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Hybrid Licensing of Product Innovations

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HYBRID LICENSING OF PRODUCT INNOVATIONS

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Abstract. This paper studies the feasibility and the effects of hybrid licensing agreements involving product innovations protected by patents and trade secrets. Since incentive and efficiency considerations suggest that a typical contract should provide for a negative fixed fee and post-patent royalties at the same unit level as before patent's expiration, we conclude that per se prohibitions of these practices are not justified on economics grounds.

Keywords: patents, trade-secrets, post-expiration royalties, hybrid licensing
JEL classification: K21, L13, O34

1. Introduction

In an often-cited decision, the US Supreme Court stated that patentee's use of a royalty agreement that projects beyond the expiration date of the patent is unlawful per se, on the ground that to collect such royalties was to extend the monopoly of the patent to inventions that are properly in the public domain.¹ The license involved in the case was limited to patents, and the royalty rate, which was based on the licensee's use of a patented machine, was the same before and after the patent expired (Cohen and Gutterman, 1998).

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¹ *Brulotte v. Thys Co.* 379 U.S. 29, 1964.

However, charging royalties over a period that exceeds the legal term of patent protection is a lawful practice in the case of a hybrid license, that is if the licensing agreement includes both patent and other intellectual property rights, such a trademark or trade secret. But since courts presume that the patent is inherently more valuable than the other form of intellectual property, in this case also it is practically impossible to subscribe an enforceable contract providing for the same royalty level before and after patent's expiration. Such clause would be invalidated as unfair towards the licensee. Thus, an enforceable hybrid licensing agreement has to provide that the royalty decreases when the patent expires, so as to reflect the value of the expired property right.

From an economics perspective, the doctrine that agreements involving unchanged royalties after patent's expiration are per se unlawful have first been questioned by Gilbert and Shapiro (1997). The argument is that the technology proprietor cannot extract royalties above the value of the innovation, and permitting royalties to be paid over a longer period can reduce the deadweight loss from the patent monopoly (Gilbert and Shapiro, 1990). Successively, Law (2004) built a model of hybrid licensing, where in an initially duopolistic market the proprietor of a process innovation, who is not a producer of the final good, is considering the prospect of licensing one or both of the producing duopolists. In this context, for non-drastic innovations hybrid licensing can enhance efficiency.²

But what we can say about a situation in which a new product enters the market and the innovator is a producer of the final good? In our paper we study this case, under the further hypothesis that the patent is very broad, in the sense that the costs

² A process innovation traditionally is said to be drastic (non-drastic) if the monopoly price with the new technology is below (above) the unit cost with the old technology.

of inventing a non-infringing imitation are greater than duopoly profits (Gallini, 1992).³

In analyzing optimal patent design with costly imitation, Gallini (1992) finds that broad patents, with patent life adjusted to generate the desired return from research, are socially efficient in that they permit to avoid socially wasteful imitation costs. This result has been questioned on the ground that imitation costs can be avoided through patent licensing (Maurer and Scotchmer, 2002): if entry by imitation constitutes a credible threat because non infringing imitations can be obtained at positive but not prohibitive costs, the patent holder will be induced to license. If so, optimality requires long-lived, narrow patents, that is imitation costs has to be very low, whereas the incentive to innovate is preserved through an adequate prolongation of the patent life.⁴

Our paper shows that if the protection of innovations allows an interaction between different types of intellectual property rights, in particular between patents and trade-secrets, the innovator can be induced to license even if patent breadth is so high to guarantee, as an alternative, the monopolistic exploitation during the patent life.⁵ Such practice, like narrow patents in the case of pure patent licensing, improves consumer's welfare, and these benefits are at a maximum when the royalty level before and after patent's expiration is the same. So, antitrust concerns relative to hybrid licenses with non-decreasing royalty are not justified on efficiency grounds. Moreover, we show that incentive considerations suggest

³ Under this hypothesis a product innovation is comparable to a drastic process innovation.

⁴ In touching the argument of optimal patents we enter a field where the literature is very large. A selection of the first contributions comprehends Tandon (1982), Gilbert and Shapiro (1990), Klemperer (1990), Gallini (1992), and Denicolò (1996).

⁵ Our model does not address the question of patentee's optimal choice of the patent-secret mix. This sort of choice is studied in Ottoz and Cugno (2008) where, however, licensing effects are not explicitly considered.

that a typical hybrid license should provide for a (limited) negative fixed fee, which raises another matter involving economics basis of antitrust positions.

2. Hybrid licensing vs. temporary monopoly exploitation

Let's consider a firm able to produce a new good by utilizing a technology jointly protected by patent and trade secret. By assumption trade secret extends beyond the statutory life of the patent, which is meant to have maximum breadth, so that imitation is necessarily infringing.

There is only one potential entrant who, when the patent expires, can enter the market bearing a fixed cost of independent invention of the secret or through a license. The purchase of the license is preferred if the royalty per unit of product set in the contract is not higher than $\bar{\rho}_s$. A third opportunity is that the two firms agree from the onset on a hybrid license allowing the immediate entry of the licensee, despite the maximum patent's breadth, conditional on the payment of a royalty per unit output ρ_p during the patent life and a subsequent royalty ρ_s after patent's expiration.

The price of the good and the quantity produced are respectively P and X and the inverse demand function is $P = a - X$. Let's assume then that unit production cost is constant and set equal to zero. The two firms compete à la Cournot so that, calling X_p^A and X_s^A the production flows of the proprietary firm before and after patent's expiration, and X_p^B and X_s^B the production flows of the entrant firm, in the case of hybrid license we have

$$X_i^A = \frac{a + \rho_i}{3}, \quad X_i^B = \frac{a - 2\rho_i}{3}, \quad i = p, s. \quad (1)$$

The corresponding profit flows, including royalties paid by the licensee, will be

$$\Pi_i^A = \left(\frac{a + \rho_i}{3}\right)^2 + \rho_i \frac{a - 2\rho_i}{3}, \quad \Pi_i^E = \left(\frac{a - 2\rho_i}{3}\right)^2, \quad i = p, s. \quad (2)$$

Let's now indicate with τ patent's length and suppose, without loss of generality, that secret duration is infinite. Then, setting $T = 1 - e^{-r\tau}$, where r is the discount rate, we can write the present values of the two firms' profits as

$$V^A = \frac{T}{r} \left[\left(\frac{a + \rho_p}{3}\right)^2 + \rho_p \frac{a - 2\rho_p}{3} \right] + \frac{1 - T}{r} \left[\left(\frac{a + \rho_s}{3}\right)^2 + \rho_s \frac{a - 2\rho_s}{3} \right], \quad (3)$$

$$V^B = \frac{T}{r} \left(\frac{a - 2\rho_p}{3}\right)^2 + \frac{1 - T}{r} \left(\frac{a - 2\rho_p}{3}\right)^2 \quad (4)$$

In turn, the value of consumer's surplus is given by

$$W = \frac{1}{2} \left[\frac{T}{r} \left(\frac{2a - \rho_p}{3}\right)^2 + \frac{1 - T}{r} \left(\frac{2a - \rho_s}{3}\right)^2 \right]. \quad (5)$$

Equations (3), (4) and (5) encompass the case of entry of the rival firm after patent's expiration by the means of a pure secret license. This case requires $\rho_p = a/2$ (implying $X_p^B = 0$) and $\rho_s = \bar{\rho}_s$. Thus, in order to evaluate the effects on social welfare of the two different types of license we do not have to introduce new equations.

Proposition 1. There exists a set of couples (ρ_p, ρ_s) such that a hybrid license is equally profitable for both firms than a pure secret license.

Proof. Let \bar{V}^A and \bar{V}^B be the present values of the technology proprietor's profits and of the entrant if entry happens after patent's expiration by the means of a pure secret license ($\rho_p = a/2$ and $\rho_s = \bar{\rho}_s$). By setting $V^B = \bar{V}^B$ in (4) we obtain the pairs

$(\hat{\rho}_p, \hat{\rho}_s)$ which makes hybrid license as profitable as pure secret license for the entrant firm, given by

$$\hat{\rho}_p = \frac{a}{2} - \frac{1}{2} \sqrt{\frac{1-T}{T} [(a-2\bar{\rho}_s)^2 - (a-2\hat{\rho}_s)^2]} \quad (6)$$

Analogously, by setting $V^A = \bar{V}^A$ in (3), we obtain the combinations between ρ_p and ρ_s that make the hybrid license as profitable as pure secret license for the technology proprietor firm. Some calculation shows that the relation in (6) applies to it too. Summing up, all hybrid licensing agreements that respect condition (6) are equally profitable for both firms and are equally profitable as compared to a pure secret license. ■

We now see the effects on consumer's surplus.

Proposition 2. A hybrid license implying the same profitability of a pure secret license is preferable for consumers.

Proof. Differentiating consumer's surplus in equation (5) and the condition for equal profitability of contracts in equation (6) we can verify that $dW \geq 0$ if

$$(2a - \hat{\rho}_s)(a - 2\hat{\rho}_p) \leq (a - 2\hat{\rho}_s)(2a - \hat{\rho}_p) \quad (7)$$

This condition is satisfied if $\hat{\rho}_p \geq \hat{\rho}_s$. Hence starting from a situation where $\rho_s = \bar{\rho}_s$ and $\rho_p = a/2$ (pure secret license) it is possible to increase consumer's surplus without reducing firms' profitability shifting to a hybrid-license implying a reduction in ρ_p coupled with an adequate increase in ρ_s . ■

As $dW > 0$ as long as $\hat{\rho}_p > \hat{\rho}_s$, it immediately follows that a hybrid license implying $\hat{\rho}_p = \hat{\rho}_s$ maximizes consumer's surplus subject to $V^B = \bar{V}^B$ and $V^A = \bar{V}^A$. Then, the following proposition holds.

Proposition 3. The legal prohibition to enter a hybrid licensing agreement providing for the same royalty before and after patent's expiration is socially inefficient.

Till now we saw that the present value of consumer's surplus is higher if royalties ρ_p and ρ_s are chosen according to condition (6) as compared to the case of pure secret license, while present values of profits remain unaltered. But in this case there are no particular private incentives for the adoption of a hybrid license. The following proposition show how these incentives could be generated.

Proposition 4. If licensing agreements providing for negative fixed fees are feasible, it is possible to obtain, in comparison with a pure secret license, an increase both of the present value of consumer's surplus and present value of licensor's profits.

Proof. By setting $\rho_p = a/2$ and $\rho_s = \bar{\rho}_s$ in equation (5) we obtain the pairs $(\tilde{\rho}_p, \tilde{\rho}_s)$ letting consumers indifferent between a hybrid license and a pure secret license, given by

$$\tilde{\rho}_p = 2a - \sqrt{\frac{9a^2}{4} + \frac{1-T}{T}[(2a - \bar{\rho}_s)^2 - (2a - \tilde{\rho}_s)^2]} \quad (8)$$

Differentiating licensor's profits in equation (3) and the condition in equation (8) we can verify that $dV^A > 0$ if

$$(2a - \tilde{\rho}_s)(a - 2\tilde{\rho}_p) < (a - 2\tilde{\rho}_s)(2a - \tilde{\rho}_p). \quad (9)$$

This condition is satisfied if $\tilde{\rho}_p > \tilde{\rho}_s$. Thus, starting from a situation where $\rho_s = \bar{\rho}_s$ and $\rho_p = a/2$ (pure secret license) it is possible to increase licensor's profits without reducing consumer's surplus shifting to a hybrid license implying a reduction in ρ_p coupled with an adequate increase in ρ_s . Since a royalty contract $(\tilde{\rho}_p, \tilde{\rho}_s)$ increases licensor's profits with respect to a pure secret license, whereas a contract $(\hat{\rho}_p, \hat{\rho}_s)$ leaves them unchanged, when $\hat{\rho}_s = \tilde{\rho}_s$ we must have $\tilde{\rho}_p > \hat{\rho}_p$.

Let's then set $\tilde{\rho}_s = \hat{\rho}_s$ and suppose it is chosen a ρ_p such that $\hat{\rho}_p < \rho < \tilde{\rho}_p$. This licensing agreement implies, as compared to the pure secret license, higher present values of consumer's surplus and licensor's profits and a lower present value of entrant's profits, which represents a violation of the participation constraint. If benefits of the technology proprietor firm outweigh the losses of the entrant, the participation constraint may be satisfied with a lump-sum transfer from the licensor to the licensee.

Partially differentiating V^A and V^B with respect to ρ_p we obtain

$$\frac{\partial V^A}{\partial \rho_p} = T \frac{2(a + \rho_p)}{9} + T \frac{a - 4\rho_p}{3}, \quad \frac{\partial V^B}{\partial \rho_p} = -T \frac{2(a - 2\rho_p)}{9}, \quad (10)$$

and it is easy to verify that for $\rho_p < a/2$ we have $\partial V^A / \partial \rho_p + \partial V^B / \partial \rho_p > 0$. ■

As it has been widely recognized, permitting negative fixed fees in licensing contracts can be somewhat dangerous. If side payments of this kind are allowed, a licensing contract may become equivalent to a bribe paid by the licensor to induce

the licensee to stay out the market (Shapiro, 1984). In our framework, this extreme outcome would be obtained with a contract envisaging royalties $\rho_p, \rho_s \geq a/2$, so that $X_p^B = X_s^B = 0$, and a negative fixed fee high enough to compensate the potential entrant for giving up entry through independent invention of secrets after patent's expiration. On the other hand, side payments can render hybrid licensing agreements both privately and socially convenient, provided that royalties per unit output are not too high. Thus, negative fixed fees should not be per se illegal under the antitrust law: reasoned case-by-case decisions seem to be the best course.

3. Concluding remarks

The paper shows that if the protection of innovations allows an interaction between different types of intellectual property rights, in particular trade-secrets/patents, hybrid-license agreements that extend royalty payments beyond the patent life can benefit both the innovator and consumers. Given innovator's benefits, consumers' welfare is maximized when the innovator is able to extract the same royalty per unit output before and after patent's expiration. In turn, innovator's benefits depend on the legal admissibility of licensing agreements providing for (limited) negative fixed fees. Thus, antitrust concerns about post-patent royalty levels and negative fixed fees either are not justified on efficiency grounds or, if justified as in the case of negative fees, should not lead to a per se prohibition.

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