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Offensive Patent Portfolio Races

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In a patent portfolio race, firms attempt to assemble a large collection of patents. Traditional explanations for patent portfolio races rest on an assumption of fragmented patent ownership where multiple unknown firms employ defensive strategies to forestall holdup. However, patent portfolio races can be observed when patent ownership is concentrated to the hands of a few firms. To explore patent portfolio races under conditions of concentrated ownership we turn to the newspaper printing machine industry, an industry characterized by a few dominant firms. Using multiple sources – patent analysis, archival data, and interviews – we identify antecedents to a phenomenon we label offensive patent portfolio races. Contrary to received wisdom, we find that patent portfolio races can be offensive, aimed at gaining rather than avoiding loss of competitive advantage. Offensive patent portfolio races hinge on the breakdown of cooperation – triggered by changes in the perceived benefits, effectiveness, and/or costs of patents, partly mediated by the adoption of a gain frame towards increased patenting, and regulated by the potential losses from further increases. We explain the behavior by invoking the folk theorem in game theory and conclude that while triggering offensive patent portfolio races may yield temporary advantages, managers are advised to tread carefully as offensive patent portfolio races may have severe implications for the effectiveness and efficiency of the innovation process.

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Introduction

Patenting rates have increased considerably over the last decades (Hall, 2005). Explanations range from institutional changes that have benefited patent holders to changes in how firms manage R&D (Kortum and Lerner, 1999). In some industries, patenting increases take the form of patent portfolio races in which firms compete to assemble the greatest collection of patents.¹ They do so in an effort to reduce the threat of being held up by other patent owners, the rationale being that a larger patent portfolio comes with a greater ability to countersue a potential plaintiff (Cohen et al., 2000; Hall and Ziedonis, 2001; Ziedonis, 2004). In other words, these measures are largely defensive – patents are not obtained with the purpose to gain market share or increase profits but to defend against potential aggressive competitors.

In this paper, we investigate and theorize a different kind of portfolio race: the offensive patent portfolio race. Our interest is sparked by an anomaly between patenting literature and empirical observations. Received literature has explained patent portfolio races to occur *because* of fragmented ownership of patents. The logic is straightforward: High fragmentation, with possibly thousands of patentees, decreases the odds of identifying the holders of all relevant patents prior to designing and manufacturing a product (Hall and Ziedonis, 2001; Williamson, 1985; Ziedonis, 2004) and increases the risk of patent infringement by the focal firm. As a result, firms amass defensive patents to mitigate the risk of rent expropriation in case of holdup. While the argument is appealing, convincing and in many cases fitting, it is troubled by an itching observation: patent portfolio races also occur when patent ownership is concentrated to the hands of a few firms – a situation where the need for defensive patents ought to be lower. To explore this puzzling observation we turn to the newspaper printing machine industry, an industry that experienced a patent portfolio race despite being a tight oligopoly. Relying on patent analysis, archival data and expert interviews we demonstrate that patent portfolio races can have an offensive purpose directed towards

¹ Patent portfolio races must be distinguished from patent races. In a patent race, firms compete to be the first to achieve a specific invention and to obtain a patent on it (cf. Dasgupta and Stiglitz, 1980; Loury, 1979; Reinganum, 1982). In a patent arms race, in contrast, firms compete for the largest patent portfolio. There are parallels between the two phenomena with respect to the participants' incentives, which in both cases relate to building a competitive advantage based on intellectual property rights. However, in a patent race this advantage would come from the exclusionary power of a single patent, while in a patent portfolio race it would be based on that of a large portfolio. Also, a patent race has a unique winner, while a patent portfolio race has a continuum of possible outcomes including symmetric situations. Given the importance of individual inventions in discrete technologies, a patent race should be more likely in such a setting, while a patent portfolio race appears more plausible in complex technologies such as the one we study.

gaining market share and increasing profits rather than a defensive purpose. In particular, we find that starting from a cooperative situation of stable patenting rates the first mover adopted a gain frame towards increased patenting, partially triggered by the introduction of broader printing cylinders. While this innovation did not pose serious technical challenges, it did create opportunities for filing more patents, in particular on combinations of known inventions with the new cylinder width. The first mover's growing patent portfolio then prompted the second mover to follow suit. A patent portfolio race, or "arms race" ensued. To make our point, we rule out alternative explanations of the explosive increase in patenting.

This article is organized as follows. In the next section we discuss extant literature on antecedents to patent portfolio races. We then describe data collection and analysis, followed by a presentation of our results. In the final sections, we conclude and discuss implications for research, policy and managers.

Antecedents to patent portfolio races

In discussing known antecedents to patent portfolio races we highlight three points. First, when ownership of intellectual property (IP) is fragmented firms expand their patenting to avoid holdup problems. Second, when IP ownership is concentrated *ex ante* solutions to holdup are generally feasible. Third, even with concentrated IP ownership firm may deviate from stable patenting rates for a number of possible reasons.

High levels of patenting in fragmented markets: avoiding holdup

The ownership of IP is highly fragmented in industries such as semiconductors, electronics, and software.² In the semiconductor industry potential rights holders range from non-practicing entities over pure design firms to integrated manufacturers (Arora et al., 2001, p. 76; Macher et al., 1999; Ziedonis, 2003). In his testimony before the U.S. Federal Trade commission in 2002 Peter N. Detkin of Intel Corporation estimated that more than 10,000 parties held the approximately 90,000 existing patents for central processing units.³ The situation is similar in the communication electronics industry where Gilroy and D'Amato (2009) estimate that over 2,700 separate entities were actively patenting technology relevant to the fourth generation of cellular wireless networks and devices in 2008.

In such a situation, firms amass defensive patents in order to mitigate holdup risk and forearm against infringement suits (Cohen et al., 2000; Hall and Ziedonis, 2001; Ziedonis, 2004). The rationale of this strategy is the ability to countersue potential plaintiffs, at least those that are practicing entities themselves (in contrast to "nonpracticing entities", or "patent trolls"; e.g. Lemley and Shapiro, 2007; Reitzig et al., 2007). Firms resort to such defensive measures because they are generally unable to arrange *ex-ante* licensing due to transaction costs, in particular the costs of identifying a large number of unknown patent holders and of closing licensing deals with them. Moreover, fragmentation of patent ownership increases the risk of patent infringement because it complicates patent monitoring. And finally, infringement will often be discovered only after the firm has made significant investments in development and production, when inventing around the infringed patent is inadequately costly and the infringer thus in a particularly weak position.

This link between IP fragmentation and higher patenting rates has broad empirical support. Hall and Ziedonis (2001), analyzing a sample of 95 publicly traded semiconductor firms over a period of 10 years, report a doubling of patent output per R&D dollar and conclude that firms entered patent portfolio races in order to forearm against holdup by competitors that owned patents required for the firms' own production. Ziedonis (2004), studying 67 semiconductor firms, finds that a wide distribution of patent rights leads to more aggressive patenting by capital intensive firms, the rationale being that holdup would hit these firms particularly hard due to idle production capacity. Cockburn and MacGarvie (2009), based on an analysis of 27 distinct software product markets between 1980 and 2006, find evidence that firms without patents are less likely to go public if they operate in a market characterized by overlapping IP rights (so called "patent thickets"; Shapiro, 2001). This creates an incentive for firms owning fewer patents in "thicket-markets" to increase their patent portfolios in order to improve their chances of going public. Noel and Schankerman (2006), using panel data on software firms in the United States during 1980 to 1999, find that higher fragmentation of patent rights is associated with higher patenting activity.

Moderate patenting in concentrated markets: Ex ante solutions to holdup

The situation is entirely different when IP ownership is concentrated. Holdup risk due to inadvertent patent infringement is lower since firms do not have to fear litigation by previously unknown patent holders – as all players are known. Firms can more easily implement cross-licensing agreements to resolve or avoid situations of escalating patenting (Shapiro, 2001). Furthermore, due to the small number of relevant patent holders it is feasible to monitor their patent applications. In particular, this implies that a first mover in a patent portfolio race must anticipate retaliation and thus has less of an incentive

² Arora et al. (2001) and other authors speak of fragmented markets for technology. Since we are mainly interested in the fragmentation of IP ownership, and since fragmented (or concentrated) IP ownership does not necessarily imply a fragmented (or concentrated) market for technology (because there may not be any trade in IP and thus no true market for technology), we focus on the degree of fragmentation of IP ownership.

³ Peter N. Detkin, vice president, Legal and Government Affairs and assistant general counsel, Intel Corporation, 28 February 2002, http://www.ftc.gov/sites/default/files/documents/public_events/competition-ip-law-policy-knowledge-based-economy-hearings/020228ftc.pdf (accessed 03/08/2014).

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