How Strong Are Weak Patents?

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Abstract

Economists usually conceive of patents as property rights that prevent others from practicing the patenting technology unless they first obtain a license from the patent holder. Even for ironclad patents, i.e., for patents that are certain to be valid, the existing literature has shown that the analysis of equilibrium licensing contracts is surprising subtle and complex.[1] For example, the analysis is quite different depending upon whether one firm's licensing contract is observable to the other firms. Likewise, equilibrium outcomes are quite different if royalties must be linear than in the case where two-part tariffs and other non-linear royalties are permitted. In that literature, a downstream firm that refuses to sign a contract with the upstream supplier either exits the industry (in the case that the upstream supplier controls an essential input) or must rely on more costly inputs (in the case of a non-essential input). In other words, the downstream firm's threat point is to use some backstop technology.

In practice, however, patents are issued after a brief examination by the patent office to see if they meet the statutory requirements for novelty and non-obviousness. Mounting evidence indicates that many "weak" patents, i.e., patents unlikely to be found valid if challenged in court, are issued by the U.S. Patent and Trademark Office (USPTO).[2] Some observers view this with great alarm, arguing that USPTO is handing out undeserved monopolies. Others, by contrast, have suggested that these weak patents are of little concern because they will have little commercial impact because they will be licensed at commensurately low royalty rates or not enforced at all.

We study the commercial impact of weak patents. More precisely, we define a patent's strength as the probability that it will be found valid if challenged in court, and we examine the relationship between a patent's strength and the royalties that it can command. The distinctive

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[1] See, for example: McAfee and Schwartz, "Opportunism in Multilateral Vertical Contracting: Nondiscrimination, Exclusivity and Uniformity," *American Economic Review,* 1994; Segal, "Contracting with Externalities," *Quarterly Journal of Economics,* 1999; Segal and Whinston, "Robust Predictions for Bilateral Contracting with Externalities," *Econometrica,* 2003.

[2] Many studies and articles support this view, including the Federal Trade Commission study, "To Promote Innovation: The Proper Balance Between Competition and Patent Law and Policy," October 2003. For a recent overview in this area, see Mark Lemley and Carl Shapiro, "Probabilistic Patents," *Journal of Economic Perspectives,* forthcoming, 2005.

feature of our analysis is that a user of the technology has the option (often in our models more attractive than avoiding the technology) of refusing to sign a license and simply infringing the patent, i.e., using the patented technology without paying. Such infringement triggers litigation with an uncertain outcome.[3] If a court finds the patent *invalid*, the infringer can use the patented technology free of charge, but so can its rivals. If the patent is found *valid*, any downstream firms that signed licenses continue to pay royalties according to those licenses, but any downstream firms who did not sign a license must now negotiate with a patent holder possessing an ironclad patent.[4]

Our results are directly relevant to the current debate about patent reform. If weak patents have little commercial impact, it is not especially important to reform the process by which patents are issued so as to greatly reduce the issuance of weak patents. We show that such optimism is misplaced: weak patents can have surprisingly strong effects.

The framework for our analysis involves a single patent holder, P, and a number of downstream firms that value the patented technology.[5] We generally assume that these downstream firms compete as oligopolists, and that use of the patented technology lowers their costs. Under these circumstances, U.S. patent law implies that challenging a patent creates a public good for the downstream firms: if downstream firm #1 challenges the patent and the patent is declared invalid, all other downstream firms are relieved of any ongoing royalty obligations, even those that had previously signed licenses. We show that weak patents can be quite strong due to the resulting free riding on an invalidity finding, especially if the downstream oligopolistic competition is fierce, so that industry-wide shifts in costs have smaller effects on profits than firm-specific changes in costs. We obtain some simple expressions for the strength of weak patents in the case of linear royalties. We also consider licensing contracts that are two-part tariffs, with a fixed fee and a running royalty.

In this framework, we are able to address a number of related questions: (1) How do the equilibrium two-part tariff licensing contracts vary with the strength of the patent? We show, for instance, that with observable contracts and symmetric equilibrium, the running royalty is below the patent's value for strong patents, but above it for weak patents if negative fixed fees are allowed. (2) How does this relationship depend upon the nature of the downstream oligopolistic competition? We show how the equilibrium linear royalty depends on the ratio of the own-cost and common-cost profit effects. (3) How do the equilibrium licensing contracts vary depending upon whether a bilateral contract between the patent holder and one downstream firm is observable to the other downstream firms? (4) What is the impact of prohibiting negative fixed

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[3] The patent holder cannot obtain royalties unless it has a credible threat to litigate against at least some uses of the technology that refuse to take a license. In the absence of a credible litigation threat, a downstream firm can decline to pay royalties and use the patented technology free of charge. Our analysis encompasses strategies by the patent holder to make the threat of litigation credible.

[4] This formulation assumes that any licenses remain in force after a validity finding. While this is the norm in practice, our framework allows us to explore alternative licensing contracts that adjust royalty rates following a validity finding by the court.

[5] We hope to extend our work soon to include the case in which the patent holder is integrated into the downstream activity. We will then ask about the strategic incentives of the patent holder to integrate downstream.

fees, due to a concern that they can be used to cartelize the downstream industry (even if the patented technology is trivial)? We find that permitting negative fixed fees generally harms consumers; in some models, we also find that negative fixed fees are most likely to be used for weak patents. (5) How is the equilibrium outcome affected by a non-discrimination rule requiring the patent holder to offer the same licensing contract to all downstream firms? (6) What would be the impact of changing the law so that licensing royalties are permitted to survive a finding of invalidity? (7) Under what circumstances will the patent holder structure its licenses so that the royalties do not change after a finding of validity?

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