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Win, lose or draw? The fate of patented inventions

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ABSTRACT

Using information from a survey of US inventors, this study explores the reasons for patent non-use and different types of non-use at the patent level, and how this varies by industry and firm characteristics. We find that 55% of triadic patents are commercialized. We also find that 17% of all triadic patents are not commercialized but are at least partially for preemption, though only 3% of all triadic patents are purely preemptive patents. We find that preemptive non-use is less common than failed patents. We then test the discriminating effects of patent effectiveness, competition, firm size and fragmentation of patent rights on the likelihood of preemptive patents. We find that greater patent effectiveness, more competition, and large firm size are associated with greater preemptive non-use relative to commercial use of patents. We conclude with the policy implications of our results.

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1. Introduction

Considering the exclusive right to invention as given not of natural right, but for the benefit of society, I know well the difficulty of drawing a line between the things which are worth to the public the embarrassment of an exclusive patent, and those which are not.

Thomas Jefferson (1813)

Patents are designed to promote science and the useful arts by giving the owner exclusive rights over an invention for a limited period of time (see, for example, US Constitution, Art. I, sec. 8). Firms are typically seen to exercise this right by using the technology in their own products and using the patent to enforce market exclusivity, or through licensing to others in exchange for a share of the rents. However, over the last two decades we have seen a growth in patenting and an increasing emphasis on preemptive (sometimes called “strategic”) non-use of patents to build fences around a technology or to prevent others from patenting and suing the focal firm (thereby ensuring freedom to operate, sometimes formalized through cross-licensing). Using patents to enhance strategic advantage in the competitive landscape is not a recent phenomenon (Merges, 1994; Saunders, 2001; Turner, 1998). However, as technology has become more critical for the competitiveness of contemporary firms (Baumol, 2002; Jaffe, 2000) and patent filings have exploded (Kortum and Lerner, 1999; Shapiro, 2001; van Zeebroeck et al., 2008), both managers and management

theorists have begun to re-examine the uses of patents (Blind et al., 2006; Cohen et al., 2000; Giuri et al., 2007; Hall and Ziedonis, 2001; Rivette and Kline, 2000; Sheehan et al., 2004). Some argue that this preemptive (or strategic) non-use is key to a well-founded firm strategy (Ziedonis, 2004), while others argue that such non-use is evidence of a broken patent system (Heller and Eisenberg, 1998; Jaffe and Lerner, 2004; Shapiro, 2001).

The law has not responded well to the problem of non-use of patents. Since the 1908 *Continental Paper Bag* Supreme Court ruling, the non-use or refusal to license patent rights has generally been seen as an allowable exercise of the government-granted patent right (Saunders, 2001).¹ US patent law specifically allows for patent non-use. Section 271(d)(4) of the Patent Act states that “No patent owner otherwise entitled to relief for infringement. . . shall be denied relief or deemed guilty of misuse or illegal extension of the patent right by reason of having. . . refused to license or use any rights to the patent.” Thus, non-use of patents is codified in US patent law. However, such preemptive patent non-use has long been controversial. As Justice Douglas wrote in dissent in *Special Equipment Co. v. Coe* (1945): “One patent is used merely to protect another. . . It is difficult to see how that use of patents can be reconciled with the purpose of the Constitution ‘to promote the progress of science and the useful arts.’”

In addition to preemptive non-use, patent non-use can result from a variety of other causes, including the low value of the

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¹ For a discussion of the relation between antitrust policy and patent policy, see Lemley (2011) and Dep't of Justice and Fed. Trade Comm'n (2007).

invention and rapid technological change making the invention not economical to commercialize. This line of argument motivates the following research questions: how common are non-use patents, what are the different types of non-use, and how do these different types of non-use vary by firm and environmental characteristics?

There have been several recent empirical studies on motives to patent (Blind et al., 2006; Cohen et al., 2000; Giuri et al., 2007). These studies find that so-called “strategic” non-uses of patents are important motives, such as patents to prevent rivals from inventing around a focal patent or to prevent rivals from getting a patent that would reduce the focal firm’s freedom to operate (Cohen et al., 2000; Gharrity, 1966). We shall refer to these uses as “preemptive” non-use of patents.² Cohen et al. (2000) suggest preemptive non-use of patents may contribute to firms’ incentives to conduct R&D beyond the effects of patents for preventing copying or for licensing. Hall and Ziedonis (2001) and Kortum and Lerner (1999) argue the growth in patenting is in part driven by the proliferation of preemptive patenting, although getting a good estimate of the rate of preemptive patenting has proven difficult. Giuri et al. (2007) report that 19% of European patents are not used and are patented for strategic blocking (accounting for about half of all non-use patents) and 3% are used for cross-licensing, with blocking motives most common in the chemicals and drugs sector. Motohashi (2008) reports that 33% of all Japanese patents are reported to be either for blocking or unused for other reasons, with cross-licensing accounting for about 9% of all patents (Motohashi, 2008). Thus, patent-level data from Japan and Europe suggest that preemptive patenting is quite common, accounting for a significant share of non-use patents, although the exact rates vary by definition and context. Much of this work uses surveys on reasons to patent.³ However, *a priori* motivations for patenting may not be maintained as the potential of the patented technology and of related technologies becomes clearer.

Therefore, the main contributions of this paper are that we examine the fate of each patent (used or not), and the different reasons for non-use of patents (after the firm has had time to establish use or non-use). In particular, we estimate the share of preemptive patents, among patents that are not commercially used, regardless of the initial motivation associated with the patenting. In other words, our interest is “patent non-use for preemptive reasons”, not “patents applied for, for preemptive reasons”. Furthermore, we compare preemptive patents to commercial patents to see how firm and environmental characteristics affect the rates of preemptive non-use of patents.

The structure of this paper is as follows. We first describe our main dataset. Second, we compare motivations for patenting to actual use of patents to motivate our operationalization of non-use patents, and then examine statistics on different reasons for patent non-use and create a typology of non-use patents. Third, we provide some exploratory analyses to compare preemptive non-use to commercial use of patents. Lastly, we conclude with results and implications.

2. Data on US inventions

We make use of a US inventor survey (Walsh et al., 2015; Walsh and Nagaoka, 2009). For the survey, we drew a systematic random sample of 9060 (out of 32,390) triadic patents (that had been

applied for at the EPO and JPO and granted by the USPTO) with at least one US-addressed inventor and priority years from 2000 to 2003, stratified by NBER technology class. Taking the first available US inventor as the representative inventor, and after randomly drawing one patent for inventors with multiple patents in our sample, we have 7933 unique US-based inventors in our mail-out sample. After sending the survey packet (with first-class stamps and individualized, signed cover letters), follow-up letters and a second-wave mailing of the full packet (Dillman, 2007), we received 1919 responses (24%). After excluding undeliverable, deceased, etc., from the denominator, we have an adjusted response rate of 32%. A detailed non-response bias analysis shows little evidence of non-response biases that were either statistically or substantively significant.⁴ For this study, we limit our sample to responses from inventors working in firms, leading to 1739 cases.

Triadic patents are a subset of US patents, over-representing those that may have significant value (enough to take on the expense of filing in three jurisdictions) and a potential global market. Thus, this population may underestimate the rate of preemptive patents. By comparing rates of preemptive non-use to other forms of non-use, we can to some extent control for this limitation in our sample. Still, it is important to note that the overall rates of non-use patents compared to commercially used patents may be lower in our sample than in some prior samples drawn from the general population of patented inventions. There may also be concerns that our sample over-represents large firms. However, a detailed comparison of the firms in our sample shows that the firm size distribution in our sample is not significantly different from the underlying population of innovating firms (Jung, 2009). In particular, there are a substantial number of patents from small and medium firms in our sample (about 20% of the sample of patents come from firms with less than 500 employees).

3. Non-use of patents

One novel aspect of our survey is that, in addition to asking the reasons for applying for the patent (as was done in Cohen et al., 2000; Blind et al., 2009; Giuri et al., 2007; and Torrisi et al., 2015), we asked for the reasons for non-use of patents that were not commercialized (after patenting). This measure of reasons for non-use is our main focus, allowing us to estimate the actual rates of different forms of non-use of patents, regardless of the initial motivation or reason for patenting.⁵ Prior work notes the difficulties of estimating rates of patent use, due to differences in definitions of use

⁴ Comparing respondents and non-respondents based on bibliometric indicators revealed few differences that were either statistically or substantively significant. In particular, measures of collaboration (solo inventions: 27% for respondents, 26% for non-respondents); average number of inventors: 2.71 for respondents, 2.80 for non-respondents), links to universities (citations to non-patent literature: 2.4 for respondents v. 2.7 for non-respondents) and measures of patent value (forward citations: 2.2 for respondents and 2.4 for non-respondents) are all similar (none are significantly different, $\alpha = 0.05$, $N = 7933$). The only significant differences are that inventors for whom we only had a company address (instead of home address) are less likely to respond (4% of respondents had a company address v. 6% for non-respondents, $p < 0.001$) and those with more patents in our sample are more likely to respond (mean of 1.18 patents for respondents, 1.13 for non-respondents, $p < 0.001$), although the absolute differences are quite small. Thus, despite the modest response rate, we have some confidence that our sample is representative of the underlying population of US-based inventors on triadic patents. In addition, this survey used a stratified sample with equal probability, except for multi-invention inventors. The number of patents belonging to each unique inventor was recorded to use as a weight to check the effect of the weight. However, comparing statistics with weights and without weights, we found that the weights have very minimal influence in this study and hence were not applied (for more information, see Jung, 2009).

⁵ The European surveys (PatVal1 and PatVal2) by Giuri et al. (2007) and Torrisi et al. (2015) do not include the question asking reasons for non-use of patents. Also see footnote 3.

² We adopt the term “preemptive” from Gilbert and Newbery (1982).

³ Motohashi (2008) is an exception. Although Giuri et al. (2007) and Torrisi et al. (2015) combine data on reasons for patenting (e.g., blocking or not) and data on commercialization to measure their rate of (supposed) strategic non-use, they do not have data on *ex post* reasons for non-use of patented inventions to measure the (consequent) preemptive non-use.

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