

DIFFERENT RULES OF LEGAL-COST ALLOCATION AND PATENT HOLD-UP

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ABSTRACT

We study how different rules for allocating litigation costs impact on royalty negotiation when a non-practicing patent holder asserts its patent against a product developer.

A theoretical framework is proposed which distinguishes between three legal cost allocation systems: the American system, where each party bears its own costs, the British system, where the loser incurs all costs, and the system favoring the defendant, where the defendant pays its own costs if it loses and nothing otherwise. The model considers both flat lawyer fees and contingency fees. We first determine conditions under which, in the assumed contexts, the American system is preferable to the British one. Successively, we show that the less usual system favoring the defendant proves to be an interesting alternative.

In this way, in addition to extend the standard model of patent hold-up, we furnish an analytical treatment of recent legislative proposals, such as the Saving High-Tech Innovators from Egregious Legal Disputes (SHIELD) Act of 2013.

Keywords: Legal costs, British system, American system, System favoring the defendant, patent hold-up

JEL Classification: K20, K21, O34.

INTRODUCTION

In recent years, patent hold-up seems to become a primary concern for innovating firms in component-driven industries. In these sectors, notably information technology where products comprise thousand of separately patentable components, many patent-assertion entities (also known as non-practicing entities or, in a pejorative term, “patent trolls”) engage in deliberate tactics allowing them to take

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product developers by surprise once they have made irreversible investments. (Lemley and Shapiro, 2007; Shapiro, 2010; Bessen and Meurer, 2014; Sichelman, 2010). As Shapiro (2010, p. 290) points out, a typical situation involves independent invention: an unexploited patent is asserted against a producer who has already begun using the underlying technology being entirely unaware of the patent. Because of the prohibitive costs associated with redesigning a non infringing version of the product, the surprised developer will usually accept to pay royalties far above the intrinsic value of the protected invention (Lemley, 2008, p. 613). The settlement of 612.5 million dollars between BlackBerry-maker RIM and NTP (a patent asserting entity) is perhaps the most notorious worldwide example of this “trolling activity”.¹ As for Europe, a relevant case involved Nokia, HTC Corp., T-Mobile GmbH and Apple sued by the German based non-practicing company IPCom GmbH.

It seems clear that in this kind of scenario the hold-up problem can be completely overcome only if the bargaining disadvantage due to the redesign costs that burden producers is nullified. According to Lemley and Shapiro (2007), this goal could be achieved if the courts routinely denied permanent injunctions –using instead ongoing royalty remedies– in patent litigation cases where patent-assertion entities are involved and the infringing feature is only a little component of a complex product.² Effectively, after the Supreme Court’s 2006 *eBay Inc. v. MercExchange, L.L.C.* decision the U.S. district courts have become much more reluctant than before to grant permanent injunctions when the patent holder does not compete against the downstream firm (Boyle, 2012; Chien and Lemley, 2013).³ But, as Chien and Lemley (2013, p. 2) note, “the Court’s ruling didn’t eliminate injunction-based holdup because another jurisdiction routinely grants injunctions in patent cases: the International Trade Commission”.

¹ With regard to this case Bessen and Meurer (2008, p. 49) report that “RIM first learned about NTP and Campana’s patents in early 2000 when NTP sent letters to several companies, including RIM, warning them about NTP’s wireless e-mail patents. This was ten years after RIM started developing wireless technology, four years after RIM introduced its prototype of the BlackBerry, and two years after RIM signed contracts with Canadian and American telecommunications companies to supply wireless e-mail service”.

² This point of view reflects the concurring opinion of Justice Kennedy in the Supreme Court’s 2006 *eBay Inc. v. MercExchange, L.L.C.* decision stating that: “When the patented invention is but a small component of the product the companies seek to produce and the threat of an injunction is employed simply for undue leverage in negotiations, legal damages may well be sufficient to compensate for the infringement and an injunction may not serve the public interest” Shapiro (2010, p. 282). The Justice Kennedy’s opinion supported by Lemley and Shapiro had been criticized by, among others, Golden (2007), Denicolò et al. (2008), Elhauge (2008). For some responses see Shapiro (2010).

³ In *eBay Inc. v. MercExchange* the supreme court stated that to obtain an injunction the plaintiff must demonstrate “(1) that it has suffered an irreparable injury; (2) that remedies available at law are inadequate to compensate for that injury; (3) that considering the balance of hardships between the plaintiff and defendant, a remedy in equity is warranted; and (4) that the public interest would not be disserved by a permanent injunction”. These requirements have made it more difficult for non practicing entities to obtain injunctions in district courts. However, research entities, such as universities, or individual patent holders that evidently are not patent trolls still seems to be entitled to obtain injunctive relief (Boyle, 2012; Chien and Lemley, 2012).

On the other hand, the tendency to consider injunctive relief as the norm, typical of many European countries,⁴ seems to be confirmed in the EU by the Agreement on a Unified Patent Court (UPC). The risk that the effects of an EU-wide injunction would be a strong incentive for “trolling activities”, so far not so common in the EU as in the US, was made plain by an open letter to the EU legislative authorities signed by sixteen leading firms or organizations. In particular, the letter, published on September 26, 2013 in the New York Times,⁵ expresses concern that:

“Rigid application of an injunction rule could enable unprincipled litigants to ‘hold up’ manufacturers by making unreasonable royalty demands for even a single trivial patent on a complex product.... This will be particularly true with injunctions under the UPC because the UPC injunction power will extend beyond a single country to most of Europe...Indeed, PAEs (patent assertion entities) have already begun to set up shop in several European countries, drawn by the potential for siphoning more revenue from European companies”.

As some commentators note, it may be that to take account of these criticisms the UPC Preparatory Committee will introduce some corrective measures.⁶ But, given the previous consideration for permanent injunctions, it seems very unlikely that a remedy similar to the US Supreme Court’s decision in eBay will be implemented.

Summing up, it must be acknowledged that both in the US and Europe practical and ideological obstacles make it difficult to fully counteract “patent trolling” activities on the basis of the Lemley and Shapiro’s proposal. Perhaps a more viable, although partial, remedy can be found through legislative actions on litigation costs.⁷ Since the rule for allocating litigation costs adopted by the courts affects the parties bargaining power in finding a licensing agreement, an appropriate choice between the available alternatives may introduce a restraint on the patent holders’ claims. In this paper we explore this possibility.

To our knowledge, although some papers exist that discuss the role of legal-cost allocation in favoring patent litigation or settlement (Meurer, 1989; Aoki and Hu, 1999; Llobet, 2002; Llobet and Suarez, 2011), and many more have dealt with the problem by referring to civil suits in general (Shavell, 1982; Bebchuk, 1984; Braeutigam et al. 1984; Reinganum and Wilde, 1986; Hylton, 1993, Hughes and Snyder, 1995, to cite a few of the early works), only little attention had been paid to the implications on the royalty-bargaining process. A notable exception is Aoki and Hu (1999), where the issue is analyzed distinguishing between legal systems depending on their degree of patent protection.⁸ Here we adopt a different point of view, that is we assume that if a patent is declared invalid or not infringed this is because, after a thorough scrutiny, the court shows that truly the invention at issue

⁴ Notably, Germany. See Cotter (2010, p. 10).

⁵ See <http://graphics8.nytimes.com/packages/pdf/business/26trolls-letter.pdf>

⁶ See <http://bricwallblog.wordpress.com/2014/02/24/patent-trolls-a-view-from-europe/#page=1>.

⁷ According to Bessen and Love (2013, p. 86), “in addition to litigation-oriented reforms,... Congress should attack the patent troll problem by strategically increasing Patent Office fees”.

⁸ Farrell and Shapiro (2008, p. 1354) point out that “their approach assumes that if a patent is ruled invalid or not infringed it is a court (or legal system) error”.

does not meet the novelty and non-obviousness requirements or the patent claims are so narrow as not to concern the feature under investigation (Farrell and Shapiro, 2008). This allows us to treat patent hold-up as a real problem, and to study how different rules of legal-cost allocation impact on it.

Specifically, we will compare the patent holder's payoff from pre-trial licensing agreements under three different systems for allocating litigation costs, namely, the "American system", where each party bears its own costs; the "British system", where the loser incurs all costs; and the "system favoring the defendant", where the defendant pays its own costs if it loses and nothing otherwise⁹ –as provided for by the Saving High-Tech Innovators from Egregious Legal Disputes (SHIELD) Act recently introduced in the U.S. House of Representatives. The comparison is performed within the hold-up model by Lemley and Shapiro (2007) and Shapiro (2010).

ROYALTY NEGOTIATION

Shapiro's (2010) model refers to an environment where a non-practicing patent holder owns a patent protecting a technological feature which allows increasing the value to consumers of a downstream firm's product by an amount $v \geq 0$ in comparison with the best non-infringing alternative. The quantity vX , where X denotes the number of units sold by the downstream firm, is referred to as the "value of the patented technology". Although a non-infringing alternative exists, when the downstream firm has already incorporated the patented technology into its product, redesigning it to avoid using the patented technology entails a cost H , including any profits lost while redesigning.¹⁰

The two parties assign the same probability $\theta < 1$ –called "patent strength"– to the event that, if litigated in court, the patent will be ruled valid and infringed. If the parties resort to a lawsuit and the patent holder wins, then it will be entitled to obtain a permanent injunction and damages for infringement on the basis of a "reasonable royalty" rate s . In any case, litigation in court can be avoided by negotiating a royalty r per unit product incorporating the patented feature sold by the downstream firm. This licensing negotiation is modeled as a Nash Bargaining game, where the patent holder captures the fraction β –reflecting the patent holder's bargaining skill– of the joint gains from settling rather than litigating.

Shapiro (2010, p. 309-312) shows that under the above assumptions, the parties will reach a pre-trial licensing agreement implying

$$rX = \theta[sT + \beta v(1-T)]X + \theta\beta H + \beta E_D - (1-\beta)E_P \quad (1)$$

where $T < 1$ stands for the duration of a typical patent lawsuit as a fraction of the remaining lifetime of the patent, while E_P and E_D denote the litigation costs that the

⁹ The label of "system favoring the defendant" applied to this allocation rule is due to Shavell (1982). In the literature this fee-shifting rule is also known as a case of "one-way fee-shifting" in contrast with the "two-way fee-shifting" provided for by the British rule.

¹⁰ As Denicolò et al. (2008, p. 580) note, "Lemley and Shapiro distinguish between direct costs of redesigning and lost profits. This allows for a richer set of predictions, but complicates the analysis. Merging the two components of the cost into a single index simplifies matters without altering the logic of the argument".

patent holder and the downstream firm, respectively, expect to bear if negotiation fails.¹¹

With respect to the reasonable royalty rate s , two possibilities can be considered. The first consists in assuming that the court sets it at its benchmark level, defined as the level that would be negotiated if the downstream firm before designing its product were aware of the patent and the patent were known to be valid and infringed (Shapiro, 2010, p. 290). In this case we have $s = \beta v$ and Eq. (1) reduces to

$$rX = \theta\beta vX + \theta\beta H + \beta E_D - (1 - \beta)E_P \quad (2)$$

Alternatively, as we will see in Section 4 below, the reasonable royalty rate can be determined endogenously in a self-fulfilling equilibrium (Shapiro, 2010, p. 301).

As for the case $s = \beta v$, Eq. (2) tells us that the patent holder's payoff, rX , depends upon three components (Shapiro, 2010, p. 295). The first term in the right-hand side of the equation, $\theta\beta vX$, can be viewed as the benchmark level of the patent holder's payoff, that is the payoff that would accrue to the patent holder if, apart from the bargaining skills, the two parties were on equal footing in the negotiation. The second term, $\theta\beta H$, reflects the patent holder's ability to hold-up the downstream firm based on direct costs and lost profits associated with redesigning the product. The third term, $\beta E_D - (1 - \beta)E_P$, measures the patent holder's bargaining advantage (disadvantage) associated with the costs of failure to reach a licensing agreement.

In what follows we study the role of different rules for allocating litigation costs in limiting (or enhancing) the departure of the patent holder's payoff from its benchmark level.

AMERICAN VS. BRITISH SYSTEM

Flat lawyer fees

Consider first the American system, where each party bears its own litigation costs, assumed identical and equal to the flat lawyer fee C , whatever the trial's outcome. In this case $E_D = E_P = C$, so that Eq. (2) can be written

$$rX - \theta\beta vX = \theta\beta H + (2\beta - 1)C \quad (3)$$

Unlike the American system, the British one envisages that the loser in court will bear all litigation costs. In this case, $E_D = 2\theta C$ and $E_P = 2(1 - \theta)C$, implying that

$$rX - \theta\beta vX = \theta\beta H + 2(\beta + \theta - 1)C \quad (4)$$

¹¹ To be precise, two further assumptions are required. First, and obviously, litigation costs expected by the patent holder must be small enough to make the patent holder's threat to sue credible and litigation costs expected by the downstream firm must be small enough to make it litigate rather than exiting. Second, in the case of litigation the downstream firm must find it not profitable to develop a non-infringing version of its product during the trial (Shapiro, 2010, p. 292).

By comparing Eqs. (3) and (4), we can immediately deduce the following proposition.

Proposition 1. Suppose that the two parties' litigation costs are identical and equal to the flat lawyer fee C . Then, when $s = \beta\theta$, under the American system the departure of the patent holder's payoff from its benchmark level, $rX - \theta\beta vX$, is greater than it is under the British system for all patent strengths θ less than 0.5. When $\theta > 0.5$ the above statement is reversed.

Thus, for relatively weak patents the British rule proves more effective in limiting patent hold-up. This is because, by charging the loser with the entire litigation costs, for a relatively weak patent the British rule puts the downstream firm in a better bargaining position than it would enjoy in the American system. More specifically, when the parties have equal bargaining skill and equal litigation costs, under the American rule litigation costs are neutral, that is they do not affect the parties' bargaining positions. So, the patent holder can appropriate all fruits of its ability to hold-up the downstream firm based on the cost of redesigning the product. By contrast, under the British rule litigation costs are not neutral, that is they positively affect the downstream firm's bargaining position, and the patent holder's ability to hold-up it is (partially or totally) offset.

Things are drastically different when the patent at issue is relatively strong, that is when $\theta > 0.5$. In this case, the rule that charges the loser with all litigation costs plays in favor of the patent holder. In particular, when the parties have the same bargaining skill and the same litigation costs, under the American rule the departure of patent holder's payoff from its benchmark level is equal to the hold-up components due to redesign lags and costs, while under the British rule the departure is greater than this term.

Contingency fees

The model can be extended to take into account contingency-fee arrangements, where lawyer fees are determined by the success of the claim, and are usually calculated as a percentage of the client's recovery: a "no win, no fee" arrangement to which patent-assertion entities increasingly turned in recent time (Towns, 2010; Schwartz, 2012; Chien and Guo, 2013). A typical contingency-fee arrangement provides for both the reimbursement of the case costs incurred by the lawyer and, in case of success, a lawyer fee αR , calculated as a percentage α of the recovery R . Nevertheless, to our purpose the case costs play no significant role, and we ignore them. Then, since an alleged infringing producer lacks comparable risk-spreading options,¹² when a patent holder is turning to a contingency-fee lawyer expected litigation costs under the American system become $E_D = C$ and $E_P = \theta\alpha R$, implying that the departure of the patent holder's payoff from its benchmark level will amount to

¹² Since in this case the burden of litigation costs is different for plaintiffs and defendants in favor of plaintiffs, in bargaining for royalties surprised producers face a further disadvantage.

$$rX - \theta\beta vX = \theta\beta H + \beta C - (1 - \beta)\theta\alpha R \quad (5)$$

In turn, under the British system expected litigation costs amount to $E_D = \theta(C + \alpha R)$ and $E_P = (1 - \theta)C$, so that

$$rX - \theta\beta vX = \theta\beta H + (\beta + \theta - 1)C + \beta\theta\alpha R \quad (6)$$

Eqs. (5) and (6) immediately lead to

Proposition 2. Suppose that the patent holder turns to a contingency-fee lawyer. Then, when $s = \beta v$, under the American system the departure of the patent holder's payoff from its benchmark level is smaller than it is under the British system for all patent strengths θ such that $(1 - \theta) < \theta\alpha R / C$.

So, if lawyers are willing to propose contingency fees only if the expected earning from the deal is not lower than what expected from the flat fee C , that is they do not sign agreements providing for a percentage α such that $\theta\alpha R < C$, differently from what happens with flat lawyer fees the American system proves preferable even when patents are relatively weak.¹³ This sharp difference is due to the fact that with contingency lawyer fees, under the British system patent holders face expected litigation costs that are half of what they are with flat lawyer fees. As a consequence, the effect of litigation costs on the patent holder's payoff remains positive whatever the patent strength, while under a flat fee arrangement for $\theta < 0.5$ it becomes negative.¹⁴

THE SYSTEM FAVORING THE DEFENDANT

Considering the difficulty in deciding, at least under flat lawyer fees, which of the two "normal" rules, American or British, performs better in the presence of hold-up, it seems useful to explore the merits of a much less usual system for allocating litigation costs, namely the system favoring the defendant.¹⁵ Actually, as suggested by its own label, this system seems more effective than the British system in limiting the patent holder's bargaining power (and a fortiori more effective than the American one) when the patent is relatively weak, and correspondingly it is more effective than

¹³ This can be easily seen by observing that if the inequality $\theta\alpha R < C$ cannot hold the necessary and sufficient condition $(1 - \theta) < \theta\alpha R / C$ can be replaced by the sufficient condition $(1 - \theta) < 1$, which is fulfilled for all relevant θ .

¹⁴ Given the increasing availability in the US of patent lawyers willing to work on contingency fees, the above result casts some doubt on legislation proposals such as the Patent Litigation Integrity Act introduced to the US Senate on October 30, 2013, and the Innovation Act passed by the U.S. House of Representatives on December 5, 2013, but taken off the Senate Judiciary Committee on May 21, 2014. Both bills envisage a British fee-shifting rule for patent lawsuits.

¹⁵ We do not consider the symmetrically opposed system favoring the plaintiff because it obviously enhances the patent holder's bargaining position with respect to both the American and British systems, so exacerbating the hold-up problem.

the American system (and a fortiori more than the British one) when the patent is relatively strong.

The strong discordance between the apparent merits of the system favoring the defendant and its unusual adoption in the real world requires a specification. As Shavell noted, despite the system favoring the defendant can be considered as a departure from the norm (the American system in the U.S. and the British system in Europe), it has been sometimes employed: for example, the state of Florida has adopted it in medical malpractice cases (Shavell, 1982, p. 55-56). But much more important from our point of view is the fact that this allocation rule has been recently perceived as a –at least partial– remedy to some opportunistic behavior in patent disputes. This is proven by the Saving High-Tech Innovators from Egregious Legal Disputes (SHIELD) Act of 2013 –introduced in the U.S. House of Representatives to modify chapter 29 of title 35 United States Code– which provides for the recovery of defendant’s litigation costs in some cases where non-practicing entities are involved. Precisely, the bill states that:

“Notwithstanding section 285, the Court shall award the recovery of full costs to any prevailing party asserting invalidity or noninfringement, including reasonable attorney’s fees, other than the United States, upon the entry of a final judgment if the court determines that the adverse party did not meet at least one of the conditions described in subsection (d), unless the court finds that exceptional circumstances make an award unjust”.¹⁶

With respect to the party alleging infringement, conditions described in subsection (d) exclude original inventors, practicing patent holders, universities, and technology transfer organizations. This makes clear the proponents' intention to curb the trolling activities of entities that purchases dormant patents for the sole purpose of asserting them against producers. In any case, the SHIELD Act seems a very important attempt to apply the rule favoring the defendant, so making it something very different from a mere theoretical curiosity.

Flat lawyer fees

Since the system favoring the defendant envisages that the downstream firm does not pay litigation costs if it wins in court and only its own costs if it loses, with flat lawyer fees the parties’ expected litigation costs are given by $E_p = 2(1 - \theta)C + \theta C = (2 - \theta)C$ and $E_D = \theta C$, respectively, implying that

¹⁶ The bill’s proponents are Representatives Peter DeFazio (D-Oregon) and Jason Chaffetz (R-Utah). The text is available at <http://cdn.arstechnica.net/wp-content/uploads/2013/02/SHIELD-Act-113th-final.pdf>. A first version of the SHIELD Act, available at https://www.eff.org/sites/default/files/SHIELD_ACT_0.pdf, has been criticized on the ground that (1) its applicability was limited to software patents, (2) there were a generic reference to a court’s determination that the party alleging the infringement of the patent did not have a reasonable likelihood of succeeding, and (3) it did not distinguished between practicing and non-practicing patent holders (Yeh, 2012; Chen, 2013). The current version of the bill overcomes these criticisms.

$$rX - \theta\beta vX = \theta\beta H + [\theta - 2(1 - \beta)]C \quad (7)$$

The following proposition can be immediately proven.

Proposition 3. Suppose that two the parties' litigation costs are identical and equal to the flat lawyer fee C . Then, when $s = \beta v$, under the system favoring the defendant the departure of the patent holder's payoff from its benchmark level is smaller than the hold-up component $\theta\beta H$ for all patent strengths θ less than $2(1 - \beta)$. If the parties have the same bargaining skill the statement holds for all relevant patent strengths.

So, if the parties have equal bargaining skill the system favoring the defendant extends the property shown by the British system for weak patents to all patent strengths, that is it exhibits all the merits of the British system without its flaws. Also, we can show that with respect to the American rule the system favoring the defendant could reduce the patent holders' ability to extract royalties by a substantial amount. To this purpose, consider the case where the ratios of redesign costs and individual litigation costs to the total value of the patented feature amount to 50% and 10%, respectively, and the two parties have the same bargaining skill, that is $H/vX = 0.5$, $C/vX = 0.1$ and $\beta = 0.5$.¹⁷ With these numerical values, Eqs. (2) and (3) imply that under the American rule we have $(r - \theta\beta v)/\theta\beta v = 0.5$ for all relevant θ : since the parties have equal bargaining skill, the effect of litigation costs is null whatever the patent strength. In turn, Eqs. (2) and (7) say that under the system favoring the defendant $(r - \theta\beta v)/\theta\beta v = 0.7 - 0.2/\theta$, that is the percentage departure of the negotiated royalty rate from its benchmark level approaches 0.5 as θ approaches 1 and it decreases toward zero as θ decreases toward 0.28. In particular, for a patent whose probability of being declared valid and infringed in court is 0.5, the percentage departure amounts to 0.3 –a reduction of 40% with respect to the corresponding departure under the American system.

Contingency fees

If the patent holder and the lawyer sign a contingency fee agreement, expected litigation costs are given by $E_D = \theta C$ and $E_P = (1 - \theta)C + \theta\alpha R$, so that

$$rX - \theta\beta vX = \theta\beta H + (\theta + \beta - 1)C - (1 - \beta)\theta\alpha R \quad (8)$$

Proposition 4. Suppose that in case of litigation the patent holder would turn to a contingency-fee lawyer. Then, when $s = \beta v$, under the system favoring the defendant the departure of the patent holder's payoff from its benchmark level is smaller than the hold-up component $\theta\beta H$ for all patent strengths θ such that $\theta < (1 - \beta)(C + \theta\alpha R)/C$.

¹⁷ Obviously, with respect to the American rule (and the British rule), the system favoring the defendant reduces the patent-holder's bargaining power for all relevant values of the parameters (compare Eqs. (3), (4) and (7)). The numerical example is only meant to show how relevant can be this effect.

Proposition 4 reproduces the statement in Proposition 3 with a slight difference in the condition regarding θ . If the two parties have equal bargaining skill and contingency-fee lawyers do not sign agreements providing for a percentage α such that $\theta\alpha R < C$, the statement holds for all relevant patent strengths. Obviously, this means that the system favoring the defendant, unlike the British system, is not significantly sensitive to the two different types of lawyer-fee arrangement.

REASONABLE ROYALTIES IN SELF-FULFILLING EQUILIBRIUM

The assumption that reasonable royalties are set at their benchmark level can be questioned on the ground that it may be very difficult to estimate βv with accuracy. As a matter of fact, in setting s the courts resort to certain practical criteria that necessarily introduce some degree of circularity: for example, if in their calculation the courts use as proxies the royalties actually negotiated for other comparable patents, the determined reasonable royalties will depend in part on themselves, since the royalties actually negotiated depend in part on what the courts decide. However, this circularity can be theoretically resolved by searching for a fulfilled-expectations equilibrium (Shapiro, 2010, p. 301 and Appendix).

A fulfilled-expectations equilibrium requires that for a valid patent (i.e., $\theta = 1$) in Eq. (1) the equality $r = s$ holds. Then, solving for s we have

$$s = \beta v + \frac{\beta H}{X(1-T)} + \frac{\beta E_D^* - (1-\beta)E_P^*}{X(1-T)} \quad (9)$$

where E_D^* and E_P^* denote expected litigation costs for $\theta = 1$. Eq. (9) tells us that the reasonable royalty rate in self-fulfilling equilibrium contains itself a hold-up component $\beta H / X(1-T)$ to be added to the benchmark level βv (Shapiro, 2010, p. 301). Moreover, it is influenced by the rule of legal-cost allocation on which E_D^* and E_P^* depend.

Some algebra involving Eqs. (1) and (9) allows us to determine the patent holder's payoff from initial negotiation when the reasonable royalties are in a self-fulfilling equilibrium and to compare the outcomes of the different systems of legal-cost allocation. Since, limiting ourselves to the case of flat lawyer fees, the American rule implies $E_D = E_P = E_D^* = E_P^* = C$, we can write the departure of the patent holder's payoff from its benchmark level under this system as

$$rX - \theta\beta vX = \frac{\theta\beta H}{1-T} + \frac{(2\beta - 1)[1 - T(1 - \theta)]C}{1-T} \quad (10)$$

In turn, the British rule entails $E_D = 2\theta C$, $E_P = 2(1 - \theta)C$, $E_D^* = 2C$ and $E_P^* = 0$, so that

$$rX - \theta\beta vX = \frac{\theta\beta H}{1-T} + \frac{2[\theta\beta - (1-\theta)(1-\beta)(1-T)]C}{1-T} \quad (11)$$

By comparing Eqs. (10) and (11) the following proposition can be proven.

Proposition 5. Suppose that two the parties' litigation costs are identical and equal to the flat lawyer fee C . Then, when the reasonable royalty rate is determined in a self-fulfilling equilibrium, under the American system the departure of the patent holder's payoff from its benchmark level, $rX - \theta\beta vX$, is greater than it is under the British system for all $\theta < (1-T)/(2-T)$. When $\theta > (1-T)/(2-T)$ the opposite occurs.

If the duration of litigation as a fraction of the remaining patent life is small, that is if T is small, the ratio $(1-T)/(2-T)$ is close to 0.5. In this case, Proposition 1, drawn under the assumption that the courts are able to set the reasonable royalty at their benchmark level, is substantially confirmed. But with T increasing toward unity, the range of the patent strength over which the American system is preferable becomes gradually wider.

The system favoring the defendant is less sensitive to the two different assumptions on reasonable royalties. In particular, the statement concerning the case where the two parties have the same bargaining skill in Proposition 3 is confirmed. This can be shown remembering that $E_D = \theta C$ and $E_P = (2-\theta)C$, so $E_D^* = E_P^* = C$, in which case the departure of the patent holder's payoff from its benchmark level becomes

$$rX - \theta\beta vX = \frac{\theta\beta H}{1-T} + \frac{[\theta - 2(1-\beta)(1-T + \theta T)]C}{1-T} \quad (12)$$

When $\beta = 0.5$ the second term in the right-hand side of Eq. (12) is negative for all relevant θ and T . This allows us to write

Proposition 6. Suppose that the two parties' litigation costs are identical and equal to the flat lawyer fee C . Then, when the reasonable royalty rate is determined in a self-fulfilling equilibrium and the parties have equal bargaining skill, the departure of the patent holder's payoff from its benchmark level is smaller than the hold-up component $\theta\beta H/(1-T)$ for all patent strengths $\theta < 1$ and trial durations $T < 1$.

Summing up, the only relevant difference with the case where the reasonable royalty rate is set at its benchmark level concerns the comparison between the American and the British systems when the duration of litigation relative to the remaining time-life of the patent is high. In these circumstance, if the reasonable royalty rate is set at its self-fulfilling equilibrium the American system becomes more attractive than the British one over a very wide range of the patent strength.

CONCLUSION

We studied how different systems for allocating litigation costs affect the patent holder's payoff in the Shapiro's (2010) model of patent hold-up. The American and British systems are compared. When in the case of litigation a contingency-fee arrangement between the patent holder and the lawyer would be signed, the American system proves to be more effective in counteracting the patent holder ability to hold-up the downstream firm. When, instead, a flat-fee arrangement would be signed, we cannot decide which of the two systems behaves better in this respect. More specifically, when the patent at issue is relatively weak –in the sense that in court the patent would be deemed invalid or not infringing with a relatively high probability– the British system opposes the hold-up effects associated with injunctions: in this case it acts as a device reducing the patent holder's bargaining advantage, while the American rule proves to be basically neutral. By contrast, if the patent is relatively strong the opposite is true: given its propensity to be neutral, the American system does not work in favor of the patent holder, as it is the case for the British system.

These conflicting results have lead us to consider the possible merits of a less usual system for allocating litigation costs, namely the system favoring the defendant provided for by the Saving High-Tech Innovators from Egregious Legal Disputes (SHIELD) Act recently introduced in the U.S. House of Representatives. This system shows promise in weakening the hold-up problem under both flat and contingency lawyer fees.

The above results are obtained under the assumption that in calculating damages the courts are able to set reasonable royalties at a "natural" benchmark level. We also considered the case where the court-determined reasonable royalties are based on the actual royalties negotiated for other comparable patents. Limiting ourselves to the case of flat lawyer fees, we have seen that in a self-fulfilling equilibrium, unlike what occurs under "natural" reasonable royalties, the range of the patent strength over which the American system is preferable to the British one becomes gradually wider as the duration of a typical patent suit increases. On the contrary, the system favoring the defendant proves to be substantially insensitive to the two different assumptions on reasonable royalties.

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