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Abuse of dominance and licensing of intellectual property☆

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ABSTRACT

We examine the impact of the licensing policies of one or more upstream owners of *essential* intellectual property (IP hereafter) on the variety offered by a downstream industry, as well as on consumers and social welfare. When an upstream IP monopoly increases the number of licenses, it enhances product variety, adding to consumer value, but it also intensifies downstream competition, and thus dissipates profits. As a result, the upstream IP monopoly may want to provide too many or too few licenses relative to what maximizes consumer surplus or social welfare. With multiple IP owners, royalty stacking increases aggregate licensing fees and thus tends to limit the number of licensees, which can also reduce downstream prices for consumers. We characterize the conditions under which these reductions in downstream prices and variety are beneficial to consumers or society.

1. Introduction

In many high technology industries, the development of any new product or service often involves hundreds and thousands of patents. Of particular concern is the so-called patent thicket problem,[1] where independent licensing policies by the owners of complementary intellectual property may give rise to *royalty stacking* — a "horizontal" form of the double marginalization problem identified by Cournot (1838)[2] — and result in prohibitively high licensing fees. This patent thicket problem is often presented as a compelling rationale for significant reform of the patent system and/or licensing policies,[3] and has led competition authorities to apply "abuse of dominance" laws in order to reduce licensing fees.[4]

This patent thicket issue is particularly problematic when it involves many patent holders. In practice, however, the reality is often not of

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[1] See e.g. Shapiro (2001) for further discussion. Empirical studies of the effects of patent thickets include Heller and Eisenberg (1998), Kiley (1992) and Kitch (2003) in bio-medical research, and Geradin et al. (2008), Schankerman and Noel (2006), Walsh et al. (2003) and Ziedonis (2003) in technology intensive industries. There is a related literature analyzing hold-up problems in standard setting and joint licensing agreements. See Shapiro (2010), Lichtman (2006), Lemley and Shapiro (2007). See also Farrell et al. (2007) for a comprehensive discussion.

[2] Such double marginalization problems arise whenever complementary inputs are involved; following Schmidt (2008), the "horizontal" form refers to situations where the inputs are bought by the same customer (e.g., when a product developer needs several pieces of IP), whereas the "vertical" form arises when the inputs involve different stages of a vertical chain (e.g., when a consumer buys from a retailer, who in turn buys from a manufacturer; addressing the consumer needs thus requires both "production" and "distribution" services).

[3] See for example "SCM v Xerox: Paper Blizzard for $1.8 Billion," New York Times, June 27, 1977. As technology has become increasingly complex, this concern has drawn both judicial and legislative scrutiny — see Business Week Online http://www.businessweek.com/magazine/content/07_20/b4034049.htm (May 14, 2007) and http://www.businessweek.com/smallbiz/content/may2007/sb20070523_462426.htm (May 23, 2007), as well as http://www.house.gov/apps/list/press/ca28_berman/berman_patent_bill.pdf and http://www.ip-watch.org/weblog/index.php?p=427. For opposing views, see for example Geradin et al. (2008), who argue that the theoretical conclusion lacks empirical support. Elhauge (2008) argues that previous analyses tend to start with too low a benchmark for royalties and that other factors can offset the adverse effects (if any) of patent thickets on royalties.

[4] For example, in July 2007 the European Commission sent Rambus a Statement of Objections, stating that Rambus may have infringed then Article 82 of the EC Treaty (now Article 102) by abusing a dominant position in the market for DRAMs. In December 2009, after an eighteen month process, the European Commission accepted Rambus' offer of a five-year worldwide cap on its royalty rates for products compliant with the standards set by the Joint Electron Device Engineering Council (JEDEC). The US Federal Trade Commission (FTC) had similarly ordered Rambus to reduce its licensing rates on the basis of Section 2 of the Sherman Act (monopolization) and of Section 5 of the FTC Act (unfair competition) — see the FTC Final order and Opinion of 2 February 2007 in Docket No. 9302. However, the Court of Appeals for the District of Columbia repelled the order, and the US Supreme Court denied to review this ruling, which led the FTC to abandon the complaint.

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thousands of patent owners, but of thousands of patents with a few owners; moreover, patents are often licensed in groups and not individually.[5] To be sure, even a few patent owners will tend to set royalties which in aggregate exceed monopoly levels, when acting independently. This type of double marginalization can result in excessive royalties from the patent owners' standpoint and tends to reduce the number of firms in the product market. When only prices matter in that market, this reduction in competition unambiguously harms consumers and society. The impact is less clear when variety matters; as some of the customers buying from a new entrant are switching away from rivals, the revenue these customers generate may exceed the social value created by entry. Excessive entry can involve inefficient duplication of fixed costs, and the resulting market segmentation can lead to higher prices that hurt consumers as well as reduce social welfare.[6] In such situations royalty stacking can have beneficial effects.

To see this, consider the case of an essential intellectual property (IP hereafter), which is necessary for competing in a product market. If the IP owners can jointly determine the number of licenses and appropriate the resulting profits, they will choose the number of licenses so as to maximize industry profits. In some markets, this may lead them to restrict entry, compared to what would be socially desirable; in such a case royalty stacking, which further restricts entry, hurts consumers as well as society. But in other markets, industry profit maximization may instead generate more entry than is socially desirable — implying that consumers would benefit from restricting entry.[7] Royalty stacking then comes as a blessing, by counterbalancing the bias towards excessive entry,[8] and can benefit both consumers and society; restricting entry can however result in fewer licenses than is socially desirable, and consumers or society could be harmed. We explore this issue using a standard framework of oligopolistic competition with product differentiation, in which IP owners can sell either fewer or more licenses than is socially desirable.[9]

Specifically, we adopt the well-known circular city model proposed by Vickrey (1964) and Salop (1979), in which the number of downstream competitors depends on the license fees as well as on entry costs.[10] As observed by Spence (1975), the impact of entry on downstream market price is a key determinant of the desired number of licenses.[11] This market price, in turn, depends on the value of the marginal consumer served by each downstream firm. Having more downstream firms reduces transportation costs; as marginal consumers are the ones who benefit most from this, an integrated monopolist, controlling both the number of downstream outlets and their prices, would typically wish to have too many outlets.

We first consider, as a benchmark, the case of a single IP owner offering licenses for a fixed fee, on a non-discriminatory basis. The IP holder faces a trade-off: increasing the number of licenses enhances product variety, which creates added value; but it also intensifies downstream competition, which dissipates profits. As a result, the IP owner may issue either fewer or more licenses than is socially desirable.

We then consider the case of two independent owners of complementary and essential IP. We find that the "patent thicket" reduces variety, as (horizontal) double marginalization leads to higher access charges and fewer downstream firms than does monopoly or joint licensing. But making the market less "segmented" also results in lower consumer prices, and the net effect benefits consumers; it may also increase social welfare when an IP monopolist (or a patent pool) would sell too many licenses.

Finally, we show that cross-licensing arrangements may alleviate the effect of royalty stacking, whereas vertical integration — namely, the acquisition of a downstream competitor by an upstream IP holder — does not affect the outcome in our setting.

The literature on IP licensing initially focused on the case of a single owner of innovation that achieves a reduction in cost in a downstream market. Arrow (1962) studied the impact of competition in the downstream market on the incentives to innovate, while most of the other pioneering work focused on specific modes of licensing such as the auctioning of a given number of licenses, flat rate licensing or per unit fees. Katz and Shapiro (1985, 1986) focus on the use of flat rate licensing and study the incentive to share or auction an innovation. Kamien and Tauman (1986) show that flat rate licensing is indeed more profitable (for non-drastic, and thus inessential IP) than volume-based royalties in the case of a homogeneous Cournot oligopoly.[12] This is partly a consequence of the fact that the licensing agreement offered to one firm affects its rivals' profits if they do not buy a license, and thus their bargaining position vis-à-vis the IP owner; such strategic effects do not arise in the case of essential (or, in their context, of drastic) innovation, since firms get no profit if they do not buy a license — whatever the agreements offered to their rivals. This optimality of flat rate licensing is somewhat at odds with what is observed in practice. This paradox triggered a number of authors to seek explanations for the use of royalties. For example, Muto (1993) shows that per unit fees can be more profitable in the case of Bertrand oligopoly with differentiated products[13]; Wang (1998) obtains a similar result in the original context of a Cournot oligopoly when the IP owner is one of the downstream firms, while Kishimoto and Muto (2012) extend this insight to Nash Bargaining between an upstream IP owner and downstream firms; Sen (2005) shows that lumpiness, too, can provide a basis for the optimality of volume-based royalties.[14]

In a recent paper Schmidt (2008) provides an analysis of the patent thicket problem that is closely related to ours. He, too, considers a model with upstream IP owners and downstream competitors needing access to the IP. He finds that, when licensing agreements involve a simple per unit fee, vertical integration between an upstream IP owner and a downstream producer solves a "vertical" double mark-up problem — of successive monopolies — but gives the integrated firm an incentive

[5] Goodman and Myers (2005) break down the composition of portfolios for the patents declared essential to 3G PP2 technology; they find that the largest IP holder owns approximately 65% of these patents, and that the three largest portfolios account for 80% of the total number. Parchomovsky and Wagner (2005) stress the importance of patent portfolios over individual patents.

[6] For conditions under which there can be excessive or insufficient entry, see for example Lancaster (1975), Spence (1976), Dixit and Stiglitz (1977), Vickrey (1964) and Salop (1979), and Mankiw and Whinston (1986) for the case of monopolistic or spatial competition, and Katz (1980) for the case of a multiproduct monopolist; Tirole (1988, chapter 7) offers a good overview of this literature. More recently, Chen and Riordan (2007) show that the market may again provide too many or too few products in a spokes model of nonlocalized spatial competition.

[7] Let $\Pi(n)$, $C(n)$ and $W(n)=\Pi(n)+C(n)$ respectively denote industry profit, consumer surplus and social welfare, and n^{Π} and n^{W} denote the number of licenses that maximize industry profit and social welfare. By construction, $\Pi(n^{\Pi})\geq\Pi(n^{W})$ and $\Pi(n^{W})+C(n^{W})\geq\Pi(n^{\Pi})+C(n^{\Pi})$; therefore, $C(n^{W})\geq C(n^{\Pi})$. Thus, whenever $n^{\Pi}>n^{W}$, consumers necessarily benefit from *reducing* the number of licenses from n^{Π} to n^{W}.

[8] In a different vein, Scotchmer (1991), Green and Scotchmer (1995), and Scotchmer and Menell (2007) stress that when early investors cannot capture the benefits accruing to subsequent investors, patent protection for complementary products should be strengthened. A key assumption for this result is that investment is sequential — different firms invest at different dates.

[9] The literature on variety has primarily focused on the polar cases of free-entry by mono-product firms (with either oligopolistic or monopolistic competition) and of a multi-product monopolist; we revisit this literature by studying instead the case where a few upstream firms (the IP owners) can affect entry and variety through their licensing terms. Also, while for expositional purposes we develop our analysis using a particular model of oligopolistic competition, our main insights would apply in other models where entry can be excessive.

[10] We assume that any entry in the downstream market takes place at once and thus ignore the positive externalities that early adopters may exert on later ones; see Glachant and Meniere (2010) for an exploration of the role of patents on technology adoption when such externalities are present.

[11] Spence focused on quality choice, but the same insight applies to other dimensions such as variety, which an IP owner can control through the number of licenses.

[12] See Kamien (1992) for an overview of this early literature.

[13] Hernández-Murillo and Llobet (2006) consider monopolistic competition with differentiated products and introduce private information on the value of the innovation for the downstream firms.

[14] Faullí-Oller and Sandonis (2002) and Erutku and Richelle (2006) look at two-part licensing policy when there is a differentiated product downstream duopoly and the upstream IP owner is vertically integrated with one of the downstream firms.