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When patents matter: The impact of competition and patent age on the performance contribution of intellectual property rights protection

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ABSTRACT

The question whether patenting impacts patenting firms' subsequent financial performance is important for technology-oriented companies. However, relevant research has led to contradictory results. We strive to overcome this impasse by introducing innovation competition and patent age as moderators of patents' performance contribution into the discourse. Based on a sample of 975 cases from diverse industries, we find strong support for our arguments. In line with our expectations, the results show that the number of patents granted, the degree of patent competition, and the timeliness of a patent contribute positively to financial performance. Moderation analysis nuances our findings by showing that the impact of patent protection on financial performance is stronger when the patent competition is stronger and the patents are younger.

These findings provide insights into the conditions under which patenting leads to higher financial performance. Our findings highlight the importance of innovation competition and patent age for innovation research. The empirical results show firms that patenting pays and that, in order to tap the full potential of patents, they need to focus on emerging competing industries and reduce the time to market. Policy makers learn that patenting is a successful approach to foster innovation at limited social costs.

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1. Introduction

Society profits from innovation, which is a “process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention” (García and Calantone, 2002, p. 112). In turn, regulators grant inventors a legally secured competitive advantage for a limited time period that protects quasi-monopolistic rents (Andries and Faems, 2013; Encaoua et al., 2006). From this perspective, it is irrelevant whether the patenting firm directly leverages this competitive advantage economically by transforming it into a market offer, or indirectly by licensing. In both cases, patents should contribute positively to firm performance. However, empirical findings on patents' contribution to firm performance are mixed. Some studies find that patents have a positive impact on firm performance (Ernst, 2001; Mann and Sager, 2007; Helmers and Rogers, 2011), while others only find such an effect in specific cases (Mansfield, 1986; Arora et al., 2003), or do not

identify a significant impact at all (Griliches et al., 1991; Artz et al., 2010; Suh and Hwang, 2010).

We argue that the ambiguous empirical picture of patents' contribution to the inventing firm's performance is rooted in previous studies not having sufficiently accounted for two pre-conditions for tapping this question: First, only if there are competing innovations in the same area as the patent, does legal protection become relevant and may the patent impact the inventing firm's performance. In settings without such innovation competition, there is no danger of imitation and the patent remains economically irrelevant. Second, a patent application process's disclosure of a patent's details enables competitors to eliminate the inventors' competitive advantage by pursuing circumvention strategies (Levin et al., 1987). The patent's age is therefore relevant and patenting firms have to quickly tap the potential competitive advantage that patents create.

We take the above two pre-conditions–innovation competition and patent age –into account in this study to shed more light on patents' performance impact. More specifically, we investigate how the number of patents granted to a firm in one period (2004–2008) impacts its performance in the following period (2009–2013), taking the moderating effect of (1) the innovation competition that the firm faced in the area in which the patent was granted, and (2) the patent's age into account.

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We contribute to the scientific discourse, practice, and the debate on innovation policies and technology entrepreneurship (Ratinho et al., 2015) in several ways. First, we support previous studies that found that patents have a general positive effect on the patenting firm's economic performance. We thus highlight that patenting is an attractive way to tap inventions' financial potential. Second, we advance the body of knowledge on patents' performance effect by identifying two conditions that foster this: innovation competition and patent age. On the practical level, we inform firms how to generate financial benefit from patents. The empirical results show firms that patenting pays and that, in order to tap patents' full potential, they need to engage in innovation in competing areas and reduce the time to market. Policy makers also learn that patenting is a successful approach to foster innovation at limited social costs.

2. Theoretical background and hypotheses

Patents are one output of technologically successful R&D activities (Ernst, 2001). Patents grant inventors exclusive rights to protect their technological inventions for a limited period of time and, thus, enable them to recover their R&D investments (Encaoua et al., 2006). Patent protection allows inventors to commercialize their inventions without having to fear imitators (Cockburn and MacGarvie, 2011). Further, patents can be used for other purposes, such as blocking competitors by obtaining broader patent protection than truly required, or improving the inventor's position in negotiations with other firms (Blind et al., 2006, Cockburn, 2009).

If patents fulfill such fundamental roles, the competitive advantage derived from patenting should be reflected in the patenting firm's performance, which should be higher than that of similar non-patenting firms (Helmers and Rogers, 2011). Lee et al. (2000) argue that firms aiming to impede competitors from imitating their invention by applying for patents at an early stage of the product development process, can earn abnormal returns for an extended period of time. Several empirical studies support this argument and indicate a positive correlation between patenting activities and a firm's performance. Ernst (2001) examined the relationship between patent applications and subsequent changes in the firm's performance in the German machine tool industry, suggesting that patents have a positive impact on firm sales. Mann and Sager (2007) found evidence that patenting in small software start-ups is positively correlated to firm performance, although they used only indirect performance measures, such as the firm's exit status and its longevity. Similarly, Helmers and Rogers (2011) found that high-tech start-ups which use patents are less likely to fail and have a higher asset growth within the firm's first five years of existence than similar start-ups which did not patent.

Although theoretical considerations and empirical evidence suggest a positive relationship between patents and firm performance, there is also some evidence that questions this positive relationship. First, this positive relationship may be industry-specific, such as between pharmaceuticals and chemicals (Mansfield, 1986; Arora et al., 2003). Second, evidence exists that patents have either a negative impact, or virtually no impact, on firm performance. Griliches et al. (1991) analyzed the influence of 340 U.S. firms' patenting practices on these firms' change in market value and found that they had almost no influence. Artz et al., (2010) examined a firm's ability to benefit from its inventions and innovations by studying their impact on a firm's return on assets and sales growth over a 19-year period in a sample of 272 firms in 35 industries. Whereas their findings suggest a positive relationship between product announcements and the firm's performance, a negative relationship was found between patents and the firm's performance. Suh and Hwang (2010) explored the effect of patents

on the performance of software firms in South Korea, but did find a negative correlation with software revenues.

In spite of prior research's partly contradictory results, we assume that patents have a positive impact on firm performance. The rationale behind this assumption is that if firms are the first to launch a new, or strongly improved product, or to introduce new production methods, they are likely to gain a competitive advantage in that particular market and realize higher margins (Andries and Faems 2013). Further, we assume that the more patents a firm owns, the bigger its competitive advantage and the better its performance.

The temporal sequence has to be taken into consideration to test the causal impact of the number of patents on firm performance. In their meta-analysis, Bowen et al. (2010) found support for a positive relationship between innovation and future performance. Thus, as patents are one possible outcome of innovation (Garcia and Calantone 2002), it can be assumed that they will be positively associated with the firm's future performance. An overview of the literature reveals that empirical studies have either neglected the time lag (Narin et al. 1987), or used different stimuli, but similar time lags, for their analyses. Scherer (1965), for instance, assumed an average period of four years between the conception of an invention, the granting of a patent, and its economic exploitation. Both Basberg (1983) and Ernst (2001) followed the assumption of a time lag of up to four years, but respectively chose the year the patent was granted and the year of priority as stimulus. However, in order to explore the impact of patents on financial performance, the point in time when the full benefits of patent protection can be captured, i.e. the date when the patent office formally grants the patent, should be taken as a stimulus. Neither the point in time of the invention, nor the effective date of the patent application filing fulfill this criterion. Thus, we use a time lag of up to four years from the year the patent was granted. These arguments lead us to H1.

H1 : The higher the number of patents granted in one period, the better the firm's performance in the following period.

Firms patent strategically in the same or adjoining patent classes to block competitors, even though there might be no interest in commercializing the patented invention (Blind et al., 2006). Such a strategy will only yield the targeted results if the innovation competition in the industry is high and the emergence of substitutes for the actual patented innovation is prevented. The findings of Narin et al. (1987), who analyzed the relationship between patenting behavior and firm performance in 17 U.S. pharmaceutical firms, show that company patents' concentration within a few patent classes is positively associated with profit and sales. Their results indicate that firms which successfully patent within limited patent classes may enjoy a competitive advantage that enables them to generate higher sales and profits. The higher the overall number of patents registered in the same patent class and during the same time period, the more intensive the innovation competition in this field. A high innovation competition suggests that the firm will be able to tap the potential competitive advantage that the legal protection of the patented invention offers. The rationale behind this argument is that patents offers a fixed-term quasi-monopoly. However, if there is no competition, this privilege does not have any economic benefit for the patenting firm. Hence, we expect patents to have a stronger impact on the inventing firms' performance when patents protect inventions in areas of intense innovation competition. We, thus, propose the following hypotheses:

H2a : The higher the innovation competition in a specific class of patents in one period, the better the firm's performance in the following period.

The innovation competition within the respective patent class influences the performance impact of each patent. Thus, besides

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