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The effects of inter-industry and country difference in supplier relationships on pioneering innovations

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ABSTRACT

Innovations are critical driving forces for firms to engage in corporate growth and new business development. Innovating firms are increasingly generating new knowledge in collaboration with partners. In this paper, we analyze how the knowledge differences between the innovating firms and their suppliers in Canada are likely to result in pioneering innovations. The knowledge difference is decomposed into two dimensions: the inter-industrial dimension and the geographic dimension in national context. Using the Canadian Innovation database, we found the *inter-industry difference* has a positive effect and the *country difference* has a negative effect on the likelihood of generating pioneering innovation. The findings of this paper suggest that for generating pioneering innovation, it is important not only to search for suppliers from different industries to get access to various complementary external knowledge sources but also to find suppliers from the same or nearby countries for the sake of communication and coordination.

1. Introduction

Innovative firms are increasingly generating new knowledge in collaboration with partners. Studies on strategic management and innovation have recognized that innovation is an interactive, cumulative and cooperative phenomenon occurring between different organizational actors (Powell et al., 1996; Gulati, 1999; Nooteboom, 2000; Freel, 2003; Zaheer and Bell, 2005). A large number of studies have paid attention to the role of strategic alliances and corporate venturing in generating technological innovations (Rothaermel and Deeds, 2004; Hagedoorn and Duysters, 2002). Other scholars have investigated the role of customers in generating innovations (Narver and Slater, 1994; Christensen and Bower, 1996). Complementary to these research efforts, this paper focuses on the role of suppliers as collaborators in the innovation process. More precisely, we analyze how supplier relationships are likely to result in pioneering innovations that are not only technologically novel, but are also first introduced to the world.

The novelty of innovations lies in the differences between the component elements, or the novel ways in which these elements are recombined (Nooteboom, 2000). The important role that knowledge differences play in respect of a firm's innovation performance has been widely discussed in the existing innovation literature (e.g., Jaffe and Trajtenberg, 2002; Rosenkopf and Nerkar, 2001; Ahuja and Lampert, 2001; Katila and Ahuja, 2002). Dissimilar external knowledge comes from having different resources, which can be investigated in respect of different dimensions. We focus on two dimensions that might have major influences in explaining the likelihood of pioneering innovations. First, knowledge differences between the innovating firms and their suppliers can be explained by the inter-industry difference between them (Dosi, 1988; Romeo, 1975), which depicts the cognitive dimension of knowledge difference. Second, firms' geographic localization matters in innovation as well (e.g., Asheim and Isaksen, 2002). Innovating firms and their suppliers do not necessarily originate from the same country. Country difference captures the differences between the national contexts in which firms are located (Phene et al., 2006). Our focus on the roles of inter-industry difference and country difference as sources of dissimilar knowledge in respect of generating pioneering innovations also reflects the call for more insight into the interplay between sectoral and national patterns of innovation, which is still under-developed in the literature (Morgan, 2004).

To examine the roles of inter-industry and country difference on pioneering innovation, we confine our research to the relationships between the innovating firm and its suppliers. Besides strategic alliances, corporate venturing and customers, the supplier relationship is an important source of creativity in

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innovation. Nevertheless, the relationship between supplier involvement and firms' innovation performance remains unclear in the literature. Research on supplier involvement has addressed the importance of involving key suppliers in new product development projects (e.g., Dyer, 1996, Handfield et al., 1999; LaBahn and Krapfel, 2000; Takeishi, 2001). However, other researchers have found that supplier involvement may not always have a positive effect on new product development project because supplier involvement requires greater complexity for project management (Wynstra, 1998; Wynstra and ten Pierick, 2000). In this paper, we use the knowledge difference perspective to investigate the complexity of the interactions between suppliers and the focal firms' innovation performance. The central research question of this paper is therefore: What are the effects of sectoral difference and country difference between the innovating firm and its suppliers on a firm's ability to generate pioneering innovations?

This article is organized as follows. First, we define pioneering innovations. Second, we provide the theoretical background on sectoral and country dimensions regarding knowledge difference and how suppliers are involved in generating pioneering innovation. Third, we develop several hypotheses based on the existing literature. Next, we present the data and estimation methods with which to test the hypotheses. Finally, we discuss the results and draw conclusions for our research.

2. Theory and hypotheses

2.1. Pioneering innovation

Innovations are critical driving forces for firms to engage in corporate growth and new business development. Before we explain theories and build hypotheses, it is important to define what pioneering innovations refer to in this paper. It has been accepted that an innovation is the unique combination of technological novelty and appropriate market access (Fleming, 2002; Nerkar and Roberts, 2004). An invention only becomes a successful innovation if it has marketable use. In the first place, a pioneering innovation is radical in a technological sense. In contrast to incremental innovations, radical innovations represent a fundamental departure from existing practices (Dewar and Dutton, 1986; Tushman and Anderson, 1986). The criterion here is whether the innovation is novel or based on existing practice. Second, the novelty criterion for innovations should not only be judged from a technological dimension, but also from a product-market perspective. A typical characteristic of pioneering innovations is that they are introduced first to the world.

Therefore, in this paper, we define product innovations that are technologically radical and are introduced first to the world as *pioneering innovations*. This definition considers both the technological and market novelty of innovations because, contrary to technological inventions, innovations require not only scientific and technological knowledge, but also product-market knowledge (Chesbrough, 2003).

2.2. Diverse external knowledge from different industries and nations

Innovating firms are increasingly generating new knowledge in collaboration with partners. Innovation is an interactive, cumulative and cooperative phenomenon occurring between different organizational actors (Powell et al., 1996; Gulati, 1999; Nooteboom, 2000; Freel, 2003; Zaheer and Bell, 2005). The traditional *closed* innovation process, based on economies of scale in R&D, is in many companies gradually being replaced by a more open innovation process in which different innovation partners work together (Chesbrough, 2003). External knowledge is crucial for innovation because, in the first place, any innovation is considered the result of a recombination of component elements (Schumpeter, 1934; Henderson and Clark, 1990; Kogut and Zander, 1992). Single organizations usually do not possess all the knowledge to undertake innovation internally. Innovations, in this case, can only be achieved by collaborating with enterprises that have different knowledge-bases (Nieto and Santamaría, 2007). Firms differ regarding R&D, production efficiency, input and output of innovation, technological capabilities, etc. (Dosi, 1988). Difference in knowledge is a crucial condition for learning and innovation to produce a Schumpeterian 'novel combination' (Nelson and Winter, 1982). Thus, pioneering innovations, which create growth opportunities for the firm by combining new technologies with new market approaches, are more likely to emerge when inter-organizational interactive learning takes place.

Differences in the knowledge-base between the innovating firm and its partners can split into multiple dimensions. For example, various researchers have studied the role of knowledge differences between partners regarding the likelihood of breakthrough innovations in terms of technological distance (e.g., Ahuja and Lampert, 2001; Nerkar and Roberts, 2004; Phene et al., 2006). The technological distance is usually measured by means of differences in patent classes or patent citations. However, technological distance is only one of the various dimensions in which innovating firms and their collaborators differ from each other. The uneven distribution of economic competence is not only firm-specific, but also industry-specific (Nelson, 1991). Diversity between industries takes the form of R&D, production efficiency, market structure, innovation, technology intensity, resource endowment, etc. (Dosi, 1988). Industries also differ in the degree to which firms are able to capture the rents generated by their innovations (Anand and Khanna, 1997; Teece, 1986). These differences accumulate over time due to organizational inertia and path dependence (Nooteboom, 2000). The aggregation of these differences across industries results in the inter-industry differences in the knowledge-base. Therefore, we focus on the inter-industry difference as an aggregated dimension along which firms differ from each other. Differences between firms along the industrial dimension may create a potential for novel combinations.

However, searching for external new knowledge inevitably involves a geographic dimension. In the global market context, geographic proximity plays an important role in knowledge flows (Verspagen, 1993). At the macro level, geographic dimension is a matter of differences between nations. Differences between countries with respect to language, institution, and culture may form obstacles regarding communication and coordination between firms (Kress, 1992; Lundvall, 1992; Nelson, 1993; Chesbrough, 1999; Oliver, 1997; Hofstede, 1980; Herrera and Nieto, 2008). The literature on international business has found inconsistent evidences for the role of country difference on firm performance (Park and Ungson, 1997; Meschi and Riccio, 2008). Therefore, the role of country difference regarding pioneering innovation deserves careful investigation as well. In this paper, we focus on a specific collaborative relationship—suppliers relationship—to examine the influence of the interplay between sectoral and national patterns of innovation.

2.3. Innovation with supplier involvement

Firms have various types of collaborative relationships. The various natures of inter-firm relationships determine the