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Credibility and credulity: how beliefs about beliefs affect entry incentives

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Credibility and Credulity: How Beliefs about Beliefs affect Entry Incentives

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Abstract

In this note we investigate the infringement (entry) decision for a firm facing an incumbent patent holder with uncertain patent rights. The entrant risks a dispute by entering, resulting in either a settlement (licensing) or litigation and trial. Using the litigation model described by Priest and Klein, we investigate the *expected* dispute resolution and its impacts on the entrant's pre-dispute behavior. The primary contribution is to show that the entrant's expectations about the patent holder's beliefs about patent enforceability are a driving factor behind the entry decision. We develop a simple taxonomy of entrant and incumbent types to explain the entry decision.

Keywords: patents, uncertainty, entry, patent litigation, patent infringement.
JEL codes: L19, L29, O32, O34, K41

1   Introduction

Since at least Priest and Klein (1984) (PK) scholars have been aware of the self-selection of disputes into trials and the factors that influence which disputes go to trial. At the same time, in industries where patent protection is important, scholars have pointed to the threat of litigation as an entry deterrent (Choi 1998), or as a mechanism to influence the terms of licensing (Meurer 1989). When the incumbent is protected by patent rights, it is natural to think of the entry decision as a decision on the part of the entrant to risk an infringement dispute. In this way, the entry decision is analogous to endogenizing harm in a general model of legal disputes (Cooter and Rubinfeld 1989).

In tort law, both the injurer and victim can take precaution to avoid harm. In contract law, the promisor can invest in effort to complete the contract, and the promisee can choose some level of complementary reliance investment. In all these cases, some level of investment occurs prior to the existence of any actual dispute. In patent cases, a dispute arises only after some alleged harm has occurred—namely, infringement. Prior to the dispute entrants decide whether to risk infringement. This risk can be thought of as a binary choice (to infringe or not), or as a continuous choice (to take precaution against infringement, e.g., to invest in "inventing around" the patented technology). The patent holder can likewise invest in monitoring, or in patent "thickets" that increase the cost of inventing around (Hall and Ziedonis 2001). The incentives for the parties to invest will depend on the likelihood of a dispute and the possible outcomes. Because the likelihood of a dispute depends on the investment by the parties, it is endogenous.

This paper presents a simple litigation model that investigates the role of an entrant's belief about patent enforceability in its entry decision. By extending the litigation bargaining model of PK, we are able to analyze the impact of *expected* litigation on the incentive of the infringing party to enter and risk a dispute. We show how the entrant forms beliefs about the patent holder's estimate of winning the case in court. Beliefs about the patent holder's beliefs are necessary for the entrant to estimate the probability that the patent holder will accommodate entry, litigate, or settle.

Our primary contribution is that the entrant's beliefs about the patent holder's beliefs are an important component of the entry decision. Contrary to intuition, it is generally *not* the case that the entrant's expectation about the patent holder's belief about winning is identical to the entrant's best guess. Instead, the entrant "discounts" its expectation based on known error rates. Based on our results, we develop a taxonomy of entry based on the beliefs of the entrant. The results highlight the importance of information in patent disputes (Meurer 1989, Schweizer 1989, Daughety and Reinganum 1993).

2   Model

Over the last several years, scholars have increasingly departed from the notion of patents as perfectly enforceable property rights. Rather than a "right to exclude," patents are best understood as a right to *attempt* to exclude or, simply, a right to sue (Lemley and Shapiro 2005, Marco 2005). Litigation bargaining models implicitly recognize imperfect enforcement by accounting for litigation costs and imperfect or asymmetric information.

We follow the litigation bargaining model of PK in order to examine the impact of the entrant's beliefs about litigation on the entrant's entry decision. Our particular interest is in how the entry decision is impacted by the entrant's *beliefs* about the patent holder's beliefs about enforcement.

We adopt several simplifications of the model. First, like PK, we abstract away from signaling on the part of the patent holder. While signaling is potentially important, it is likely to be of primary importance after a potential infringer is identified. Second, we assume that monitoring is

costless. This assumption is purely for parsimony: monitoring will affect the likelihood of detection, and thus the likelihood of enforcement. But, the effect is one of degree, not kind. Last, we do not specify the type of post-entry competition that exists between the two firms, or the ability of the firm to invent around the patent. That is, we do not model the factors that influence the returns to infringement.

Following PK, we assume that whether an entrant is found to infringe a patent depends upon the facts of the case and the legal standard. Conditional upon entry, the "facts of the case" are given by Y'. The legal standard, Y^*, determines whether the entrant (A) or the patent holder (B) prevails. If $Y' < Y^*$, then the entrant's technology is found not to infringe the patent and the *status quo* remains. If $Y' > Y^*$, then the patent holder prevails, and is awarded a judgment J.

Y^* is common knowledge; but, Y' is observed only by the court. A and B measure Y' independently with error. Each party is ignorant of the other's draw, but each is aware of the other's distribution. Formally, party i draws a guess about the facts of the case according to

$$\hat{Y}_i = Y' + \varepsilon_i \tag{1}$$

where ε_i is distributed continuously, unimodally, and symmetrically with pdf $f_i()$ centered at zero with variance σ_i^2. The corresponding cdf is given by $F_i()$ and draws of the random variable $\hat{Y}_i$ are given by $\hat{y}_i$.

Party i's beliefs about the patent holder prevailing in an infringement claim are given by P_i as follows:

$$P_i = \Pr(\hat{Y}_i + \varepsilon_i > Y^*) = F_i(\hat{Y}_i - Y^*). \tag{2}$$

P_i is a random variable, with draws represented by $p_i = F_i(\hat{y}_i - Y^*)$.

2.1 Bargaining

In the classic PK model, a sufficient condition for the case to go to trial[1] can be formed based on the beliefs of the two parties about the patent holder winning. If litigation costs are c for each party, and if the size of the judgment is J, then the parties' threat values (in expectation) are given by

$$T_B = p_B J - c \tag{3}$$
$$T_A = -p_A J - c. \tag{4}$$

Two conditions must hold for the case to go to trial. First, litigation by the patent holder must be credible. Second, there must be no cooperative surplus to settling.[2] The credibility condition is simply that B's threat value is positive, or

$$p_B \geq \frac{c}{J}. \tag{5}$$

Assuming that settlement costs are zero, the litigation condition ensures that the sum of the threat values exceeds the sum of the payoffs from settling. Because settling involves a pure transfer (which

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[1] For the purposes of this note, we will use the terms "litigation" and "going to trial" interchangeably. In reality, most filed cases are settled prior to trial. However, for the purposes of the model, we will assume that patent holders will file a case only if they intend to go to trial. Thus, "settlement" in our model constitutes a licensing agreement written after a dispute occurs, but without any formal filing of a suit. The difference is semantic.

[2] Together, the conditions are sufficient rather than necessary, because other factors may lead to trial even if there is a cooperative surplus, e.g., animosity or imperfect signaling.

may be zero), the sum of the payoffs from settling is necessarily zero. So, the litigation condition is

$$p_B J - c - p_A J - c \;>\; 0 \tag{6}$$

$$p_B - p_A \;>\; \frac{2c}{J}. \tag{7}$$

The litigation condition is identical to that of PK, and simply states that beliefs by the parties must be sufficiently divergent for each party to prefer litigation to settlement.[3] Strictly speaking, the model does not require either party to have knowledge of the other party's probability estimate p_i. It only assumes that if a cooperative surplus exists, that it will be divided in some way between the parties.

Because inequality (7) can be written as $p_B > \frac{2c}{J} + p_A$, the litigation condition is more restrictive than credibility, i.e., litigation implies credibility. When litigation is credible and the litigation condition does not hold, the parties settle. If litigation is not credible, entry will be accommodated without a challenge.

For the entrant to prophecy about the patent holder's response to entry, it requires an estimate of p_B in order to evaluate the credibility condition and the litigation condition. The question is, conditional on its draw of $\hat{y}_A$, what is A's best guess of p_B? After forming a best guess of Y', what does A think that B thinks? Can we assume that $E_A(P_B|\hat{y}_A) = p_A$? In the next section we show that in general, A's beliefs about B's beliefs are not equal to A's beliefs.

2.2   Beliefs

A's beliefs about B's beliefs can be written as $E_A(P_B|\hat{y}_A)$. Aside from the knowledge of the underlying distributions, A's only piece of information is $\hat{y}_A$. Because $p_B = F_B(\hat{y}_B - Y^*)$, A's expectation of P_B reduces to integrating this expression over all possible values of $\hat{y}_B$ conditional on A's draw of $\hat{y}_A$.

$$E_A(P_B|\hat{y}_A) = \int_{-\infty}^{\infty} F_B(\hat{y}_B - Y^*) f_{\hat{Y}_B|\hat{y}_A}(\hat{y}_B|\hat{y}_A) d\hat{y}_B, \tag{8}$$

where $f_{\hat{Y}_B|\hat{y}_A}(\hat{y}_B \mid \hat{y}_A)$ is the pdf—from A's perspective—of $\hat{Y}_B$ contingent on A's guess of Y'. Given $\hat{y}_A$, we can write $\hat{Y}_B$ as

$$\hat{Y}_B = Y' + \varepsilon_B = \hat{y}_A - \varepsilon_A + \varepsilon_B. \tag{9}$$

From the perspective of A, the random variable $\hat{Y}_B$ has a distribution with mean $\hat{y}_A$ and variance $\sigma_B^2 + \sigma_A^2$. The corresponding pdf is given by $f_{\hat{Y}_B|\hat{y}_A}()$.

The expression for $E_A(P_B|\hat{y}_A)$ in equation (8) yields three results.

Proposition 1 $\displaystyle\lim_{\sigma_B^2 \longrightarrow \infty} E_A(P_B|\hat{y}_A) = \frac{1}{2}$.

Proof. Intuitively, as σ_B^2 explodes, any draw of $\hat{y}_B$ will be less informative to the patent holder. More formally, as $\sigma_B^2 \longrightarrow \infty$, given any value of $\hat{y}_B$ we know that $F_B(\hat{y}_B - Y^*) \longrightarrow \frac{1}{2}$. Hence, for very large values of σ_B^2, $F_B(\hat{y}_B - Y^*) \approx \frac{1}{2}$, and

$$E_A(P_B|\hat{y}_A) \approx \int_{-\infty}^{\infty} \frac{1}{2} \cdot f_{\hat{Y}_B|\hat{y}_A}(\hat{y}_B|\hat{y}_A) d\hat{y}_B = \frac{1}{2}. \tag{10}$$

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[3] In the litigation literature, this is known as "divergent beliefs" or "relative optimism."

When the entrant knows the patent holder is uncertain of its property right, the infringer expects the patent holder's estimate of the probability of winning to be closer to $\frac{1}{2}$. $\blacksquare$

Proposition 2 $\lim\limits_{\sigma_B^2 \longrightarrow 0} E_A(P_B|\hat{y}_A) = p_A.$

Proof. For sufficiently small σ_B^2, $F_B(\hat{y}_B - Y^*) \approx 0$ if $\hat{y}_B < Y^*$ and $F_B(\hat{y}_B - Y^*) \approx 1$ if $\hat{y}_B \geq Y^*$. That is, for sufficiently small σ_B^2, the patent holder knows almost with certainty whether it will win. If $\hat{y}_B$ is below the legal standard, then it will almost certainly lose, and if $\hat{y}_B$ is above the legal standard, it will almost certainly win. Because of this, for sufficiently small σ_B^2 we can segment A's expectation into two parts

$$E_A(P_B \,|\hat{y}_A) \approx \int_{-\infty}^{Y^*} 0 \cdot f_{\hat{Y}_B|\hat{y}_A}(\hat{y}_B|\hat{y}_A)d\hat{y}_B + \int_{Y^*}^{\infty} 1 \cdot f_{\hat{Y}_B|\hat{y}_A}(\hat{y}_B|\hat{y}_A)d\hat{y}_B \qquad (11)$$

Because $f_{\hat{Y}_B|\hat{y}_A}$ is centered on $\hat{y}_A$, for sufficiently small σ_B^2 we can write

$$E_A(P_B \,|\hat{y}_A) \approx \int_{Y^*}^{\infty} f_{\hat{Y}_B|\hat{y}_A}(\hat{y}_B|\hat{y}_A)d\hat{y}_B = F_A(\hat{y}_A - Y^*) = p_A. \qquad (12)$$

$\blacksquare$

Proposition 3 $\left|p_A - \frac{1}{2}\right| \geq \left|E_A(P_B|\hat{y}_A) - \frac{1}{2}\right| \geq 0$, *i.e.,* $E_A(P_B|\hat{y}_A) \in \left[p_A, \frac{1}{2}\right\rangle$ *if* $p_A < \frac{1}{2}$ *and* $E_A(P_B|\hat{y}_A) \in \left\langle \frac{1}{2}, p_A\right]$ *if* $p_A > \frac{1}{2}$, *with* $E_A(P_B|\hat{y}_A) = \frac{1}{2}$ *if* $p_A = \frac{1}{2}$.

Proof. Proposition 3 follows from Propositions 1 and 2. $\blacksquare$

These results can be seen graphically in figure (1).[4] The vertical axis represents probability estimates, and the horizontal axis represents the known variance of the patent holder, σ_B^2. The graph traces out the expected patent holder beliefs for two types of entrants—one with a high draw of $p_A = 0.8$, and one with a low draw of $p_A = 0.2$. For very low σ_B^2, $E_A P_B$ approaches p_A, whether that belief is high or low. As σ_B^2 increases, the expected beliefs approach $\frac{1}{2}$, either from above or below.

The graph is useful for understanding the impact of private information. In the extreme case of $\sigma_B^2 = 0$, the patent holder has perfect private information about the enforceability of its patent. More generally, when $0 < \sigma_B^2 < \sigma_A^2$, then the patent holder has better information about the facts of the case than the entrant. In the case of patents, this is likely to hold (Meurer 1989). However, the entrant may have better information about its own technology and whether it infringes, especially if some effort was made to invent around the patent; so, the possibility remains that $\sigma_B^2 > \sigma_A^2$.

Before discussing the impact of beliefs on entry, we derive expressions for the expected probability of litigation and credibility.

2.3   Litigation

The expected probability of litigation cannot be determined by examining the mean, $E_A P_B$. Myopically replacing p_B with $E_A P_B$ in the credibility and litigation conditions fails to account for the known distribution of P_B. To illustrate, suppose that $p_A = \frac{1}{2}$ and the patent holder has perfect

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[4]Calculating expected beliefs requires a numerical solution. For the calculations, we assume that $\sigma_A^2 = 1$, and we allow σ_B^2 to vary from 0.01 (close to perfect information) to 2.5.

information.[5] In that case, $E_A P_B = \frac{1}{2}$, and the litigation condition would suggest that litigation does not occur in expectation. Because the patent holder has perfect information, the expected belief represents a 0.5 chance that the patent holder's belief is $p_B = 1$ and a 0.5 chance that it is $p_B = 0$. The litigation condition could easily be met when $p_B = 1$, for sufficiently low litigation costs.

To formalize this intuition, the entrant must form beliefs about the probability of litigation, p_L, conditional on its draw of $\hat{y}_A$. To do this it will utilize its knowledge of the distribution of P_B conditional on $\hat{y}_A$, which itself depends upon the distribution of $\hat{Y}_B$ conditional on $\hat{y}_A$, $f_{\hat{Y}_B|\hat{y}_A}()$. This distribution is described in section 2.2.

The entrant's belief about litigation, p_L, conditional on $\hat{y}_A$ is

$$p_L = \Pr\left(P_B > \frac{2c}{J} + p_A \,\middle|\, \hat{y}_A \right). \tag{13}$$

If $p_A \geq 1 - \frac{2c}{J}$, then $p_L = 0$ because the patent holder's and entrant's beliefs will be sufficiently close to avoid litigation. If $p_A < 1 - \frac{2c}{J}$, then the entrant must establish an expected distribution of $\hat{Y}_B$ conditional on $\hat{y}_A$, in much the same way as it did when calculating $E_A P_B$.

$$p_L = \Pr\left(F_B\left(\hat{Y}_B - Y^*\right) > \frac{2c}{J} + p_A \,\middle|\, \hat{y}_A \right) \tag{14}$$

$$= 1 - F_{\hat{Y}_B|\hat{y}_A}\left(F_B^{-1}\left(\frac{2c}{J} + p_A\right) + Y^* \right). \tag{15}$$

$f_{\hat{Y}_B|\hat{y}_A}()$ is distributed symmetrically with mean $\hat{y}_A$ and variance $\sigma_A^2 + \sigma_B^2$, with corresponding cdf $F_{\hat{Y}_B|\hat{y}_A}()$. The probability that litigation is credible, p_C, can likewise be derived as

$$p_C = 1 - F_{\hat{Y}_B|\hat{y}_A}\left(F_B^{-1}\left(\frac{c}{J}\right) + Y^* \right). \tag{16}$$

Note that $p_C \geq p_L$ everywhere. Figure (2) graphs the probability of litigation, the probability of credibility, and $E_A P_B$ for three different types of entrants.[6]

3   Discussion

The analysis of entry and litigation behavior consists of a simple taxonomy. We present several cases based upon 1) the credulity of the entrant, and 2) the quality of the information available to the patent holder. The credulous entrant draws a high p_A $\left(p_A > \frac{1}{2}\right)$ and the skeptical entrant draws a low p_A $\left(p_A < \frac{1}{2}\right)$.[7] Further, we define a well-informed patent holder to have a low value of σ_B^2, and an ill-informed patent holder to have a high value of σ_B^2. A summary of the findings is presented in table (I).

Although we have not modeled the exact payoff from entry, we can make several inferences about the entry decision based on the results of the model. The results need to be interpreted

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[5]A value of $p_A = \frac{1}{2}$ could occur due to a high value of σ_A^2. As σ_A^2 increases, the entrant's draw of $\hat{y}_A$ becomes less informative and p_A will necessarily become closer to $\frac{1}{2}$. In figure 1, this has the effect of sliding both the upper and lower curves towards the 0.5 horizontal line. In the extreme, $p_A \approx E_A P_B \approx \frac{1}{2}$ irrespective of the variance of the patent holder's draw.

[6]Each expected probability is graphed for σ_B^2 from 0.01 to 2.5, and for $\sigma_A^2 = 1$. Following PK, we set $\frac{2c}{J} = \frac{1}{3}$. We restrict the domain in order to restrict the set of ill-informed patent holders to a reasonable limit, namely a variance of 2.5 that of the entrant.

[7]Credulity implies that the entrant is "optimistic" in that it has a high value of p_A. Because p_A represents beliefs about the patent holder prevailing, the entrant is optimistic toward the patent holder, not itself.

conditional on litigation costs and the size of the judgment.[8] We leave the formal modeling for future research, but we develop some intuition about the entry decision below.

3.1 Entry

The primary result is that the expected belief $E_A P_B$ drives the entry decision, and is a function of both the credulity of the entrant (p_A) and the quality of information of the patent holder (σ_B^2). Whether the entrant expects litigation or settlement, its incentive enter depends primarily on the patent holder's bargaining position. By itself, expected litigation is not an entry deterrent, *per se*. Litigation only occurs if there is no cooperative surplus to settlement: the entrant literally prefers litigation to settlement.

When the entrant is credulous, and the patent holder is well-informed, the entrant expects either an unfavorable settlement or litigation. And, it is pessimistic about its chances to win in litigation. Unless the benefit to infringement is very high, the patent holder is most likely to opt out of the industry altogether. If it does enter, it is more likely to enter against an ill-informed patent holder, because the expected settlement (based on $E_A P_B$) is lower. The more ill-informed the patent holder, the lower the expected license fee.

Deterrence is less likely for the skeptical entrant. The skeptical entrant always perceives itself in a stronger position than the credulous entrant: it is more willing to litigate because it is skeptical about the patent holder's chances, and in settlement it will credibly demand a low license fee. However, in the case of a skeptical entrant, the information of the patent holder has the opposite effect in comparison to the credulous entrant. A higher value of σ_B^2 will increase $E_A P_B$, making expected settlement terms worse, and deterrence more likely.

The entrant, of course, cannot strategically control its level of credulity.

3.2 Litigation

In discussing litigation, it is useful to distinguish between the credulous entrant ($p_A > \frac{1}{2}$), and the super-credulous entrant ($p_A \geq 1 - \frac{2c}{J}$). The super-credulous entrant faces no possibility of litigation. Because of the entrant's very high belief about patent holder victory, the litigation condition can never hold. This does not mean that the *threat* of litigation does not exist; it can be observed in figure (2) that credibility, p_C, is very high and generally increases with σ_B^2. In fact, for all entrants, $p_C > p_A$. That $p_L = 0$ should be interpreted to mean that super-credulous entrants will always sufficiently agree with patent holders so that a cooperative surplus to settlement exists, if entry occurs.

The credulous entrant is faces a risk of litigation, especially for low values of σ_B^2. Against a patent holder with perfect information, the probability of litigation approaches the entrant's belief, p_A (depending upon the size of $\frac{2c}{J}$). For sufficiently valuable infringement, we will observe entry and high rates of litigation for credulous entrants facing very well informed patent holders. Litigation is much less likely for ill-informed patent holders and credulous entrants. If there is entry we will frequently observe settlement.

For the skeptical entrant, the quality of information of the patent holder enters in a very different way relative to the credulous entrant: the probability of litigation *increases* in σ_B^2. The skeptical entrant will avoid litigation *and* experience better contract terms against a well-informed patent holder. Because credibility is so low with a well-informed patent holder, the entrant may expect

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[8]If J is interpreted as lost profits, then it will be highly correlated with the patent holder's own use value of the patented technology. To what extent this correlation extends to the entrant's gross profits from infringement will depend upon the industry structure and the technology in question.

accommodation with no legal challenge. The increased credibility as σ_B^2 increases is accompanied by an increased risk of litigation and worse settlement terms.

While the probability of litigation, p_L, is higher for a credulous entrant and well-informed patent holder, this probability is conditional on entry. Credulous entrants are more likely to opt out than skeptical entrants; so, skeptical entrants are more likely to self-select into disputes. For these cases, we would expect a relatively low patent holder win rate. For sufficiently valuable infringement, credulous entrants may enter and face a high litigation rate. In these cases, we will observe a fairly high patent holder win rate. These effects represent a further refinement of the PK selection hypothesis by endogenizing the entry decision.

4 Conclusion

The primary contribution of this paper is to explain how the entrant's expectation about patent holder's beliefs affects its entry decision. We show that the expected belief about winning is generally *not* identical to the entrant's belief. Instead, the entrant hedges its expectation based on its own level of uncertainty and that of the patent holder, so that the expected belief tends toward $\frac{1}{2}$ when patent holder uncertainty is high. In this way, the entry decision depends on the variances of *both* parties' errors in measuring the facts of the case.

Incentives for entry are inversely correlated with the entrant's expected belief about victory. Skeptical entrants facing well-informed patent holders are most likely to enter, and credulous entrants facing well-informed patent holders are most likely to be deterred. This is true even when litigation is impossible, because it is the *threat* of litigation that matters rather than the probability of a trial. Entrants facing ill-informed patent holders are between those extremes.

The results highlight the consequences of uncertainty in intellectual property rights. Uncertainty can arise in at least two ways: legal uncertainty and technological uncertainty. With respect to legal uncertainty, more clearly defined patent rights will reduce uncertainty for both parties, i.e., σ_A^2 and σ_B^2 will be lower. The consequence is that credulous entrants will become more credulous, and skeptical entrants will become more skeptical. Simultaneously, patent holders will become better informed so that expected patent holder beliefs will tend towards entrant's beliefs. As a result, clarification of property rights will serve to further separate weak patents from strong patents. Holders of strong patents will be able to appropriate more value in the form of greater deterrence or higher license fees. Holders of weak patents will be less credible and more willing to accommodate entry without a challenge.[9]

Technological uncertainty is more difficult for policy makers to control. Even so, better defined patent claims at the Patent and Trademark Office, and well-specified legal doctrines about infringing technologies (e.g., the "doctrine of equivalents"), can lower the uncertainty as to whether one technology infringes upon another.

Whether greater legal clarity is efficient depends on the costs to the patent office and the courts, and the benefits in the form of incentives for innovation.

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[9]Clarification of patent rights will cause more cases to fall under regions I and V of table (I). Litigation will not necessarily decrease unless all entrants become super-credulous. Litigation in region III is very high, and may replace the lost litigation from region VI.

7

References

CHOI, J. P. (1998): "Patent litigation as an informational-transmission mechanism," *American Economic Review*, 88(5), 1249–1263.

COOTER, R. D., AND D. L. RUBINFELD (1989): "Economic analysis of legal disputes and their resolution," *Journal of Economic Literature*, 27, 1067–1097.

DAUGHETY, A. F., AND J. F. REINGANUM (1993): "Endogenous Sequencing in Models of Settlement and Litigation," *Journal of Law, Economics, and Organization*, 9(2), 314–48.

HALL, B. H., AND R. H. ZIEDONIS (2001): "The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995," *RAND Journal of Economics*, 32(1), 101–128.

LEMLEY, M. A., AND C. SHAPIRO (2005): "Probabilistic Patents," *Journal of Economic Perspectives*, 19(2), 75–98.

MARCO, A. C. (2005): "The Option Value of Patent Litigation: Theory and Evidence," *Review of Financial Economics*, 14(3-4), 323–351.

MEURER, M. J. (1989): "The settlement of patent litigation," *Rand Journal of Economics*, 20(1), 77–91.

PRIEST, G. L., AND B. KLEIN (1984): "The selection of disputes for litigation," *Journal of Legal Studies*, 13, 1–55.

SCHWEIZER, U. (1989): "Litigation and settlement under two-sided incomplete information," *Review of Economic Studies*, 56, 163–178.

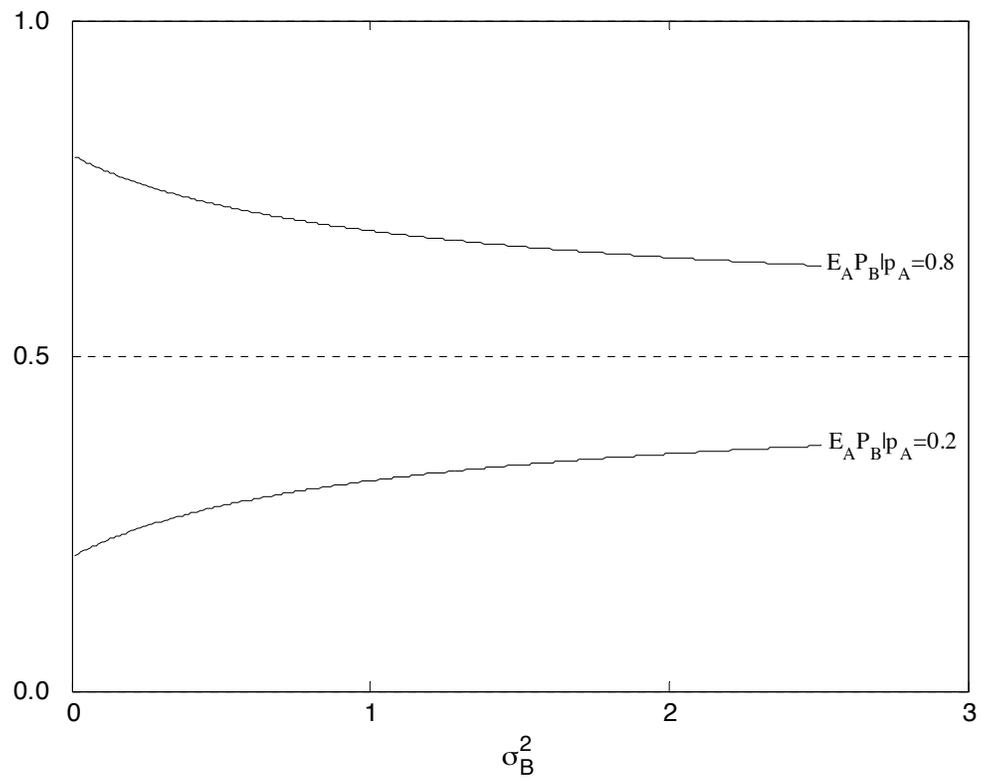Figure 1: Entrant's expectation of patent holder's beliefs

$E_A P_B | p_A = 0.8$

$E_A P_B | p_A = 0.2$

σ_B^2

Figure 2: Credibility, expected beliefs, and probability of litigation by type of entrant

Super-credulous entrant, $p_A = 0.85$

Credulous entrant, $p_A = 0.65$

Skeptical entrant, $p_A = 0.20$

σ_B^2
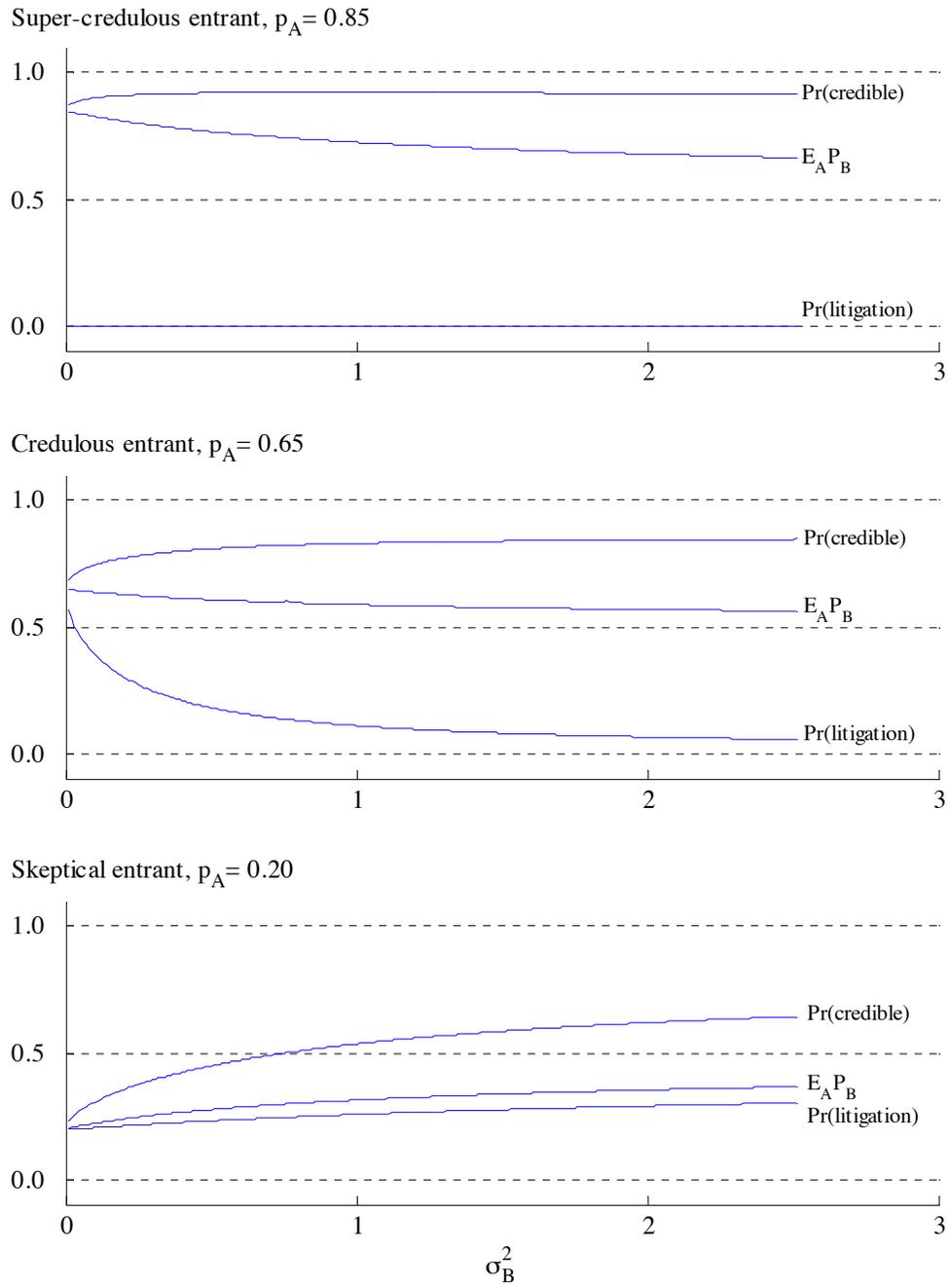
Table I: Summary of results

Entrant	Patent holder	
	Well-informed	Ill-informed
Super-Credulous	I. Litigation credible (Deterrence likely)	II. Litigation credible (Deterrence or settlement with high license fee)
Credulous	III. Litigation credible (Deterrence or likely litigation)	IV. Litigation credible (Deterrence or settlement)
Skeptical	V. Non-credible litigation (Entry & accommodation or settlement with low license fee)	VI. Weakly credible litigation Entry & possible trial, possible accommodation, possible settlement with low license fee