) that organizations encounter when applying established routines to completely new external contingencies (Zollo and Winter, 2002).

Second, high-tech entrepreneurial ventures enjoy an advantage over older, larger, more established high-tech firms because of their peculiar learning modes. Learning modes evolve over a firm's lifecycle (Autio, Sapienza and Almeida, 2000), and young entrepreneurial ventures mainly resort to *improvisation* and *trial and error* (Zahra *et al*., 2006, p. 937). Improvisation and trial and error result in higher responsiveness to external changes, thus enhancing firms' ability to seize the threats engendered by the crisis and accordingly alter their resource configurations (Winter, 2003; see also Boccardelli and Magnusson, 2006).

In sum, when relying on dynamic capabilities to respond to the crisis, entrepreneurial ventures can override certain dysfunctional features of the decision mechanisms and resource alteration processes that characterize large, established firms (Teece, 2007, p. 1327).

From the above arguments, we conclude that high-tech entrepreneurial ventures can use dynamic capabilities relating to both new product development and expansion in international markets soon and in an astute manner when facing the present crisis, thus achieving superior growth performance. Hypotheses H1a and H1b follow.

H1a(b): In the crisis context, high-tech entrepreneurial ventures' dynamic capability relating to new product development (expansion in international markets) leads to superior growth performance.

2.2. Antecedents of high-tech entrepreneurial ventures' dynamic capabilities

In order to investigate the antecedents of *new product development* and *expansion in international markets*, we draw inspiration from Zahra *et al*. (2006) and argue that entrepreneurial ventures' dynamic capabilities depend on both firms' endowment of resources and the associated learning processes. Accordingly, we consider five antecedents: firm size, slack resources, founders' work experience, prior internationalization, and prior product innovation.

Firm size is a proxy of entrepreneurial ventures' commercial and technological assets (Haveman, 1993), whereas the crisis literature has shed light on the importance of *slack resources* when firms navigate rough times (Tan and Peng, 2003; De Carolis *et al*. 2009). Likewise, the entrepreneurship literature has highlighted founders' human capital, and notably their work experience, as a crucial resource of high-tech entrepreneurial ventures that plays a prominent role in firms' survival and growth (see Geroski et al., 2010 for a recent contributions). As will be explained below, we have reasonable grounds for presuming that firm size, slack resources, and founders' work experience affect both new product development and expansion in international markets. Furthermore, we contend that the extent of the resource base and the associated learning processes *specific* to prior innovation and prior internationalization influence the corresponding dynamic capability. Accordingly, we consider high-tech entrepreneurial ventures' prior innovation among the

antecedents of the dynamic capability relating to new product development and their prior internationalization among the antecedents of the dynamic capability relating to expansion in international markets.

Firm size

Two opposite views with respect to the role of firm size in triggering firms' reactions to environmental changes (Haveman, 1993). On the one side, size induces inertia (Aldrich, 1979): larger firms are more bureaucratic and thus slower to react to new contingencies (Merton, 1957). On the other side, larger firms have a larger resource base to be altered in response to modifications of the external environment (Ndofor *et al*., 2011). Inertia arguments do not apply here. The smallness and newness of high-tech entrepreneurial ventures give them flexibility and environmental responsiveness (Carlsson, 1989). Furthermore, inertia is unlikely to occur when, as in case of the global crisis, the business environment undergoes radical changes that disrupt firms' past equilibrium, thus propelling reactions (Gersick, 1991). Therefore, we argue in favor of a *positive* relationship between the size of high-tech entrepreneurial ventures and the dynamic capabilities of developing new products and expanding in international markets.

First, larger entrepreneurial ventures have a larger pool of human capital available. Their personnel act as receptors of information from the business environment signaling the crisis. Hence, larger entrepreneurial ventures can sense the threats sooner than their smaller peers (Majumdar, 2000). Second, larger high-tech entrepreneurial ventures benefit from informational economies of scale (Wilson, 1975) arising from the increasing returns to scale in using information about the crisis. These firms have a greater array and variety of assets and competences available within the firm (Penrose, 1959; see also Haveman, 1993). Smaller high-tech entrepreneurial ventures generally focus on R&D and engineering activity. As these ventures become larger, they extend the value chain to production and commercial activities (Colombo, Grilli and Piva, 2006). During a crisis,

these additional internal resources can be manipulated and modified to develop new products and expand in international markets.

In short, larger high-tech entrepreneurial ventures possess a richer base of resources, which is positively related to their dynamic capabilities (McKelvey and Davidsson, 2009). Hypotheses 2a and 2b follow:

H2a(b): In the crisis context, firm size has a positive impact on high-tech entrepreneurial ventures' dynamic capability relating to new product development (expansion in international markets).

Slack resources

Firm slack is formed by potentially utilizable resources that can be diverted or redeployed for the achievement of organizational goals (George 2005, p. 661). Due to their fungible nature, slack resources are crucial for modifying firms' current resource configurations in response to environmental changes through the addition of new resources or the alteration of existing ones (Sirmon, Hitt and Ireland, 2007, p. 277). Slack resources are even more crucial in the *low-munificence environment* (Castrogiovanni, 1991) forged by the crisis.

The extant literature acknowledges that slack resources vary in type (Bourgeois, 1981). We consider here the most easily deployed slack resource: *cash*. Cash availability provides high-tech entrepreneurial ventures with the greatest degree of freedom in altering the pre-crisis resource configuration by adding new resources. It makes it easier to recruit talented scientists and engineers, to acquire advanced laboratory and production equipment, to open distribution channels in international markets, and to provide assistance to long-distance customers. In accordance with this view, previous studies have documented that the investments of high-tech entrepreneurial ventures, especially those of smaller size, are highly sensitive to cash availability (Hao and Jaffe, 1993; Himmelberg and Petersen, 1994). The crisis, by deteriorating credit conditions and reducing the

supply of venture capital, is likely to have rendered this sensitivity even higher. Based on the above arguments, we put forth hypotheses H3a and H3b.

H3a(b): In the crisis context, slack resources, in terms of cash, have a positive impact on high-tech entrepreneurial ventures' dynamic capability relating to new product development (expansion in international markets).

Founders' work experience

Entrepreneurship scholars concur that the distinctive capabilities of high-tech entrepreneurial ventures originate from the human capital of their founders (Cooper and Bruno, 1977). In particular, the work experience founders have gained in the same industry in which the focal venture operates has been shown to positively affect firms' performance (Colombo and Grilli, 2005). Likewise, the dynamic capabilities literature observes that founders' human capital strongly influences entrepreneurial ventures' dynamic capabilities (McKelvie and Davidsson, 2009). Following this line of reasoning, in the crisis context, one expects founders' industry-specific work experience to have a positive impact on high-tech entrepreneurial ventures' dynamic capabilities.

The more experienced in the focal industry a firm's founders are, the more they exert on their ventures an *imprint* of responsiveness, which can be effectively conveyed to processes that alter firms' resource configurations in response to the crisis. First, founders' industry-specific work experience constitutes a core resource for high-tech entrepreneurial ventures. Past experience gives founders valuable information and knowledge that can be leveraged to the advantage of the focal venture (Newbert, 2005). Experienced founders probably know the most talented scientists and engineers to collaborate with, the most advanced equipment to acquire, the best value suppliers to turn to, and the most reliable distribution channels to use. Therefore, they are well equipped to respond to the drop in demand engendered by the crisis by astutely reconfiguring the firm's resource base to support new product development and expansion in international markets. Second, having worked in high-tech industries in the past, experienced founders know how to master

resource alteration processes in high-velocity environments. They have learned to seize environmental threats soon and to react to them wisely by applying simple routines to alter the firm's resource configuration (Eisenhardt and Sull, 2001).

However, in spite of the advantages illustrated above, industry-specific work experience may also have a *dark side* in that it locks individuals into past behaviors and leads them to over-generalize from the past (Argote, 1999). This may pose severe problems in the crisis context. Experienced founders may run the risk of applying old lessons that proved effective in 'normal' high-velocity environments to abruptly changed and inherently different scenarios (i.e., *inappropriate generalization*, Halebian and Finkelstein 1999). When applying past decision-making rules that assured firm success in the pre-crisis scenario, they will refrain from altering their firm's resource configuration and wait for better times to come.

Because opposing forces are likely to be at work, we do not formulate hypotheses about the link between founders' industry-specific work experience and firms' dynamic capabilities in the crisis context.

Prior internationalization

We contend that the extent of the presence of high-tech entrepreneurial ventures in international markets in the pre-crisis period is positively associated with their dynamic capability relating to further expansion in international markets.

First, high-tech entrepreneurial ventures that internationalized their offerings before the crisis have developed a richer resource base at the international level, which constitutes a stepping-stone to further international expansion. Exporting entrepreneurial ventures are likely to have an international sales force, have gained access to foreign distribution channels and have established collaborative relations with local intermediaries and shipping agents. They may have even built foreign commercial or production facilities to support foreign sales. In sum, prior internationalization puts entrepreneurial ventures at the core of an abundant flow of resources

(Bingham and Eisenhardt, 2008), which can be wisely altered in crisis times to enable further expansion in international markets.

Second, prior internationalization gives entrepreneurial ventures learning advantages (Oviatt and McDougall, 1999; Autio *et al*., 2000) because it exposes them to multiple and diverse exogenous and endogenous stimuli (Sapienza *et al*., 2006, p. 915). International entrepreneurial ventures have learned how to alter their resource base to fit the conditions of foreign markets (Hitt, Hoskisson and Kim, 1997) and how to position products in global competitive arenas (Weerawardema *et al*., 2007). Having already learned how to operate internationally, these firms are likely to sooner and more easily make and implement the decision to expand further in international markets in response to the crisis. Hypothesis H4 follows.

H4: In the crisis context, prior internationalization has a positive impact on high-tech entrepreneurial ventures' dynamic capability relating to expansion in international markets.

Prior product innovation

The arguments supporting the view that prior product innovation influences dynamic capabilities relating to *new product development* in the crisis context mirror those made above when referring to prior internationalization.

During the crisis, high-tech entrepreneurial ventures that invested in product innovation in the pre-crisis period can rely on the tangible and intangible resources they accumulated through their past innovation activity to alter more easily their resource configuration with the aim of developing new products. New product development in response to the crisis requires that high-tech entrepreneurial ventures have kept pace with the latest advances in scientific and technological research in areas where new knowledge is continuously emerging, complex, and highly specific (Deeds *et al*., 1999, p. 212). This turns out to be easier for entrepreneurial ventures that hired brilliant scientists and technicians and invested in advanced tangible and intangible technological assets (e.g., laboratory equipment, patents) before the crisis. Moreover, young firms can rarely base new product

development solely on their internal knowledge (Pavia, 1991). Innovative entrepreneurial ventures are likely to have established technological collaborations with external third parties, such as universities or other firms (Shan, Walker and Kogut, 1994). Further, successful product innovation may help high-tech entrepreneurial ventures to acquire additional resources during the crisis because it assures visibility and legitimacy (Schoonhoven *et al*.,1990). A strong innovation track record certifies the good quality of an entrepreneurial venture to uninformed third parties (Rothaermel, 2002). In the crisis context, this alleviates the severe adverse selection problems that high-tech entrepreneurial ventures face in attracting external capital to the process of new product development.

Lastly, prior innovation is also an important source of learning by doing (Malerba, 1992). Through their past product development experiences, high-tech entrepreneurial ventures have mastered innovation processes (e.g., Hatch and Mowery, 1998) and learned to integrate their internal knowledge with knowledge provided by external sources (Raisch *et al*., 2009). They have become able to identify customers' needs soon and to use customers' knowledge about product applications to develop successful products. All this results in a superior ability to seize the threats posed by the crisis through new product development.

H5: In the crisis context, prior innovation has a positive impact on high-tech entrepreneurial ventures' dynamic capability relating to new product development.

3. Data and sample

We test our hypotheses using a sample of 114 Italian young entrepreneurial ventures extracted from the 2010 release of the *RITA* (*Research on Entrepreneurship in Advanced Technologies*) *Directory*. Developed by the RITA Observatory research team at Politecnico di Milano, the *RITA Directory* is the most reliable source of data presently available on Italian high-tech entrepreneurial ventures. As of January 1st, 2009, it stored information on 1,646 firms that were representative of the Italian

population of high-tech entrepreneurial ventures by both industry and geographic area. This information includes data on the firms' founders, employment, internationalization, and innovation activity. These data were obtained through periodic surveys administered to the firms' owner-managers. The directory also includes accounting data from the CERVED commercial database.

To study the effects of the current global crisis on Italian high-tech entrepreneurial ventures, a questionnaire was sent by e-mail between January and March 2010 to the 1,588 RITA directory firms that had survived as independent until January 1st, 2010. The questionnaire asked for the amount of sales in 2009 and the number of employees on December 31st, 2009. Moreover, it investigated whether the firm had invested additional resources in i) *new product (service) development* or ii) *expansion in international markets* in response to the crisis. Respondents were also asked whether, in response to the crisis, they had *searched for external equity financing*. The questionnaire was sent to the personal e-mail address of the owner-manager of each firm who acted as the firm's contact point with the RITA Observatory team. The responses were cross-checked by research assistants and compared with information obtained from the firm's website and other public sources. Phone interviews helped to eliminate discrepancies, thereby assuring that the data collected are reliable. A total of 454 firms answered the questionnaire (response rate: 28.6%). For 114 of them, we have complete data on the variables of interest in this study (see Sections 4 and 5).

The majority of sample firms operate in ICT services (34.2% of the sample) and ICT manufacturing (30.7%) and are located in the highly developed regions of the northwest (36%) and northeast (26.3%) of Italy. As to firm size, our sample includes only SMEs. The size distribution is highly skewed, with most firms having less than 2 million € in sales (81.6%) and fewer than 10 employees (70.2%). Most firms are between 6 and 15 years old (54.4%).

4. High-tech entrepreneurial ventures and the global crisis

4.1. Dynamic capabilities in the context of the crisis

In order to operationalize the dynamic capability relating to new product development, we asked respondents whether their firms had invested additional resources in the development of new products or services in 2009 in response to the crisis. We assume that, for this type of firm, this is a good proxy of the alteration of the firm's resource configuration aimed at developing new products. Indeed, firms that made this type of investment devoted additional resources to new product development, thus altering their prior resource configuration. Following the same logic, we proxy the dynamic capability relating to expansion in international markets with the realization of investments for international expansion in 2009.

Barreto (2010) highlights that, in the real world, firms possess dynamic capabilities in varying degrees. Hence, dynamic capabilities are non-dichotomous. In accordance with this view, we were interested in finding a proxy of the *extent* of the alteration of a firm's resource configuration associated with the two dynamic capabilities under consideration. For this purpose, we used information about whether firms searched for external equity financing in 2009 to cope with the crisis. When the investments oriented towards new product development or expansion in international markets, respectively, were combined with the search for external equity capital, we interpret this combination as indicating a greater extent of the alteration of the firm's resource configuration associated with the corresponding dynamic capability. The rationale is the following. External equity is the most expensive source of capital for high-tech entrepreneurial ventures (Fazzari et al., 1988). The dearth of venture capital engendered by the crisis has made this source of capital even more expensive. Accordingly, high-tech entrepreneurial ventures looked for external equity capital only if the amount of the investments they planned was large enough to exceed the capital they could obtain from other sources (i.e., internal liquidity, owner-managers' personal capital, bank loans).

Using the answers to the questions reported above and relying on the arguments presented so far, we built *ProductInnovationDC* and *InternationalExpansionDC*, two discrete variables ranging from 0 to 2. *ProductInnovationDC* (*InternationalExpansionDC*) equals 0 when the entrepreneurial

venture did not invest in the development of new products (expansion in international markets) in 2009, 1 when it made investments in new product development (expansion in international markets) without searching for external equity financing, and 2 when these investments were associated with the search for external equity financing.

[Table 1 around here]

In Table 1, we illustrate data on the dynamic capabilities of the sample entrepreneurial ventures relating to new product development and expansion in international markets in the context of the crisis. In 2009, in response to the crisis, 82 firms (71.9% of the sample) invested additional resources in new product development (*ProductInnovationDC*=1 or *ProductInnovationDC*=2), and 62 (54.4%) in expansion in international markets (*InternationalExpansionDC*=1 or *InternationalExpansionDC*=2). These findings confirm the natural tendency of high-tech entrepreneurial ventures towards product innovation. Moreover, they document the importance for these firms of expanding their commercial activities beyond national borders, but they also suggest that high-tech entrepreneurial ventures have encountered some difficulties in building and using this capability during the crisis.

Let us now consider the extent of the alteration of a firm's resource configuration associated with the two dynamic capabilities under consideration. Out of the 82 entrepreneurial ventures that invested in new product development, 25 also searched for equity financing (30.5%). The percentage of entrepreneurial ventures that both invested in expansion in international markets and searched for equity financing is slightly higher: 32.2% (20 out of 62 firms).

[Table 2 around here]

Table 2 shows the distribution by industry and geographic location, and the sizes and age classes of the firms that invested in new product development and in expansion in international markets. We also ran a series of chi-squared tests to assess whether the percentage of high-tech entrepreneurial ventures that invested in new product development and the share of firms that invested in expansion

in international markets differ across the four dimensions. Quite notably, we find statistically significant differences only when we consider firms' distribution by industry. In particular, manufacturing entrepreneurial ventures invested in expansion in international markets more often than service firms did ($\chi^2(2)=6.93$).

4.2. Firm growth in the context of the crisis

This section provides evidence on the performance of Italian high-tech entrepreneurial ventures during the crisis. We proxy firm performance with the variations in employees and sales.

[Figure 1 around here]

The growth of Italian high-tech entrepreneurial ventures has been severely affected by the global crisis. This is apparent from the evolution of firms' average sales in the 2007-2009 period (see Figure 1). Data refer to a subset of the entrepreneurial ventures that answered the questionnaire: the 218 firms that provided data on both their sales and their employees in the 2007-2009 period. The positive trend of sales between 2007 and 2008 (+10.1%) was abruptly interrupted by the crisis. Between 2008 and 2009, sales decreased by 4.7%. More than half of the 218 firms registered a sales reduction during this period.

Quite notably, employment evolved differently. The average number of employees indeed increased between 2008 and 2009 (+5.2%). Moreover, only 27% of the 218 firms registered a decrease in the number of employees during the crisis. These data suggest that the negative impact of the crisis materialized more (or more rapidly) in sales than in employment.

[Table 3 around here]

Table 3 presents the growth rates of sales and employment by industry, geographic area, size on December 31st, 2007, and age class of the 218 firms. The crisis had negative effects throughout Italy, although entrepreneurial ventures located in the more developed northern areas, which were growing more rapidly before the crisis, experienced a greater drop in sales. Moreover, the data

reveal interesting differences along the three remaining dimensions. The crisis had more severe effects on the entrepreneurial ventures operating in manufacturing industries. As for firm size and age, larger and older entrepreneurial ventures experienced a greater contraction of sales and a smaller increase in the number of employees in 2009.

5. Econometric analysis

As was noted in Section 4.1, *ProductInnovationDC* and *InternationalExpansionDC* are discrete variables ranging from 0 to 2. Hence, to study the antecedents of these two dynamic capabilities, we resort to a bivariate ordered probit model. In particular, the following equations are specified:

$$ProductInnovationDC_i = \alpha_{10} + \alpha_1 z_{1i} + u_{1i} \quad (1)$$

$$InternationalExpansionDC_i = \alpha_{20} + \alpha_2 z_{2i} + u_{2i} \quad (2)$$

where the z_{ji} are vectors of explanatory variables calculated for firm i and the u_{ji} are zero mean error terms (with j=1,2).

We then investigate the impacts of the two dynamic capabilities under consideration on firms' relative and absolute growth in terms of both sales and employees. In the former case, we approximate the rate of growth by the difference of the logarithms of sales and employees in 2009 and 2008 ($EmplGrowthRate_{0809}$ and $SalesGrowthRate_{0809}$). We resort to the following specification *à la* Chesher (1979), which has been extensively used in the Gibrat's law literature to study the growth of firms (see Caves, 1998; Sutton, 1999).

$$lnFirmSize_{09i} = \beta_0 + \beta_1 lnFirmSize_{08i} + \beta_2 DC_i + \beta_3 x_i + \varepsilon_i \quad (3)$$

In this specification, if β_1 is lower than unity, firm size negatively affects firms' growth rates. We also consider a model for absolute growth of employees and sales between 2008 and 2009 ($\Delta Employee_{0809}$ and $\Delta Sales_{0809}$). This model tends to ascribe higher growth to larger firms. We estimate the following specification:

$$FirmSize_{09i} = \gamma_0 + \gamma_1 FirmSize_{08i} + \gamma_2 DC_i + \gamma_3 x_i + \varepsilon_i \quad (4)$$

where, again, γ_1 indicates a negative effect of firm size on absolute growth. Both types of models are estimated using ordinary least squares (OLS).

In equations (3) and (4), the vector DC_i includes the measures of the two dynamic capabilities under consideration, the vector x_i is a series of control variables, and ε_i are zero mean error terms. It is important to bear in mind that, in the context of the global crisis, the two dynamic capabilities may be influenced by unobservable factors that also influence firm growth. For instance, both growth and dynamic capabilities may depend on the talent of the firm's owner-managers. Therefore, *ProductInnovationDC* and *InternationalExpansionDC* are endogenous in the growth equation and the OLS method gives biased and inconsistent estimates. Following the instrumental variables approach (Angrist, Imbens and Rubin, 1996), we test hypotheses H1a and H1b in two steps. First, we use the bivariate ordered probit model illustrated above to calculate *ProductInnovationDCPred* and *InternationalExpansionDCPred*, the predicted values of *ProductInnovationDC* and *InternationalExpansionDC*. Then, we include *ProductInnovationDCPred* and *InternationalExpansionDCPred* as regressors in the growth model.

Table 4 provides the definitions of the explanatory variables included in our econometric models.
[Table 4 about here]

The use of survey information implies a potential *survivorship bias* in the data that may influence the relationships investigated in hypotheses H1a and H1b. We acknowledge that the sample suffers from a survivorship bias. Firms that either failed or were acquired by other companies in 2009 are not included in our study. As we do have data on the 58 firms included in the RITA directory on January 1st, 2009, that did not exist as independent firms on January 1st, 2010, we were able to correct for the survivorship bias through a usual Heckman (1979) sample selection correction. Using the 1,646 RITA entrepreneurial ventures that were active and independent at the beginning of 2009, we estimated a bivariate probit model of the exit of firms in 2009 by either failure or

acquisition. Based on these estimates, we computed two Inverse Mills Ratio factors for the 114 firms included in the sample considered in this work. *InverseMillsRatioFailure* is the hazard rate of ceasing operations during 2009, while *InverseMillsRatioAcquisition* is the hazard rate of being acquired. *InverseMillsRatioFailure* and *InverseMillsRatioAcquisition* are included in the vector of controls (x_i) in equations (3) and (4).

6. Results

[Table 5 about here]

Table 5 reports the results on the antecedents of the two dynamic capabilities considered here. In line with hypotheses H2a and H2b, firm size affects both dynamic capabilities. The coefficient of $LnEmployees_{07}$ is indeed positive and significant at the conventional confidence level in both models. All of the remaining explanatory variables have different effects in Model A and in Model B, so we will analyze the antecedents of the two dynamic capabilities separately.

The dynamic capability relating to new product development is influenced by founders' industry-specific work experience in technical functions (see Model A). In particular, the coefficient of *TechWorkExp* is negative, whereas that of *SqTechWorkExp* is positive. The Wald χ^2 test at the bottom of Table 5 rejects the null hypothesis that the two coefficients are jointly equal to zero ($\chi^2(2)=5.94$). This result indicates that there is a U-shaped relationship between founders' industry-specific work experience in technical functions and the dynamic capability relating to new product development. Specifically, the extent of the alteration of a firm's resource configuration associated with the dynamic capability first decreases with founders' industry-specific technical work experience up to an amount of experience of about 5 years. Then, it starts increasing as the industry-specific work experience in technical functions increases further. Because the value of 5 years is above the 75th percentile of the *TechWorkExp* distribution, we conclude that founders' industry-

specific work experience in technical functions *usually* has a negative impact on high-tech entrepreneurial ventures' dynamic capability relating to new product development. Nonetheless, *very experienced* founders were able to seize the threats generated by the crisis soon and to alter the pre-crisis resource configuration to develop new products.

In contrast to hypothesis H5, the coefficient of $\%NewProductsSales_{07}$ is negative and close to significance. Therefore, we find no evidence that prior product innovation activity helped entrepreneurial ventures to build and use the dynamic capability to develop new products. A possible explanation for this result is that when high shares of sales are accounted for by new products (services), firms already possess a resource configuration oriented towards product innovation; hence, they have lower incentives to alter this configuration than the remaining firms.

All of the remaining explanatory variables have negligible effects on the dynamic capability of new product development.

Let us now focus on Model B. First, the results of the estimates indicate that, in accordance with hypothesis H3, cash availability positively affects the dynamic capability relating to expansion in international markets. $Liquidity_{07}$ indeed has a positive and significant coefficient. The crucial role of slack resources may be explained by the fact that expansion in international markets is associated with a (costly) enlargement of the firm's resource base: firms may indeed need to develop an international sales force, gain access to distribution channels in new foreign markets, establish further collaborative relations with local intermediaries and even build facilities to support foreign sales. In accordance with this argument, we also find that the entrepreneurial ventures that already possess a resource base oriented towards international sales and have more experience in operating internationally enjoy an advantage compared with firms that are novices in the internationalization process. Indeed, the positive and significant coefficient of $\%InternationalSales_{07}$ provides support for hypothesis H4.

[Table 6 about here]

Table 6 shows the impact of the high-tech entrepreneurial ventures' dynamic capabilities under consideration on firm growth in the context of the global crisis. *ProductInnovationDC* and *InternationalExpansionDC* are instrumented by their predicted values (*ProductInnovationDCPred* and *InternationalExpansionDCPred*, respectively) calculated from the estimates in Table 5.

Models 1 and 2 in Table 6 refer to firms' growth rates in employment and sales, respectively, while in models 3 and 4 we use absolute growth measures. In all models, the coefficient of *ProductInnovationDCPred* is positive and significant at the conventional confidence level. This confirms hypothesis H1a, according to which the dynamic capability of high-tech entrepreneurial ventures relating to new product development has a positive impact on firm growth in the context of the crisis. Conversely, in contrast to hypothesis H1b, the dynamic capability relating to expansion in international markets has a negligible effect on firm growth. The coefficient of *InternationalExpansionDCPred* is indeed never significant at conventional confidence levels.

7. Conclusions

This paper advances knowledge in three main respects. First, it contributes to the technological entrepreneurship literature by offering novel insights on how external contingencies impact technology-based businesses. To the best of our knowledge, entrepreneurship scholars have never embraced a dynamic capabilities perspective to study how high-tech entrepreneurial ventures react to major macroeconomic shocks that forge an extreme high-velocity environment. De Carolis *et al*. (2009) analyzed how high-tech entrepreneurial ventures navigate *rough times* (p. 147), but they approached the issue from a narrower standpoint. The authors focused on how high-tech entrepreneurial ventures react to a *single adverse event,* namely firms' failure to achieve a major goal. Consideration of the current global crisis lends greater relevance and breadth to our investigation.

Second, this study makes an original addition to the dynamic capabilities literature. The dynamic capabilities literature has mainly focused on established companies, and the study of dynamic capabilities in young ventures is still in an emerging phase (Zahra *et al*., 2006). As the global crisis has made the pre-crisis resource configurations of high-tech entrepreneurial ventures obsolete, thereby threatening firm survival and growth, it is an especially interesting context for studying both the impact of dynamic capabilities on entrepreneurial ventures' performance and the antecedents of the dynamic capabilities of these firms. In addition, our work contributes to the debate on the relationship between dynamic capabilities and firm performance. Previous studies have conceptually challenged the assumption that dynamic capabilities inevitably lead to superior performance. In this paper, we provide fresh empirical evidence documenting that dynamic capabilities are not one-size-fits-all.

Moreover, the paper contributes to scholarly conversations on the relationship between the resource-based view (RBV) and the dynamic capabilities perspective (see, e.g., Wu, 2010) in that it documents a positive linkage between possession of valuable, rare, inimitable resources (Barney, 1991) and dynamic capabilities, which, in turn, under certain circumstances, positively affect firms' performance.

Lastly, by analyzing firm-level effects of the current global crisis, this paper contributes to the literature studying how organizations manage crises. This literature mainly focuses on events that usually affect relatively few stakeholders in a few industries or geographical areas. In brief, their impact is much more limited than that of the current global crisis. This paper provides the crisis literature with a novel theoretical framework that can be applied whenever the crisis event is so disruptive and pervasive that the need for change is straightforward. Moreover, because crises are low-probability events (Shrivastava, 1987), the crisis literature has mainly adopted a qualitative research design. The current crisis is affecting many firms in different industries and countries simultaneously. Therefore, it is an extraordinary research opportunity for crisis management scholars because it offers the chance to explore the firm-level consequences of a crisis through

large-scale quantitative analyses that use econometric techniques. In seizing this opportunity, this paper fills a gap in the crisis literature, which mostly lacks a quantitative basis (Helsloot, 2006).

Notwithstanding the strengths of this study, we are aware of its limitations, which open promising avenues for future research. First, we examined the impact of the crisis on Italian high-tech entrepreneurial ventures. It would be interesting to test our hypotheses in other countries or in medium- and low-tech industries. Second, here we examined the short-term effects of dynamic capabilities on growth in the crisis context. It is interesting to investigate whether the relationship between dynamic capabilities and performance documented by this paper persists over a longer time period. Third, here we disregarded the factors that may moderate the relationship between dynamic capabilities and firm performance. Examining under which environmental and firm-level contingencies the dynamic capabilities lead to superior performance would be an interesting addition to the dynamic capability literature. Finally, the literature has highlighted that other dynamic capabilities are crucial for high-tech entrepreneurial ventures (e.g., alliance and acquisition capabilities). Analyzing whether and how these dynamic capabilities matter in the crisis context and what their antecedents are might be an interesting addition to this work.

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Table 1: The dynamic capabilities of the sample firms in the context of the crisis

	No.	%
ProductInnovationDC		
Firms did not invest additional resources in new product (service) development (*ProductInnovationDC=0)*	32	28.1
Firms invested additional resources in new product (service) development but did not search for external equity financing (*ProductInnovationDC=1)*	57	50.0
Firms invested additional resources in new product (service) development and searched for external equity financing (*ProductInnovationDC=2)*	25	21.9
Total	*114*	*100.0*
InternationalExpansionDC		
Firms did not invest additional resources in expansion in international markets (*InternationalExpansionDC=0)*	52	45.6
Firms invested additional resources in expansion in international markets but did not search for external equity financing (*InternationalExpansionDC=1)*	42	36.8
Firms invested additional resources in expansion in international markets and searched for external equity financing (*InternationalExpansionDC=2)*	20	17.5
Total	*114*	*100.0*

Table 2: The dynamic capabilities of the sample high-tech entrepreneurial ventures in the context of the global crisis

		ProductInnovationDC						***InternationalExpansionDC***					
		=0		*=1*		*=2*		*=0*		*=1*		*=2*	
	No. (a)	*No. (b)*	*% (b)/(a)*	*No. (c)*	*% (c)/(a)*	*No. (d)*	*% (d)/(a)*	*No. (e)*	*% (e)/(a)*	*No. (f)*	*% (f)/(a)*	*No. (g)*	*% (g)/(a)*
Industry													
Manufacturing	66	18	27.3	36	54.5	12	18.2	25	37.9	31	47.0	10	15.2
Services	48	14	29.2	21	43.8	13	27.1	27	56.2	11	22.9	10	20.8
Geographic area													
North	71	16	22.5	40	56.3	15	21.1	32	45.1	28	39.4	11	15.5
Center, South and islands	43	16	37.2	17	39.5	10	23.2	20	46.5	14	32.6	9	20.9
Size on December 31st, 2008													
≤2,000 k€	92	29	31.5	43	46.7	20	21.7	45	48.9	30	32.6	17	18.5
>2,000 k€	22	3	13.6	14	63.6	5	22.7	7	31.8	12	54.5	3	13.6
Age class on December 31st, 2008													
≤10 years	57	18	31.6	26	45.6	13	22.8	24	42.1	19	33.3	14	24.6
>10 years	57	14	24.6	31	54.4	12	21.0	28	49.1	23	40.4	6	10.5

Table 3: Sales and employment growth rates of Italian high-tech entrepreneurial ventures between 2007 and 2009

	Sales growth rates		*Employment growth rates*	
	2007-2008	*2008-2009*	*2007-2008*	*2008-2009*
Industry				
Manufacturing	8.83%	-9.46%	3.95%	-2.18%
Services	9.95%	5.24%	-9.67%	16.56%
Geographic area				
North	10.93%	-7.57%	1.74%	4.69%
Center, South and islands	7.11%	-2.00%	-4.03%	5.35%
Size on December 31st, 2007[a]				
≤2,000 k€	10.28%	5.61%	-6.26%	15.34%
>2,000 k€	10.00%	-7.93%	1.30%	2.08%
Age class on December 31st, 2008				
≤10 years	12.85%	3.52%	-0.08%	12.32%
>10 years	8.42%	-6.71%	-0.78%	2.25%

Legend: Sales and employment growth rates between years *t* and *t+1* are calculated by the difference between sales (employment) in *t+1* and in *t*, divided by sales (employment) in *t*.

[a] Employment growth rates are calculated separately for firms with 10 or fewer employees and firms with more than 10 employees.

Table 4: Definitions of the explanatory variables

Variable	*Description*
The antecedents of the dynamic capabilities	
$LnEmployees_{07}$	Firm size: logarithm of the number of employees (plus one) in full-time equivalents on December 31st, 2007
$Liquidity_{07}$	Cash availability: cash and cash equivalents divided by sales measured in 2007 and winsorized at 90%
TechWorkExp	Founders' average number of years of work experience in technical functions in the focal firm's industry prior to creating the entrepreneurial venture
SqTechWorkExp	Squared term of *TechWorkExp*
ProdWorkExp	Founders' average number of years of work experience in production functions in the focal firm's industry prior to creating the entrepreneurial venture
SqProdWorkExp	Squared term of *ProdWorkExp*
ComWorkExp	Founders' average number of years of work experience in commercial functions in the focal firm's industry prior to creating the entrepreneurial venture
SqComWorkExp	Squared term of *ComWorkExp*
OtherWorkExp	Founders' average number of years of work experience in industries other than that of the focal firm prior to creating the entrepreneurial venture
SqOtherWorkExp	Squared term of *OtherWorkExp*
$\%InternationalSales_{07}$	Prior internationalization: share of firm's 2007 sales accounted for by international sales
$\%NewProductsSales_{07}$	Prior innovation: share of firm's 2007 sales accounted for by products (services) developed by the firm since 2005
Age	Firm's age on December 31st, 2008
LnFounders	Logarithm of the number of founders
The growth equation	
$EmpGrowthRate_{0708}$	Growth rate of employment, calculated as the variation in the logarithm of the number of employees (plus one) in full-time equivalents between 2007 and 2008
$SalesGrowthRate_{0708}$	Growth rate of sales, calculated as the variation in the logarithm of sales (in k€) between 2007 and 2008
$\Delta Employees_{0708}$	Absolute growth of employment, calculated as the variation in the number of employees in full-time equivalents between 2007 and 2008
$\Delta Sales_{0708}$	Absolute growth of sales, calculated as the variation in sales (in k€) between 2007 and 2008

Table 5: Antecedents of the dynamic capabilities

Variable		**Model A** *ProductInnovationDC*		**Model B** *InternationalExpansionDC*	
α_1	*LnEmployees*$_{07}$	0.302	(0.148) **	0.278	(0.150) *
α_2	*Liquidity*$_{07}$	0.137	(0.336)	0.710	(0.279) **
α_3	*TechWorkExp*	-0.137	(0.082) *	-0.018	(0.090)
α_4	*SqTechWorkExp*	0.013	(0.006) *	0.003	(0.005)
α_5	*ProdWorkExp*	-0.064	(0.059)	-0.037	(0.052)
α_6	*SqProdWorkExp*	0.003	(0.002)	0.002	(0.002)
α_7	*ComWorkExp*	-0.073	(0.095)	0.083	(0.106)
α_8	*SqComWorkExp*	0.002	(0.005)	-0.002	(0.005)
α_9	*OtherWorkExp*	-0.064	(0.044)	0.020	(0.046)
α_{10}	*SqOtherWorkExp*	0.002	(0.002)	0.000	(0.002)
α_{11}	*%InternationalSales*$_{07}$	-		0.015	(0.004) ***
α_{12}	*%NewProductsSales*$_{07}$	-0.006	(0.004)	-	
α_{13}	*Age*	-0.024	(0.026)	-0.054	(0.026)
α_{14}	*LnFounders*	0.398	(0.279)	-0.662	(0.258) ***
Industry dummies		Yes		Yes	
Geographic area dummies		Yes		Yes	
Wald χ^2 test: $\alpha_3=\alpha_4=0$		5.94(2)*		0.82(2)	
Wald χ^2 test: $\alpha_5=\alpha_6=0$		1.94(2)		2.12(2)	
Wald χ^2 test: $\alpha_7=\alpha_8=0$		1.48(2)		3.68(2)	
Wald χ^2 test: $\alpha_9=\alpha_{10}=0$		2.21(2)		0.74(2)	
Number of observations		114			
χ^2		39.04(19)***			
Wald test of independence of the equations		10.23(1)***			
Correlation between the dependent variable and its predicted value		47.1%		54.9%	

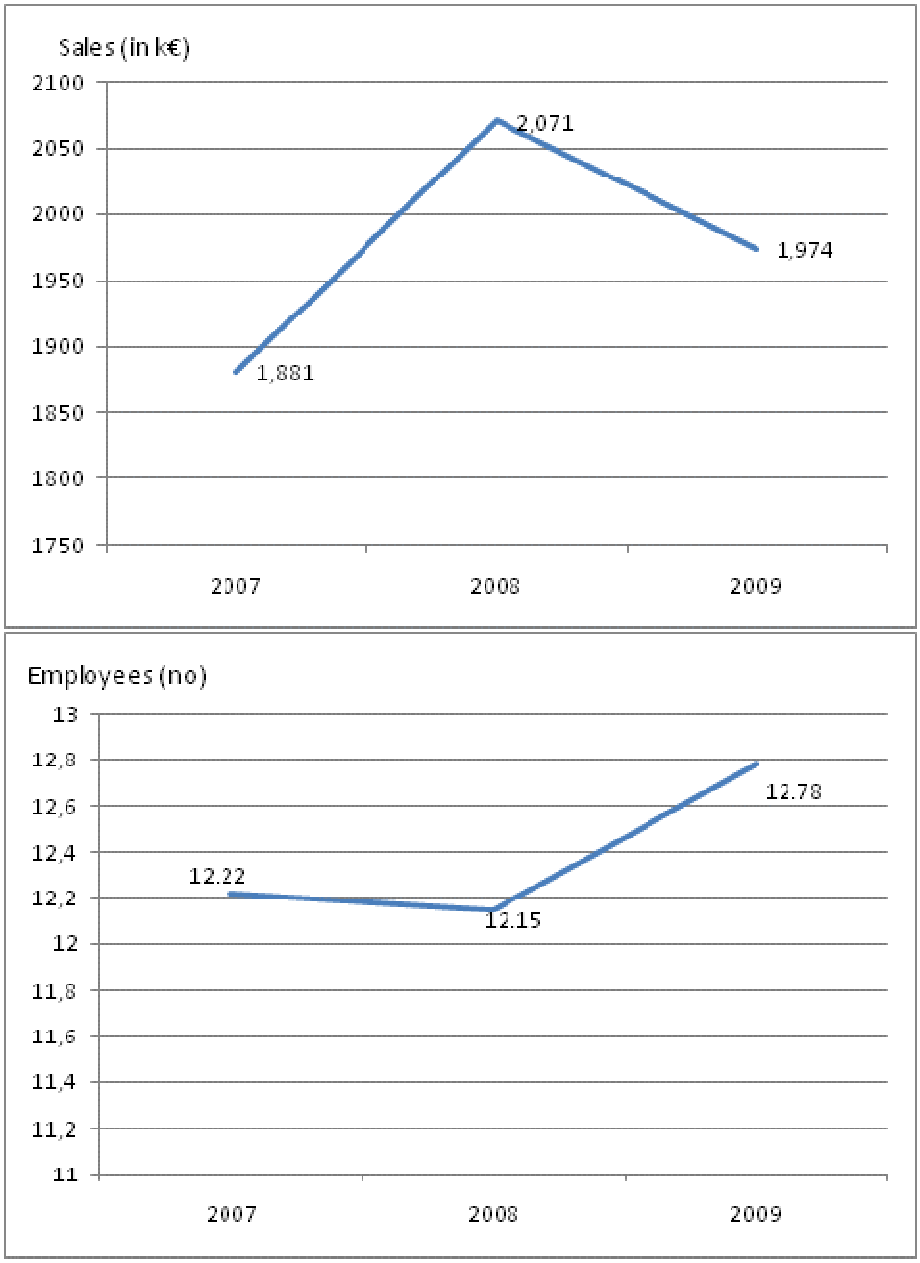
Legend. *Significance level greater than 90%; **significance level greater than 95%; ***significance level greater than 99%. Robust standard errors are in parentheses. For the sake of synthesis, estimated coefficients of industry and geographic area dummies are not reported.

Table 6: Impact on growth of the dynamic capabilities

Variables		**Model 1** *LnEmployees$_{09}$*			**Model 2** *LnSales$_{09}$*			**Model 3** *Employees$_{09}$*			**Model 4** *Sales$_{09}$*		
β_0	*Constant*	-8.019	(3.689)	**	-35.004	(38.961)		-2.913	(3.094)		2535.882	(2305.587)	
β_1	*ProductInnovationDCPred*	0.114	(0.060)	*	0.156	(0.084)	*	1.891	(0.774)	**	155.561	(68.747)	**
β_2	*InternationalExpansionDCPred*	0.027	(0.067)		0.134	(0.101)		-0.009	(0.519)		-31.669	(57.546)	
β_3	*LnEmployees$_{08}$*	0.695	(0.089)	***	-			-			-		
β_4	*EmplGrowthRate$_{0708}$*	-0.142	(0.114)		-			-			-		
β_5	*LnSales$_{08}$*	-			0.157	(0.800)		-			-		
β_6	*SalesGrowthRate$_{0708}$*	-			-0.548	(0.283)	*	-			-		
β_7	*Employees$_{08}$*	-			-			0.857	(0.040)	***	-		
β_8	Δ*Employees$_{0708}$*	-			-			0.428	(0.248)	*	-		
β_9	*Sales$_{08}$*	-			-			-			0.987	(0.051)	***
β_{10}	Δ*Sales$_{0708}$*	-			-			-			0.253	(0.127)	**
β_{11}	*Age*	0.015	(0.009)	*	0.066	(0.072)		0.023	(0.077)		-15.611	(8.447)	*
β_{12}	*InverseMillsRatioFailure*	-0.973	(0.433)	**	-4.805	(5.256)		-3.094	(1.466)	**	277.152	(281.938)	
β_{12}	*InverseMillsRatioAcquisition*	0.030	(0.033)		0.289	(0.311)		0.537	(0.228)	**	-9.544	(29.340)	
Industry dummies		Yes			Yes			Yes			Yes		
Geographic area dummies		Yes			Yes			Yes			Yes		
N. of observations		114			114			114			114		
F		111.90 (13, 100)***			100.56 (13, 100)***			143.14 (13, 100)***			118.45 (13, 100)***		
R^2		0.90			0.90			0.96			0.98		
Test F: β_3=1		11.81 (1, 100)***			-			-			-		
Test F: β_5=1		-			1.11 (1, 100)			-			-		
Test F: β_7=1		-			-			12.62 (1, 100)***			-		
Test F: β_9=1		-			-			-			0.06 (1, 100)		

Legend. *Significance level greater than 90%; **significance level greater than 95%; ***significance level greater than 99%. Robust standard errors are in parentheses. For the sake of synthesis, estimated coefficients of industry and geographic area dummies are not reported.

Figure 1: Evolution of average sales and average number of employees of Italian high-tech entrepreneurial ventures between 2007 and 2009.



Source: RITA Observatory
Legend: number of employees is measured in full time equivalents.