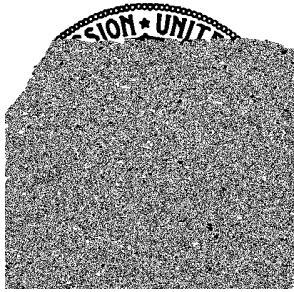# WORKING PAPERS

THE VALUE OF A SECOND BITE AT THE APPLE:
THE EFFECT OF PATENT DISPUTE SETTLEMENTS
ON ENTRY AND CONSUMER WELFARE

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The Value of a Second Bite at the Apple:
The Effect of Patent Dispute Settlements on Entry and Consumer Welfare

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Abstract: I analyze the effect on consumer welfare of settlements of patent infringement lawsuits that consist of a royalty-free license for delayed entry by a potentially infringing horizontal competitor of the incumbent patent-holder. Settlements that split the remaining patent life in a way that reflects the expected outcome of the trial do not in general improve consumer welfare compared to the litigation alternative. This result arises because such settlements can undermine potential entrants' incentives to challenge the incumbent's monopoly. If settlements of patent infringement lawsuits cause a reduction in the investment in development of competing products, consumers may prefer that the parties to such disputes litigate rather than settle.

Keywords: patents, settlement, antitrust, intellectual property

JEL Codes: K21, L4, O34

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1.   Introduction

Intellectual property disputes between actual or potential horizontal competitors are an unavoidable consequence of the uncertain nature of the property right that a patent represents.[1] The parties involved in such disputes can choose to litigate their cases to a final conclusion, but they may also resolve their disagreements with settlements. Such settlements can produce a variety of benefits, including lower social and private litigation costs, faster entry by new producers, and the reduction of risk. Yet such settlements can also raise antitrust concerns, since they are agreements between firms that are, at least with some probability, direct competitors.

Some kinds of patent dispute settlements clearly raise more concerns than others. A cash payment from an incumbent firm to a potentially infringing entrant in exchange for the entrant's commitment to abandon or delay the marketing of its product would clearly be worrisome; consumers would probably prefer the firms to litigate rather than reach such a settlement.[2] A royalty-bearing license that enabled an entrant to immediately market its product might raise fewer red flags; such a settlement could conceivably benefit both consumers and the parties to the settlement agreement. In a related paper (Schrag (2004)), I demonstrate some of the difficulties that can arise in an analysis of the competitive effects of this kind of agreement.

In this paper, I analyze the effects of a particular kind of patent dispute settlement between potential horizontal competitors, namely a royalty-free license in exchange for delayed

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[1] See Shapiro and Lemley (2005) for a discussion of the "probabilistic" nature of intellectual property rights. As they point out, a patent is not an iron-clad right to exclude a competitor. It is instead a right to try to exclude a competitor.

[2] The Federal Trade Commission has challenged patent settlements between Schering-Plough and two potential generic competitors, Upsher-Smith Laboratories and the ESI Lederle unit of American Home Products, on the grounds that Schering had essentially paid its rivals not to compete. See http://www.ftc.gov/os/2001/04/scheringpart3cmp.pdf. In December, 2003, the Commission released its final decision in this case, finding that the agreements were anticompetitive. See *In the Matter of Schering Plough Corporation, et al.,* Dkt No. 9297 (December 18, 2003) (final decision of the Commission). In March 2005 the 11th Circuit Court of Appeals reversed the FTC's decision. For related examples in the pharmaceutical industry, see also *Abbott Labs.*, Dkt. No. C-3945 (May 22, 2000) (consent order); *Geneva Pharm., Inc.,* Dkt. No. C-3946 (May 22, 2000) (consent order) and *Hoechst Marion Roussel, Inc.,* Dkt. No 9293 (May 8, 2001) (consent order).

entry by the potentially infringing firm.   I assume that, aside from the license, the incumbent

cannot transfer to the entrant any other net consideration, e.g. cash. Under this assumption, the

Federal Trade Commission's concern about an incumbent paying for delayed entry that was the

focus of its recent *Schering* case cannot arise.[3] The central question that I address is whether such

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have an incentive to litigate rather than settle. Under both litigation and the hypothesized settlement for time off the relevant patent's life, then, the entrant would expect to be in the market — and consumers would expect to benefit from the entrant's presence — for approximately five years.

In order to test this argument, I develop a formal model in which two entrants each decide whether or not to develop a substitute product in order to challenge an incumbent firm's patent-protected monopoly in some market. After an entrant successfully develops a product, the incumbent can sue for patent infringement, and the firms can either litigate their case or settle for a royalty-free license that permits the entrant to sell its product after some delay. Even though I assume that litigation is costless, I show that a settlement between the incumbent and the entrant that develops its product first creates a non-negative surplus that they can divide. This surplus arises because their settlement discourages the trailing entrant's product development, increasing the profits that the incumbent and the leading entrant can share. The incumbent and the entrant that develops a product first therefore strictly prefer settlement to litigation, even in the absence of direct litigation costs. In order to identify the effects of the firms' settlements, I analyze consumer welfare and the entrants' product development decisions both when the firms can settle their cases and when the firms always litigate any patent infringement cases.

In the model, the relevant market is a natural duopoly, so at most one entrant completes its project. Under this assumption, I find that settlements for time off the patent generally leave consumers worse off than they would be if the firms litigated their cases. This conclusion does not change even if the terms of settlement are very favorable to the potential entrants, whose interests during settlement negotiations are to some degree aligned with consumers' interests; both consumers and entrants prefer earlier entry, *ceteris paribus*. My formal assumption about settlement bargaining is that the incumbent captures none of the surplus from avoiding trial, so any entry occurs at the earliest possible date that is consistent with the incumbent being willing to settle rather than litigate.

My analysis reveals two reasons that settlements can harm consumers' interests. First, the time that consumers expect to benefit from a *particular* entrant represents a lower bound on the expected time that consumers would benefit from *some* entrant. For example, a particular entrant may have a fifty-fifty chance of winning an infringement case, but a settlement that enables the entrant to sell its product halfway through the remaining patent life could shortchange consumers, because another entrant may emerge if the first loses its infringement case. Given this possibility, consumers would have a greater than fifty-fifty chance of benefiting from *some* entrant. I develop this argument more fully in the example in the next section.

Second, the form of patent settlement that I analyze can undermine the entrants' incentives to invent around the incumbent's patent. If the entrant that completes its product development first always settles with the incumbent, a slower entrant would likely never have a chance to earn duopoly profits.[4] If the entrant that completes its product development first always litigates, meanwhile, a slower entrant would possibly have an opportunity to earn duopoly profits, because the first entrant may lose its patent infringement case. The prospect of settlement thus increases the relative importance to an entrant of being the first to develop a competing product and, therefore, discourages an entrant from undertaking a project that it believes will take a long time to complete.

It would be wrong to conclude from the results that the settlement of intellectual property disputes generally harm consumer welfare. First, the analysis considers only one kind of settlement that parties to such a dispute could reach. Second, in order to expose the basic arguments more clearly, the analysis abstracts away from key factors, such as the private and social costs of litigation. Incorporating these costs into the model would tend to make settlement look more socially desirable. Of course, the analysis also abstracts away from some of the social

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[4] The first entrant and the incumbent could always guarantee that the later entrant did not receive duopoly profits by including in their settlement agreement a pr

benefits of litigation. For example, litigating a patent infringement or invalidity case reveals valuable information about the true scope or even existence of the patent-holder's property right. Incorporating such benefits into the model would tend to make litigation look more socially desirable.

The formal analysis does, however, support two broad conclusions. First, the model highlights the importance of analyzing the effects of any patent settlement on the incentives of the relevant third parties before drawing any conclusions about the settlement's effect on consumers' interests. If an incumbent monopolist and the first entrant to challenge the incumbent's monopoly craft an agreement that, intentionally or not, undermines other firms' incentives to develop competing products, cons

negotiated entry date simply reflected the expected outcome of the trial that they avoided, meaning that the entrant would compete for the same amount of time, in expectation. For a variety of reasons, third parties may not be in a position to evaluate whether the negotiated entry date actually was consistent with the expected outcome of the case.[6] My findings suggest that, even if the negotiated entry date actually did reflect the expected outcome of the case, consumers might very well have been better off anyway if the parties had litigated.

There is a small economic literature on the antitrust issues that patent settlements raise. Shapiro (2003) proposes that a settlement of an intellectual property dispute, including a settlement for a license that permits delayed entry by a potential entrant, should satisfy a simple rule to pass antitrust muster, namely that expected consumer surplus must be at least as large under the settlement as under continued litigation. In practice, such a standard would often be difficult to implement, because it would often involve a highly subjective analysis of the likely outcome of the parties' litigation. Shapiro argues that there always exists a settlement that leaves both the parties and consumers better off than they would be with litigation, but he does not analyze the effect of patent settlements on third parties' incentives to develop products.[7]

Meurer (1989) studies the effect of antitrust policy on patent settlements when the patent holder has private information about its patent's validity and can make a take-it-or-leave-it offer to a competitor. In his model, antitrust policy falls on a continuum between what he terms a laissez-faire and a lump sum policy. A laissez-faire policy enables the two parties to split monopoly profits, while a lump-sum policy limits the parties to a split of the Cournot-Nash profits in any settlement they reach. He finds that antitrust policy has no effect on the probability

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[6] In such a situation, the defendants in the antitrust case would have a natural incentive to exaggerate the strength of the incumbent's case in the underlying patent case, since that would tend to reduce their antitrust liability. See the discussion in O'Rourke and Brodley (2003). Evidence that could overcome this exaggeration may often be protected by attorney-client privilege.

[7]

that the parties settle. In the equilibrium of his

2.   An Example

Consider a market that will last for ten years, and assume that there is no discounting. One risk neutral incumbent is already selling in the market, and there are two risk neutral and identical potential entrants. The first entrant's product is ready for immediate sale, but the second entrant's product will not be available for two years, either because it requires additional development or because it must obtain regulatory approval. I assume that the second entrant's incremental cost of bringing its product to market is sufficiently high that it finds entry as the third supplier to be unprofitable. If the first entrant successfully launches its product, therefore, the second entrant stops work on its product and does not enter.

Each entrant's product potentially infringes a patent that the incumbent holds. Suppose that each entrant has a fifty percent chance of prevailing in court if the incumbent sues for infringement, and suppose further that the entrants' cases are independent. To simplify the example and expose the basic argument, I assume that both patent litigation and any settlement negotiations are instantaneous and costless. It follows from these assumptions that the incumbent will immediately sue for patent infringement if an entrant launches its product, and the parties will either settle their case or litigate.

of any settlement in this range would presumably depend on the parties' relative bargaining power.

The example illustrates how, even in the absence of risk aversion or litigation costs, settlement can still be advantageous for the incumbent and the first entrant. By causing the second entrant to abandon its entry plans, the settlement between the incumbent and the first entrant increases the total profits that they can split. If the first entrant receives any of the surplus that the settlement creates, its entry date under settlement will be earlier than its expected entry date under litigation, possibly leading to the conclusion that the settlement benefits consumers. Such a conclusion may not be valid, as the following analysis of consumers' interests illustrates.

Were settlement between the incumbent and the entrants impossible, consumers would face a fifty percent chance of ten years of duopoly (the first entrant wins its infringement case), a twenty-five percent chance of ten years of monopoly (both entrants lose their cases), and a twenty-five percent chance of two years of monopoly followed by eight years of duopoly (the first entrant loses and the second entrant wins). Define CS_n as the (time-invariant) yearly consumer surplus when $n \in \{1, 2\}$ firms are selling in the market. Consumers' expected surplus if the entrants always litigate their cases is:

$$ECS_{lit} = 0.5(10CS_2) + 0.25(10CS_1) + 0.25(2CS_1 + 8CS_2) = 3CS_1 + 7CS_2.$$

Consumers' expected surplus under a settlement that permits the first entrant to compete for t^* years is

$$ECS_{settle} = (10 - t^*)CS_1 + t^*CS_2.$$

Because $CS_2 > CS_1$, consumers strictly prefer settlement to litigation if and only if $t^* > 7$, but the preceding analysis of the litigants' incentives indicates that the incumbent would not be willing to accept such a settlement. If the incumbent has any bargaining power at all, i.e. if it captures any of the bargaining surplus, then under a settlement the first entrant would compete for less than

seven years and consumers would then be strictly worse off if the entrants and the incumbent settle rather than litigate.

The example illustrates how the settlement of patent litigation between the incumbent firm and an entrant can harm consumers' interests, even if the settlement allows the entrant to enter the market sooner than the date that would reflect the strength of its infringement case. A simple rule of thumb that consumers will be indifferent between litigation and a settlement that reflects the expected outcome of the trial fails to recognize that, if the settling entrant were to lose its infringement case, another entrant may replace it.[9] From the perspective of consumers, the probability that the first entrant prevails in its infringement case is a lower bound on the probability that they will benefit from *some* entrant. If the incumbent and the first entrant can craft a settlement that discourages subsequent entrants from developing and offering a product, consumers may strongly prefer litigation to settlement.

The first entrant clearly benefits when it receives a share of the surplus created by deterring the second entrant's possible entry. This increase in the first entrant's profits may strengthen its *ex ante* incentive to develop a product and challenge the incumbent's monopoly. On the other hand, the second entrant is clearly hurt by the settlement between the incumbent and the first entrant, and the decrease in the second entrant's profits may weaken the early incentive to develop a product. The net effect of settlement on the entrants' initial incentives to develop products (before it is known which will be first and which will be second) is not immediately obvious. I explore this issue in more detail in the formal model in the next section.

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[9] Willig and Bigelow (2002, p. 2) seem to suggest just such a rule of thumb. Their paper does not address the effect of patent settlements on third party investment behavior.

3.   A Model of Patent Litigation Settlement

Consider a market in which an incumbent firm is currently selling a product. Because it holds a patent that claims its product, the incumbent initially faces no competition. I normalize the patent life to unity and assume for simplicity that there is no discounting.[10] I also assume that free entry immediately drives profits to zero after the patent expires. Before that occurs, two potential entrants can each attempt to invent around the incumbent's patent and enter early. I index the entrants by $i \in \{a, b\}$. In order to model the entrants' product development decisions, I assume that each entrant can begin a development project at time $t = 0$. To simplify the model, I assume that this is the only time at which an entrant can start a project.[11] Associated with entrant i's project is a parameter z_i that represents the amount of time the entrant would need to complete the project. I assume that z_a and z_b are random variables that are independently and identically distributed on the support $[0, \infty)$ according to the continuous probability distribution function $f( )$. Entrant i knows how long its own project will take, i.e. entrant i observes z_i at time 0, but neither entrant can observe how long the other entrant's project will take. While each entrant knows when its rival has completed its project, neither entrant can observe whether its rival is working on an unfinished project. Each entrant must therefore decide whether to continue investing in its project without knowing what its rival is doing. If an entrant decides to pursue a project, it must pay a flow cost $c > 0$ until it either completes or abandons the project.

To streamline the exposition that follows, I often refer to the "first entrant" and the "second entrant." By definition, the first entrant's project has the earlier completion date, and the second entrant's project has the later completion date. Of course, the identities of the first and

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[10] Incorporating discounting into the model is straightforward, but it complicates the presentation without adding additional insights.

[11] Relaxing this assumption would enable an entrant to choose a more complicated investment strategy, since it could defer a decision about whether to start a project until after it knew whether its rival would quickly complete its project. I conjecture that the main qualitative conclusions of the paper would continue to hold even if this sort of behavior were possible.

In order to establish a benchmark, I first analyze the entrants' product development decisions when the incumbent and the entrants are not permitted to settle their legal disputes and instead must litigate. The timing of the model is as follows. First, each entrant i chooses a

Using the entrants' Nash equilibrium strategies, it is straightforward to calculate expected consumer surplus when the incumbent and the entrants cannot settle their legal disputes. Define CS_n as consumer surplus when there are $n \in \{1, 2, \ldots\}$ firms selling in the market. It is reasonable to assume that $CS_{(n+1)} > CS_n$

an entry date at time $t_2^* = 1 -$

one of the two entrants and leaves the incumbent just indifferent between litigating and settling.

There are two reasons for consumers' preference for

Using the entrants' Nash equilibrium strategies, it is straightforward to calculate expected

consumer surplus when the incumbent and the entran

Obviously, this result depends to some extent on the assumption that litigation costs are zero. If litigation costs are significant and settlement is not possible, an entrant may have little incentive to try to invent around the incumbent's patent. But the maintained assumption that the entrant captures the entire surplus under settlement bargaining is extreme as well, and it serves to increase the incentive to invent around the incumbent's patent when settlement is possible. A more realistic division of the bargaining surplus between the incumbent and the entrant would further depress the entrants' incentives to invest when settlement is possible.

The following proposition contains the main result.

PROPOSITION 3: Expected consumer surplus is lower when the incumbent and the entrants can settle their patent infringement cases, compared to when they must litigate, i.e. *ECS*

This paper represents at best a first step in the analysis of the antitrust issues that surround the settlement of patent disputes, but it is a first step on an important road. Because settlement is such a key part of any litigation, antitrust policy towards patent settlements has a significant effect on the nature of the property right that a patent represents. The development of a sound basis for this policy is of great importance.

APPENDIX

Proof of Proposition 1: I first notice that $H(z) \equiv \pi_E(2)(1-z)(1-F(z)) - c\int_0^z (1-F(x))dx$

is a continuous, monotone decreasing function of z, and $H(0) > 0 > H(1)$. Therefore, there exists a unique $\bar{z}_l$ satisfying $H(\bar{z}_l) = 0$. Suppose that entrant i believes that j is choosing a cutoff $\bar{z}_l$. Entrant i pursues any project that yields non-negative profit, and its net profit from pursuing a project with $z \leq \bar{z}_l$ is $H(z)$; the first term in $H(\ddot{y})$ reflects the fact that the entrant earns duopoly profits for $(1 - z)$ periods if both it wins its patent litigation and the other entrant has not already completed its project and prevailed in its patent litigation, and the second term reflects the entrant's expected cost of pursuing the project, adjusted to reflect the possibility that its rival will finish first. But then entrant i's best reply to entrant j choosing a cutoff $\bar{z}_l$ is to choose the same cutoff itself, and there is a unique symmetric pure strategy Nash Equilibrium in which both entrants choose $\bar{z}_l$. It remains to show that there does not exist an asymmetric pure strategy Nash Equilibrium. Assume without loss of generality that $\bar{z}_1 < \bar{z}_2$. Because entrant 1's payoff from a project with $z \leq \bar{z}_2$ is $H(z)$, it follows immediately that $\bar{z}_1 = \bar{z}_l$. But entrant 2's payoff from a

project with $z > \bar{z}_l$ is $\pi_E(2)(1-z)(1-F(\bar{z}_l)) - c\int_0^z (1-F(x))dx < H(\bar{z}_l) = 0$, so it is not optimal for

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