BACK TO THE ENVIRONMENT—EXPLORING THE DIFFERENTIAL EFFECTS OF THE INDUSTRY KNOWLEDGE BASE ON NEW VENTURE PERFORMANCE AND GROWTH

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Principal Topic

What industry should we be in? This is a fundamental question for entrepreneurs. In the past, industrial economics (Bain, 1951) and strategy scholars (Ansoff, 1965; Porter, 1980) have stated that structural conditions made some industries intrinsically more profitable than others. More recently, organizational learning theory has claimed that the environment in which a firm competes has important learning implications, shifting the focus from the structural conditions of an industry to the knowledge and competences available within and across industries.

Indeed, the environment, and especially the industry in which a venture competes, may contain important sources of knowledge and technologies (Huber, 1991), enabling firms, to keep abreast of new technological developments and changes in customers' needs and demands (Sirmon, Hitt, & Ireland, 2007; Yli-Renko, Autio, & Sapienza, 2001). This dependence towards external knowledge makes new ventures very susceptible to the knowledge base—alias the knowledge characteristics— of the industry in which they operate. Yet, currently there is limited research on how the knowledge base of an industry affects the performance and growth of new ventures. Inspired by the latest trends in strategic management and entrepreneurship, most studies have taken an inside-out perspective and focused on the performance and growth implications of the knowledge base internal to the firm, such as the prior knowledge and experience of the entrepreneur(s) (Shane, 2000) or the new venture's resources and capabilities (Autio, Sapienza, & Almeida, 2000; Sapienza, Autio, George, & Zahra, 2006). In this project, we complement this body of knowledge by going back to the environment. Specifically, we propose an outside-in perspective and explore the links between the knowledge base of an industry on the one hand, and performance and growth of new ventures, on the other hand.

We consider one particular strand of knowledge— technological knowledge— and define it as scientific knowledge applied to useful purposes (Prabhu et al., 2005). We look at four dimensions of an industry's knowledge base—breath, depth, complexity and longevity. *Depth* refers to the amount of within-area knowledge of the firms in the industry; *breath* refers to the range of areas over which the firms in the industry have knowledge; *complexity* amount of cross-area knowledge of firms in the industry; and *stage of development* refers to the novelty of the knowledge in the industry. Therefore, in this project we focus on how these four characteristics may differentially affect new ventures' survival and growth.

According to the knowledge based view (Grant, 1991; Kogut & Zander, 1992) and organizational learning literature (Huber, 1991) firm are generators, repositories and integrators of knowledge, and compete with other firms on the basis of their ability to acquire, develop and utilize knowledge (Cohen & Levinthal, 1990). Thus, knowledge is essential to the survival and prosperity of firms (Grant, 1996).

Gaps in the knowledge-based and learning literature are evident in that while it is maintained that organizational knowledge is closely dependent upon the knowledge of the organizational members who hold it, the literature does not address the link between organizational knowledge and industry knowledge (Cohen & Levinthal, 1990). In this project, while we agree that looking at individual knowledge is useful to understand the emergence of collective knowledge within organizations (and vice versa); we propose to focus the attention to an additional layer— the knowledge within an industry. We define industry knowledge as the knowledge residing within the firms competing in a certain industry.

There are several reasons why the dimensions of an industry's technological knowledge may influence performance and growth of new ventures. First, each dimension may affect the costs and investments that new firms might undertake to enter and build positional advantages in the industry (Stinchcombe, 1965). And, depending on the industry knowledge, these costs might be more or less significant and enduring. For example, industries characterized by technological complexity (i.e. knowledge which crosses specialized areas) may pose significant challenges to the performance of new ventures, because firms must incur in high investment costs. Yet, these costs are likely to decrease over time as the initial stock of knowledge has been acquired.

Second, each dimension may differently affect how new ventures acquire, develop and employ new knowledge to stay competitive (Cohen & Levinthal, 1990). New venture literature holds that because of their young age, new ventures lack cognitive impediments to learning and, compared with older companies, are better able to acquire new valuable knowledge from external sources (Autio, et al., 2000). Thus, the technological and scientific knowledge to which a new venture is exposed to may influence the knowledge the new venture can absorb and use to stay competitive. Beside the actual knowledge acquired, the dimensions of an industry's technological knowledge may also influence the ease with which learning occurs. As noted by Cohen and Levinthal (Cohen & Levinthal, 1989: 570), "the ease of learning [...] depends upon the characteristics of the underlying technological and scientific knowledge upon which innovation depends in a given industry ".

This discussion sets the stage for the research project, which expects the relationships between each dimension of an industry knowledge base, and the performance and growth of new ventures to be neither linear nor simple.

Method

The empirical setting for the study are high tech industries in the European Union over a five year period from 2010 through 2014. High-tech industries are identified following the OECD classification based on their NAICS codes.

We will test our hypotheses on a longitudinal data set comprising around 10.000 new ventures. The sample is selected to include all European new ventures in all high-tech industries. The data will be gathered from two different sources—EU Patent Office, survey data and AMADEUS.

Patent data, directly obtained from AMADEUS and the EU Patent Office, will be used to measure the knowledge base of each industry. Specifically, we will measure the four dimensions of knowledge base aggregating the patent information of every patenting company (regardless their age) in each industry, during the period under study, as follows: *Depth of knowledge*: Average number of approved patents per patent *class* for each sub-

industry; *Breath of knowledge*: number of patents *classes* approved for each sub-industry; *Complexity of knowledge*: number of patents approved combining two or more *classes* for each industry; *stage of development*: average age of the patents for each industry.

Using patent data to measure knowledge has some limitations (King & Zeithaml, 2003), because patents only partially capture the technological knowledge base of an industry (Yayavaram & Ahuja, 2008). Patents, by definition, are codified knowledge and do not effectively cover intangible aspects of knowledge (Steensma & Corley, 2000). In addition, the importance of patents might vary even within the same industry, and the propensity to patent might not be consistent across sub-industries. Because of these limitations, the four measures described above will be complemented by survey-based measures tapping entrepreneurs' perceptions of their industry knowledge base. As suggested by King and Zeithmal (2003), entrepreneurs and business managers are particularly adept at articulating knowledge. And, CEO's assessments are often the preferred method for grasping knowledge aspects of new ventures (Autio, et al., 2000). Multiple item scales will be used to measure each aforementioned dimension of an industry knowledge base. The scales will be developed using the process suggested by DeVellis (1991). Specifically, the item generation will be based on a literature review and on expert interviews.

Finally, data on performance and growth of new ventures in this industry will be obtained from AMAEDUS, along with other descriptive data on these firms.

Data will be analyzed using panel data analysis techniques. In order to handle the large amount of data gathered from the three sources mentioned above —EU Patent Office, survey data and AMADEUS—a specific customized software will be designed for organizing the entire database, including data at the firm and industry levels.

Implications

The project intends to make the following contributions to the literature. First, it presents an outside-in perspective that complements the dominant inside-in perspective of entrepreneurship literature, recognizing that industries are important for the strategic development of new ventures enabling and constraining entrepreneurs in their possibilities for success. The notion that the conditions in which a firm is born may have a substantial effect on its performance is one that has received attention from different perspectives, such as the resource based view of the firm or organizational ecology (Helfat & Lieberman, 2002; Geroski et al., 2010). The project contributes to this body of research by suggesting that the characteristics of the industry knowledge may be important predictors of new venture success.

Second, the project focuses on two types of outcomes—performance and growth— and shows how they not necessary co-vary in new ventures. Specifically, it intends to illustrate how the characteristics of an industry's knowledge base may affect new ventures' performance and growth in different ways overtime. Understanding the sources of new venture performance and growth is indeed a research priority for entrepreneurship scholars (Hmieleski & Ensley, 2007).

Third, the project intends to add to the growing literature on the knowledge-based view of the firm (Grant, 1991) by highlighting possible origins and evolutionary paths of a venture's knowledge base. The characteristics of an industry knowledge base influence the mobility, migration, and diffusion of knowledge (Cohen & Levinthal, 1989; 1990) and thus, most

likely, resource accumulation and capabilities development in new ventures. Indeed, authors studying the path-dependent process of organization evolution are starting to pay closer attention to the role of the external environment in shaping organizational paths (e.g. Van den Bosch et al., 1999; Sydow et al., 2009).

This project has also important implications for entrepreneurs starting de-novo firms and companies launching new businesses. New ventures often face a number of dilemmas when they start commercializing their knowledge. In which markets and industries should we position themselves? These are questions of crucial importance for the survival of new ventures (Hmieleski & Ensley, 2007). This is so because different industries offer different challenges for new entrants. Some industries have knowledge characteristics that pose initial strong threats for new ventures' performance, yet offer rich prospects for future growth and success. Other industries, on the contrary, have knowledge characteristics that ease the initial positioning of new ventures but increase the likelihood of future failure.

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