



## Private–collective innovation, competition, and firms' counterintuitive appropriation strategies

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### ABSTRACT

We extend theory on private–collective innovation by studying the role of exclusion rights for technology in the competition between private–collective and other innovators. We argue that private–collective innovators both pledge their own and invest in orphan exclusion rights for technology as a subtle coordination mechanism to compete against firms proposing alternative proprietary solutions. We discuss implications of our findings for theories of innovation, particularly appropriation strategy, ownership and control, and coordination and industry self-regulation.

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### Prologue:

On August 2, 2004, the independent insurance company Open Source Risk Management (OSRM) published a report suggesting that Linux was infringing on as many as 283 different patents, dozens of which belonged to the Microsoft corporation. On October 12, 2004, U.S. software giant Novell announced that it would not enforce any of its patents against Linux or the Open Source Software (OSS) community more broadly. On November 12, 2004, the firm acquired 39 patents crucial to Internet commerce and Web services in an auction for \$15.5 m (an acquisition that was conducted in disguise through a subsidiary called JGR Acquisition). Shortly thereafter, Novell officially donated these newly acquired patents to the open source community.

### 1. Introduction

Established management theory suggests that a firm's performance increases as the firm creates and captures more value, all else being equal (from Penrose, 1959 to MacDonald and Ryall, 2004). Another fundamental conjecture is that private property

rights over resources are a means for firms to capture value through appropriation (Demsetz, 1967; Grossman and Hart, 1986; Pfeffer and Salancik, 1978). Finally, in high-technology industries, patents are important property rights firms can possess that allow the excluding of competitors from gaining access to rare resources and guarantee freedom to operate (Hall and Ziedonis, 2001). So, why would a profit-maximizing firm waive (parts of) the exclusion rights it owns—particularly if those rights protect a rare and valuable resource from imitation? (Dierickx and Cool, 1989). And, even more puzzling, why would a firm continue to purchase further exclusion rights protecting such resources, only to waive them again after acquisition, as in the introductory example? Basic management theory fails to explain the logic behind the public pledges of certain firms—among them IBM, Novell, and Nokia—not to assert their exclusion rights against anyone who infringes on them while developing or adopting open source software (OSS). More advanced theory on the use of exclusion rights could rationalize the pledges if the patent waivers created positive externalities for the right-holders that outweigh the opportunity costs of not excluding third parties (Peitz, 2004; Varian and Shapiro, 1999). Known examples of such instances include DuPont's waiver on the onco mouse patent (Murray et al., 2009) to stimulate upstream research and development (R&D) for related product applications, and Intel's way of resolving constraints for other firms to develop technologies that are complementary to its own (Ethiraj, 2007). However, neither basic nor advanced theory can easily explain the above behavior *in the absence of such externalities*. Moreover,

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extant theory cannot reconcile such pledges, on the one hand, with the continued purchasing behavior, on the other.

In this paper, we suggest an explanation for why firms may both pledge and invest in exclusion rights for technology. Our argument extends the theory on private–collective (hereafter also abbreviated ‘p–c’) innovation more broadly (von Hippel and von Krogh, 2003). The p–c innovation model theorizes about why firms have incentives to contribute privately to the production of public goods that exceed the firms’ benefits of free-riding; examples of such p–c innovation include OSS (Fosfuri et al., 2008), pharmaceuticals (Perkmann, 2009), biotechnology (Henkel and Maurer, 2009), and agriculture (Kloppenborg, 2010). Moreover, science in itself shares traits of p–c innovation (see Dasgupta and David, 1987; Stephan, 1996; von Hippel and von Krogh, 2003). Within this theory we focus on the role that exclusion rights play in the hitherto unexplored *competition* (as noted, e.g., by Lerner and Tirole, 2005) between p–c innovators—firms participating in p–c innovation and implementing it in their products—and innovators that draw on proprietary resources but compete in the same product markets as the aforementioned firms (hereafter called similar proprietary innovators). We propose, somewhat counterintuitively, that private–collectively innovating firms facing competition from proprietary innovators are willing to give up control over exclusion rights, just to capture more value from innovation eventually.<sup>2</sup> This rather unorthodox approach becomes the rational strategic choice for these innovators exactly when residual exclusion rights held by competitive proprietary innovators cover part of the good and threaten to foreclose p–c innovators from accessing it. In this situation, well known from other domains of cumulative and overlapping innovation (Green and Scotchmer, 1995), the public pledging of exclusion rights serves two purposes for p–c innovators. First, just like forming R&D consortia (e.g., Sakakibara, 2002) or patent pools (e.g., Joshi and Nerkar, 2011), pledging not to assert patents can trigger corporate collective reciprocal action (Barnett and King, 2008; Ingram and Inman, 1996) among all p–c innovators that is aimed at mitigating mutual hold-up when implementing p–c innovation in commercial products. Second, the public and highly visible non-assertion pledges additionally establish norms of non-exclusion (North, 1990) at a broader industry level, thereby preventing competing proprietary innovators from exercising their exclusion rights, which also could forestall all p–c innovation. Finally, the p–c innovators’ continued purchasing of exclusion rights (and their non-assertion of those rights) complements these efforts by forearming against those competitors who may not be susceptible to the normative changes of non-exclusion in the industry, most notably patent trolls.

We empirically test our rationale within the infrastructure software industry, a setting in which we can clearly identify groups of p–c innovators (e.g., IBM) and proprietary innovators (e.g., Microsoft) from 2000 onwards, and in which the competition between the two types of players comes to bear. In this industry, the publication of the OSRM report in 2004 (see prologue) came as a largely unexpected shock to market participants, affecting the (treatment) group of p–c innovators but not the (control) group of proprietary ones, thus allowing us to observe differential pledging behavior between the two groups and estimate differences-in-differences (d-i-d) in their patent-purchasing activity pre and post shock. Not only are our results consistent with our theoretical rationale; drawing on additional quantitative and

qualitative data we are also able to demonstrate that our *ex-post* findings are indeed likely the consequences of *ex-ante* strategies chosen by private–collectively innovating firms triggered by the exogenous shock. Finally, we provide empirical evidence that is consistent with viewing p–c innovators’ pledges as a *successful* attempt at coordinating on exploiting joint p–c innovation efforts using complementary assets.

Our findings allow us to make several contributions to different streams of literature; however, three appear most important. First, our paper fills part of a gap in the theory of innovation strategy identified by scholars before us. Namely, whereas literature on the topic of p–c innovation has greatly advanced our understanding of how firms create value by engaging in such innovation (e.g., Henkel, 2006; Murray et al., 2009) and of how their individual business models should allow them to capture some of this value (e.g., von Krogh and von Hippel, 2006; West, 2003), the challenges arising from the interplay with competing proprietary innovators have so far largely been ignored (as noted, e.g., by Lerner and Tirole, 2005). We enrich the theory of p–c innovation by introducing competition between p–c innovators and proprietary competitors more explicitly than has been done before. Here, we show that both groups, p–c and proprietary innovators, use diametrically opposed approaches to capturing value using exclusion rights, despite working in the same industry. Notably, such intra-industry variation in the use of the same appropriation mechanism is different from previous conceptualizations of appropriability regimes (Teece, 1986). We explicate that the waiving of exclusion rights becomes part of the profit-maximizing strategy for p–c innovators to capture value from innovation under the given competitive conditions. Second, and likely interesting to management scholars more broadly, we describe how unilateral actions such as waivers of exclusion rights by p–c innovators serve a coordinative purpose among several actors and enable them to jointly design industry-regulating institutions to facilitate value capturing. In explaining how such moves may lead to the creation of reputational cost barriers for proprietary innovators that prevent them from exercising their exclusion rights, we add to resource dependence theory (e.g., Pfeffer and Salancik, 1978). We show that, counterintuitive as it may seem, gaining (*de facto*) control over a resource may come about by giving (*formal*) control away. This indicates that these two forms of control may be mutually exclusive in certain settings. Third, and finally, we believe that the thoughts and rationales presented in this paper may be of some relevance to the current policy debate on software patenting, in that they suggest shifting the discussion about non-obviousness/inventive step further away from a pure debate about admissible thresholds to one of protectable software categories.

## 2. Theory and hypotheses

### 2.1. Private–collective innovation and competition

The “private–collective model of innovation” (von Hippel and von Krogh, 2003) describes a mode of value creation through innovation that lies between the two ends of a spectrum marked by the established models of proprietary innovation at one extreme and collective innovation at the other. In the proprietary model of innovation, society incentivizes inventors by granting them exclusion rights to secure returns from their private investments (Demsetz, 1967; Nordhaus, 1969). Collective innovation, intended to provide public goods (Olson, 1971), relinquishes ownership rights over non-rivalrous resources to make them nonexcludable. In the private–collective, or hybrid (Bonaccorsi et al., 2006), model, firms contribute to the production of a common-pool resource (the ‘p–c good’), just as in the case of creating public goods. Yet

<sup>2</sup> Importantly, we refer to voluntary relinquishments of rights as opposed to licenses that are mandatory for private–collective innovators to grant when engaging with the public (e.g., as in the case of open source software, under the most recent General Public License version 3–GPLv3). We elaborate on this further in the Theory and the Data sections.

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