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Exploring the use of patents in a weak institutional environment: The effects of innovation partnerships, firm ownership, and new management practices

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ABSTRACT

Most observations of the patent behavior of firms are derived from institutional environments in which relatively strong protection can be obtained, even if patents *per se* are imperfect protection mechanisms. As a result, the determinants of a firm's propensity to patent in a weak appropriability regime are still unclear. This paper advances our current understanding of patent behavior by exploring the effects of manufacturing firms' innovation partnerships, foreign ownership, and adoption of new management practices on the likelihood of patenting. Our analysis is based on the responses of firms to questions in the Brazilian Industrial Survey of Technological Innovation (Pintec). The findings presented here indicate that, despite the weaknesses of the patent system, firms engaged in innovation-oriented collaborations are more likely to patent than firms not involved in these partnerships. Additionally, the results reveal that domestic and foreign firms in a weak institutional environment are similar in their inclination to patent. Finally, the empirical exercise shows that when a patent system is characterized by high levels of formalism and low levels of safeguarding against infringements of property rights firms adopt novel management practices as substitutes for patents.

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1. Introduction

The innovation literature suggests that an era of 'intellectual capitalism' has emerged (Granstrand, 1999, 2003) and that firms are pursuing patents more frequently (Lerner, 2002, 2009). Hence, the patent behavior of firms has received considerable attention in the academic literature (e.g., Galende, 2006; Novelli, 2015; Scotchmer, 2004; Somaya, 2012). However, most studies focus on firms operating in institutional environments in which relatively strong protections can be obtained (Forero-Pineda, 2006; Galende, 2006; James et al., 2013), even if patents *per se* are imperfect protection mechanisms. Thus, the recent surge in patenting may be particular to countries in which scientific and technological infrastructures are at the forefront. Firms operating in markets in

which the judicial system does not favor patent enforcement may innovate without patenting due to the uncertain enforceability of their intellectual property rights (Bouet, 2015; Sarkissian, 2008; Waguespack et al., 2005). Innovation theory posits that patents are less useful in weak appropriability regimes (Teece, 1986). However, the determinants of a firm's propensity to patent in regimes with weak intellectual property rights (IPR) remains unclear (Candelin-Palmqvist et al., 2012; Hanel, 2006; Keupp et al., 2009; Song et al., 2014; Woo et al., 2015). The present study primarily seeks to fill this gap in our knowledge.

In this paper, we focus on three potential determinants of firms' propensities to patent: innovation-oriented partnerships, firm ownership (i.e., foreign vs. domestic), and the adoption of new management practices. We concentrate on these factors for several reasons. First, innovation-based collaborations have become widespread (Gesing et al., 2015; Hagedoorn, 2002; Hemmert et al., 2014; Laursen and Salter, 2006), but to the best of our knowledge, only a few studies have sought to directly address the effects of partnerships on firms' propensities to patent (Blind et al., 2006; Brouwer and Kleinknecht, 1999). The influence of partnership on the propensity to patent is largely attributable to the increased likelihood of unintended knowledge spillovers. Patents are viewed as safeguards against partners' opportunistic behavior. However, in settings characterized by judiciary dysfunction, firms are likely

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to pursue alternative means of avoiding rent expropriation, such as informal, relational mechanisms of governance (Huang et al., 2013; Jean et al., 2014; Kotabe et al., forthcoming). As previous studies of the relationship between partnership and the propensity to patent have focused on countries with strong IPR systems, our knowledge of this relationship in business environments characterized by greater judicial uncertainty is limited.

Second, the literature on patenting has devoted little attention to the effects of ownership (i.e., foreign vs. domestic) on a firm's propensity to patent, especially in emerging economies (Keupp et al., 2012). Innovation theory suggests that in weak appropriability regimes, patents are less useful for firms hoping to reap the benefits of innovation (Teece, 1986). Thus, one would not expect foreign affiliates to be more inclined than domestic firms to patent. Nevertheless, the subsidiaries of multinational enterprises (MNEs) have, on average, a larger number of patents than the domestic firms of a focal country with a weak patent system (Albuquerque, 2000). Additionally, recent empirical evidence indicates that MNEs tend to replicate their home country patent behavior in host countries, even when the latter are emerging economies with fragile institutions (Athreye et al., 2014; Keupp et al., 2009). These findings appear to challenge innovation theory, warranting further investigation.

Finally, the literature on firms' propensities to patent largely builds on the neoclassical notion that firm size, market structure, and technological characteristics are central determinants of a firm's patent behavior (Griliches, 1990). Recent research, however, has suggested that other organizational aspects (e.g., managerial issues) also play a role (Webster, 2004). In fact, a firm's patent behavior also results from changes in management practices (Ernst and Fischer, 2014; Hall and Ziedonis, 2001; Reitzig and Puranam, 2009). We argue that management practices are adopted not only to create value but also to capture a larger share of the value that a firm creates. This is especially relevant in our context, as, given the weakness of the IPR system, such practices may reinforce firms' abilities to capture value from innovation. Thus, enhanced management practices may complement patenting in firms' efforts to reap the benefits of innovation. Although there has been increasing interest in the extent to which complementarities exist between patents and other mechanisms firms employ to appropriate the returns from innovation (Somaya, 2012), as far as we know, no effort has been undertaken to determine whether the pursuit of enhanced management practices reinforces patenting. Thus, this question deserves further consideration.

Our analysis derives from the responses of firms to questions in the Brazilian Industrial Survey of Technological Innovation (Pintec) and is based on logit-model estimates of the probability that firms' various attributes make them more inclined to patent. We focus on Brazil because its patent system has been shown to be rather unpredictable and to operate within an inefficient legal system (Pereira and Plonski, 2009). The paper is organized as follows. In the next section, we briefly review the literature from which our hypotheses are derived. In Section 3, we describe our dataset as well as the analytical framework employed in our analysis. Our estimation results are shown and discussed in Section 4. Finally, conclusions are drawn in Section 5.

2. Literature review and research hypotheses

Although the patent behavior of firms has received considerable attention in the academic literature (Novelli, 2015; van Zeebroeck et al., 2009), most studies have focused on developed economies with strong institutions and thus patent systems that are highly favorable to the enforcement of intellectual property rights. By contrast, there is little evidence regarding how more

fragile institutional settings affect firms' patent behavior. Why should we expect firms to behave differently in less vigorous patent systems? Dysfunctional administrative bodies pose challenges to patent prosecution and enforcement (Bouet, 2015; Drahos, 2008). Thus, firms operating in markets in which judicial systems do not facilitate patent enforcement are likely to adopt alternative approaches to appropriability (Hurmelinna-Laukkanen, 2009; James et al., 2013; Keupp et al., 2009). Weak appropriability regimes render patents less effective in appropriating the returns from innovation, and thus firms in such markets tend to more highly value other means (e.g., secrecy, control of complementary assets) of appropriating such returns (Teece, 2000). The adoption of other appropriability mechanisms does not imply that patents are not pursued (Zhao, 2006) but that a firm's propensity to patent (i.e. the likelihood of patenting) may be altered. In this paper, we explore the effects of partnerships, ownership, and adoption of new management practices on firms' patenting behavior.

2.1. Partnerships and a firm's propensity to patent

There is clear evidence that innovation partnerships have escalated since the 1980s, particularly in Europe, Asia, and North America (Gesing et al., 2015; Hagedoorn, 2002; Ma and Lee, 2008). Firms engage in collaboration to gain knowledge or specific resources needed to strengthen their competitive positions (Bekkers et al., 2002; Chesbrough, 2003; Giannopoulou et al., 2011; Hemmert et al., 2014). In fact, firms engaged in such innovation-based collaboration have seen increases in both economic performance (Belderbos et al., 2004b) and innovative output (Sherwood and Covin, 2008; Tether, 2002; Zeng et al., 2010). Although the latter depends, for example, on partner firms' depth of knowledge, the nature of the partnership, and the level of the vertical integration of the focal firm (Keupp and Gassmann, 2009; Mention, 2011; Srivastava and Gnyawali, 2011), by partnering, firms enhance their ability to innovate and are thus more likely to patent (Galende, 2006; Gesing et al., 2015; Schilling and Phelps, 2007).

While the exchange of knowledge increases the likelihood of innovation, it also encourages involuntary knowledge spillovers that can harm the continuity of the partnership (Hart and Moore, 1990; Veugelers and Cassiman, 1999). Thus, firms pursue safeguards against opportunistic behavior. One type of safeguard is a patent. Patents reduce transaction costs by documenting and formalizing a firm's knowledge. Indeed, as Brouwer and Kleinknecht (1999) observe, a firm becomes more inclined to patent and patents more frequently when it is involved in innovative collaborations. Blind et al. (2006) observe the same phenomenon, although at a lower level of statistical significance (i.e., 10%). Both papers provide evidence from institutional environments marked by stable and reliable governing rules and clear dispute settlement mechanisms. Emerging markets, however, tend to be characterized by market inefficiencies caused by weak regulatory institutions (Benoliel and Salama, 2010; Kotabe et al., forthcoming; La Porta et al., 1998). As a result, alternative mechanisms are expected to compensate for patent system ineffectiveness.

Innovation partnerships require not only strong commitment but also mutual reliability of the parties involved to protect the confidentiality of proprietary information exchanged (Hagedoorn, 2002; Robin and Schubert, 2013). Social exchange theory posits that strong relational capital emerges from close interaction between partners (Kale et al., 2000). As parties continue transacting over time, social norms and trust tend to emerge, further supporting collaborative arrangements (Gulati, 1995; Huff and Kelley, 2003). In this way, relational norms promote greater support for the exchange of proprietary information, even in the absence of a legally binding mechanism, facilitating the transfer of information and expertise.

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