Strategic patents and asymmetric litigation costs as entry deterrence instruments

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Abstract

To spur innovation, the patent protection system grants the patentee limited monopoly power to recoup his RDinvestment, although, in general, allowing the use of the public good "innovation" is socially efficient. But patents and patent threats can also be used strategically, e.g. to deter entry from competitors. This note shows that, besides incumbency, the present patent protection system constitutes an additional strategic instrument that favors the incumbent, because asymmetric litigation costs may deter entry from potential rivals.

1 Introduction

To promote innovation, the patent system grants the patentee (temporary) monopoly power to exploit the innovative good or production process. Nordhaus' (1969, 1972) seminal contributions analyzed the trade-off between setting incentives to spur innovation by granting a monopoly and the social cost this monopoly entails by restricting the access to knowledge, which is, by definition, a public good. He also introduced the concepts of "patent length" (the duration of the monopoly) and "patent breadth" (the scope of the patent).

The following literature considered the optimal trade-off between a patent's length and its scope, which turned out to be highly sensitive with respect to the model specification of the patent breadth. If increasing competition is socially desirable (e.g., if competition bears little cost) infinite length and narrow patents are optimal, as in the homogenous good model with Bertrand competition of Gilbert and Shapiro (1990). If competition involves some costs, as in the product differentiation model of Klemperer (1990), the optimal mix may involve maximum patent breadth.[1] "Optimality" in this strand of literature refers to the socially optimal way of compensating the innovator for his innovating effort, which is assumed to be exogenously given.

Yet patents may also be used to other aims. Empirical surveys by Levin et al. (1987) and Cohen et al. (2000) about the returns of innovation in many different industries conclude that the positive effect of being first to market a product and of dominating the innovating technology far outweighs the benefits of the patent's monopoly rent.[2] Patents may also be used as bargaining chips in cross-licensing deals or within other strategic settings.

In Gilbert and Newbery (1982) patents are used strategically by a monopolist as an entry deterrence instrument. Preemptive innovation and subsequent patenting is used by firms to prevent competition. Thus, Rank Xerox patented a range of inventions, some of which were never used nor licensed, in order to maintain its monopoly position.[3] Reinganum (1983) added uncertainty about the R&D success to the strategic setting of Gilbert and Newbery and showed that an entrant may have a higher incentive to invest in R&D than an incumbent, while Yi (1995) showed how this strategic incentive depends on how R&D is modeled.

In the last years, there has been a surge both in patent filings and especially in patent litigation (see Hall and Ziedonis, 2001). In the 1990s, Texas Instruments led the field in asserting its patent rights in court and other big firms like AT&T, IBM,

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[1]See also Waterson (1990), Gallini (1992) and Wright (1999). Denicolo (1996) and Takalo (2001) survey these optimal patent models.

[2]The pharmaceutical industry being an important exception.

[3]A patent that is not used nor licensed is called a "sleeping" or "submarine" patent.

and Motorola followed. Lanjouw and Schankerman (2001) analyze the relationship between patent filings and patent litigation by combining data from U. S. patent court cases with data from the U.S. Patent and Trademark Office. They argue that patent enforcement costs are higher and litigation rewards smaller for smaller startup firms when compared with bigger incumbents.

The present note analyzes this relationship between patent filings and patent litigation in a game theoretic entry model in the tradition of Spence (1977) and Dixit (1980). We extend the strategic entry deterrence model of Gilbert and Newbery (1982) to include litigation with an uncertain outcome. Innovating firms often have a monopoly position in their markets and they have thus a greater rent to lose (the monopoly rent) than a potential entrant has to gain (the duopoly rent). The present patent protection system and the subsequent litigation may protect the incumbent monopolist from entry in another way, because the costs and the rewards of litigation are not evenly distributed among the incumbent and the challenger.

The filing of a patent for an incumbent monopolist M entails only a small cost and leads to higher costs for potential entrants (Gallini, 1992). The entrant E carries the burden of proof that the patent is not valid (e.g. because there is "prior art"[4]). In addition, if E is successful and the patent is subsequently declared void, often there is no fine or sanction mechanism for M, other than the possible litigation costs of E that M may have to pay. Since in practice most cases end in an agreement out of court (see Lanjouw and Schankerman, 2001), the incumbent M often has much smaller litigation costs than the entrant E.

Several high-profile patent cases follow this pattern where an established incumbent registers a patent (whose innovative content is questionable) in order to defend its monopoly position. Amazon.com has patented its "One-Click-Shopping" as a "Method and system for placing a purchase order via a communications network", which was widened to cover the possibility of buying online an item that is delivered as a gift to a third person.[5] This "One-Click"-patent was used against Amazon's biggest competitor Barnes & Noble. The process of adding several items to a virtual shopping cart and of paying all items together when checking out has been patented by Sun Microsystems as a an "Electronic Shopping Cart" for a "Network Sales System".[6] Again, one can argue that the innovation is trivial and was there before the patent was registered.

Our aim is to show, in a entry game as simple as possible, how the present patent

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[4]Prior art is the body of publicly available knowledge as shown in in earlier patents and other published material. To be patentable, an invention has to be novel and non-obvious with respect to prior art, see title 35 of the US Code, Sections 102 and 103.

[5]See US patent number 5,960,411 and the European patent number 927,945 at the http://www.uspto.gov/ and http://www.european-patent-office.org/.

[6]US patent numbers 5,745,681 and 5,909,492, and European patent numbers 807,891 and 803,105.

protection system with asymmetric litigation costs may be used strategically as an entry deterrence instrument by an incumbent to protect his monopoly. The paper proceeds as follows. In the next section we describe the entry game where the incumbent firm may file for a patent within a given patent protection system. Section 3 shows how the asymmetric distribution of costs and rewards constitutes an additional advantage for the incumbent. The last section summarizes the main results and suggests some policy results.

2   The strategic entry game

Suppose there is initially a single, risk neutral firm M who has a monopoly in a given market and faces a demand

$$p = a - bX \tag{1}$$

where X is the total amount of the good sold in the market, p is its unit price, a and b are positive parameters. The good X can be produced at constant marginal cost of $c > 0, c < a$. For the sake of simplicity, we assume that there are no fixed costs in production.

There is a potential entrant firm E. M has the possibility to register a patent for the good X itself or for the production process of good X. It cannot evaluate in an objective way the true innovative value of X, specifically if the invention really "novel" and not "obvious" in the light of "prior art". The innovation can be patented at a negligible cost which will be assumed to be zero.[7]

Due to the patent a potential entrant is not legally allowed to use the patented innovation. But it may circumvent the patent by inventing an alternative production process leading to a perfect substitute for good X. This may specially be the case if the innovative content of the innovation is not really novel. With this alternative technology, an entrant can produce a perfect substitute for X, possibly at slightly higher marginal cost λc, $\lambda \geq 1$, than the incumbent.

When the original innovating monopolist realizes that it is being imitated by an entrant, it may sue the rival firm for patent infringement. A patent court decides in favor of the innovating monopolist with probability ρ, and with the residual probability $1 - \rho$ it exculpates the imitating entrant from patent infringement. The court then imposes the cost of litigation on the losing party, F_M on the innovating monopolist and F_E on the imitating entrant. This payment can be interpreted in a general way as the cost of the lawsuit, a fine to be paid by the losing party, or as the compensation cost

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[7]Patent offices usually do not check the validity of a patent and restrict themselves to filing the patent registration.

paid to the other party. If the patent is declared void, the entrant can use the same technology of the monopolist at the same marginal cost c. If the patent is upheld by the court, the entrant has to leave the market.

Our crucial assumption is that litigation costs are higher for the imitating entrant than for the innovating monopolist, e. g. $F_M < F_E$, if only because the former carries the burden of proof that the alternative technology does not infringe the registered patent. Our litigation setting assumes, for the sake of simplicity, that both players have the same a-priori expectation about the litigation outcome. Although in principle the innovating monopolist may be better informed, it is not always easy to judge in an objective way whether an innovation is a truly innovative or not. Besides, the aim of the patent is to strategically deter entry and thus, the innovation aspect is not central to it. Finally, lawsuits' outcomes are notoriously difficult to predict.

Thus, we consider the following game:

1. The innovating firm chooses whether to register or not a patent for X.
2. A rival firm decides whether to enter the market and imitate the monopolist.
3. If there is no entry, the incumbent produces the monopoly output and the game ends. If there is entry, the incumbent may sue the entrant for patent infringement.
4. If the incumbent has chosen litigation, a court (nature) determines in the fourth stage whether there has been patent infringement or not.
5. In the final stage production takes place: either the two firms play a Nash-Cournot game in output or the incumbent monopolist produces the monopoly output.

3 The strategic use of patents under asymmetric litigation costs

Consider the extensive form of this imperfect information game as given in Figure 1.
To find its subgame perfect Nash equilibrium (SPNE), we solve backwards starting with the Nash-Cournot market game in the final stage. We skip the straightforward calculations for the monopoly and duopoly games[8] and summarize the players' payoffs in Figure 1. The upper and lower payoffs are the payoffs of the incumbent and the entrant firm, respectively. The expected payoff of litigation for the incumbent (Π_I) and for the potential entrant (Π_E) are given by

$$\Pi_I \;=\; \rho(\frac{(a-c)^2}{4b} + F_E) + (1-\rho)(\frac{(a-c)^2}{9b} - F_M) \tag{2}$$

$$\Pi_E \;=\; \rho(-F_E) + (1-\rho)(\frac{(a-c)^2}{9b} + F_M) \tag{3}$$

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[8]The extended calculations are available from the author on request.
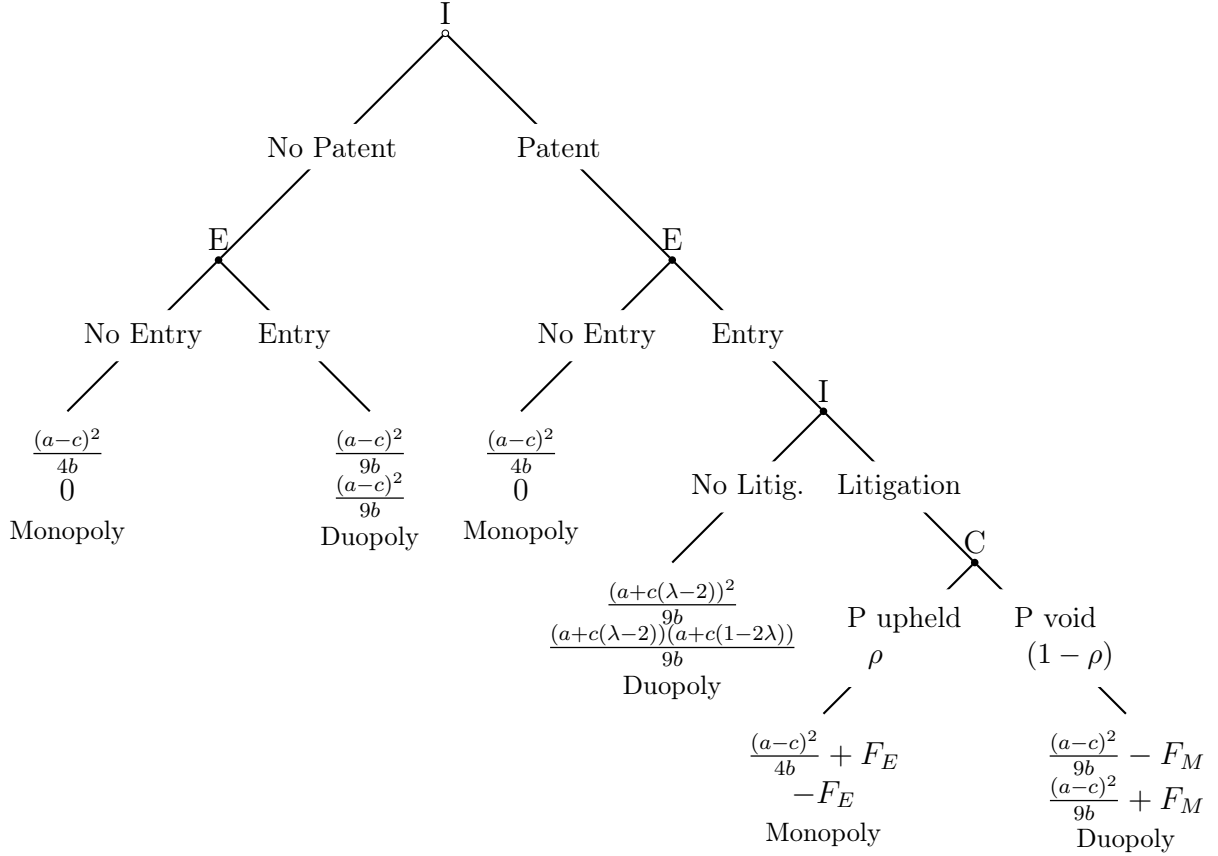
Notation: I = incumbent firm, E = potential entrant, C = patent court. The upper and lower payoffs are the payoffs of the incumbent I and the entrant E, respectively. ρ is the probability the court C upholds the patent.

Figure 1: The strategic patent game: Extensive form

Depending on the specific parametrization (the demand properties a and b, the marginal cost c, the additional cost factor λ, and the litigation costs F_M and F_E), we may obtain different equilibrium outcomes. We are interested in situations where the incumbent has an incentive to file for a patent and where this patent may successfully deter the rival from entering the market. The following two propositions show that under plausible assumptions this might be the case in a large number of situations.

Proposition 1 (Entry without patent)
If the incumbent does not register for a patent, then entry by the rival firm and duopoly is an SPNE in dominant strategies.

   Proof. If there is no patent threat, the incumbent is not able to deter entry and in our game, any other threat is not credible. For the potential rival firm, entry delivers a duopoly rent, since it is the incumbent's best response to accommodate to the new

duopoly situation. QED.

Proposition 2 (Entry deterrence)
Assume that the patent court decides with a fair coin ($\rho = 0.5$) and that both players have equal marginal cost ($\lambda = 1$). If $F_M < F_E$ (asymmetric litigation costs) and the potential Cournot oligopoly rent is smaller than the cost difference of litigation $F_E - F_M$, then the strategy no-entry by the rival firm and incumbent monopoly is an SPNE.

Proof. By direct calculation, since in this situation the incumbent would always sue for patent infringement and the expected litigation cost for the entrant is greater than the expected duopoly rent. QED.

Notice that the outcome described in Proposition 2 is a "sustainable" equilibrium in the sense of Baumol et al. (1982), where there is no profitable entry for a potential rival firm.[9]

4   Conclusion and policy implications

This note analyzes the situation where a patented innovation may not be truly innovative. The patentee uses the patent as a strategic instrument against a potential entrant. This strategic incentive may be exacerbated by the patent protection system, which poses asymmetric litigation costs on the incumbent patentee and the potential entrant to the market. Entry is deterred leading to higher monopoly prices and welfare losses. If the patented good or process is not really novel and the "innovation" deserves no patent protection, efficiency would require that no patent is granted at all.

Two possible solutions are the following. First, the incentives of the present patent protection system, which asymmetrically favor the original patentee, could be changed by increasing the sanctions on firms that register innovations that are not truly innovative. This would reduce the asymmetry of the litigation costs. In practice, the sanctions for patenting a patent which is subsequently declared void are very small, specially when compared with the gains from the patent monopoly. A second, different approach would be to require the patent office not just to register the patent applications, but to engage in an evaluation process, instead of leaving this judgement to the courts. This approach has two advantages with respect to the present system: Since there are no litigation costs involved, the evaluation is less costly. Additionally, all patents are evaluated and not only those patents that are contested in court. These solutions would reduce the incentive to use patents as strategic instruments and would confine patents to their original aim, namely to spur and reward true innovations.

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[9]For an exact definition of sustainability, see Chapter 8 in Baumol et al. (1982).

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