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# Trial and settlement negotiations between asymmetrically skilled parties\*

Bertrand CHOPARD<sup>†</sup>, Thomas CORTADE<sup>‡</sup> and Eric LANGLAIS<sup>§</sup>

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## Abstract

Parties engaged in a litigation generally enter the discovery process with different informations regarding their case and/or an unequal endowment in terms of skill and ability to produce evidence and predict the outcome of a trial. Hence, they have to bear different legal costs to assess the (equilibrium) plaintiff's win rate. The paper analyses pretrial negotiations and revisits the selection hypothesis in the case where these legal expenditures are private information. This assumption is consistent with empirical evidence (Osborne, 1999). Two alternative situations are investigated, depending on whether there exists a unilateral or a bilateral informational asymmetry. Our general result is that efficient pretrial negotiations select cases with the smallest legal expenditures as those going to trial, while cases with largest costs prefer to settle. Under the one-sided asymmetric information assumption, we find that the American rule yields more trials and higher aggregate legal expenditures than the French and British rules. The two-sided case leads to a higher rate of trials, but in contrast provides less clear-cut predictions regarding the influence of fee-shifting.

*JEL classification:* D81, K42.

*Keywords:* litigation, unilateral and bilateral asymmetric information, legal expenditures.

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# 1 Introduction

There is a longstanding debate in the literature: whether and how informational imperfections may give rise to biases in a dispute between two parties.

From a theoretical point of view, the debate has focused on the appropriate information structure to model the lawsuit. The main conclusion of the economics of litigations is that parties engaged in a dispute would prefer to conclude an amicable settlement if they have the opportunity to do so, in order to save on the transaction costs associated to a trial. As long as legal expenditures are merely dead-weight losses incurred by parties at trial in order to litigate their case, there exists a surplus which may be shared by litigants when an alternative issue to the dispute is available out of the Court. In this sense, pretrial negotiations yield agreements which represent Pareto-efficient solutions to disputes. However, the existence of a disagreement between the plaintiff and the defendant regarding their private assessment of the value (or the existence) of this surplus may prevent the negotiation between parties. The very nature of such a disagreement depends on the assumption regarding the informational structures the parties have.

In the Different Expectations model (or "optimistic approach": Hughes and Snyder (1995), Priest and Klein (1984), Shavell (1982)), the defendant and the plaintiff have incomplete but symmetric information. The failure of the pretrial negotiation stage occurs when the plaintiff is more confident than the defendant about his own chances to win at trial. Moreover, the more confident the plaintiff relative to the defendant, the more likely the trial. As a result, the DE model predicts that, provided that both litigants perform Rational Expectations of the chances that the plaintiff prevails (Priest and Klein (1984), Waldfogel (1995,1998)) the subset of cases going to trial is not a representative sample of all filed cases but it is biased towards those for which the plaintiff has a win rate at trial close to 50%, regardless of the effective fraction of prevailing plaintiffs among all disputes.

On the other hand, the existence of Information Asymmetries between the parties may explain why disputes are sometimes inefficiently solved in front of Courts. In the IA theory, the general prediction that cases going to trial are unrepresentative of filed cases also holds. Nevertheless, given that several informational contexts may be relevant but yielding alternative solutions, the specific way the selection operates has to be refined with regard to four main characteristics of the game-based structure of the lawsuit: 1/ whether the plaintiff or the defendant is the informed party, 2/ whether the private information concerns the probability that the plaintiff prevails at trial, the damage set by the Court, or the preferences of the litigants, 3/ whether the pretrial negotiations round consists in a one-shot proposal ("take-it-or-leave-it" offer or demand) or a

multi-stage bargaining process, 4/ whether the IA is one-sided or two-sided (see: Bebchuck (1984), Daughety and Reinganum (1994), Che and Yi (1993), Farmer and Pecorino (1994, 2002, 2004), Friedman and Wittman (2003), Reinganum and Wilde (1986), Schweizer (1989), Spier (1992), Wang, Kim and Yi (1994)).

On the empirical side, the various studies usually focus more on the design of a direct test for the selection hypothesis *per se*, as well as on the empirical assessment of the predictions regarding the relationships between the rate of cases settled, the probability that the plaintiff prevails at trial and the various parameters of the model, rather than onto the test of the Rational Expectations hypothesis or the presence of IA at the trial stage. To sum up, the available evidence is mixed. Priest and Klein (1984), Waldfogel (1995) find evidence in favour of the prediction of a 50% prevailing rate for plaintiffs, but Hughes and Snyder (1985), Katz (1987) conclude that it is more likely less than 20%. Finally, Waldfogel (1998) rejects the assumption that IA exist for cases going to trial while Osborne (1999) finds evidences that they do exist. More specifically, Osborne shows that they are substantially in favour of defendants but not in a way supporting Bebchuk (1984)'s view that defendants' degree of fault is private information. In a sense, his findings require that the focus be shifted to some neglected aspects of the discovery process, such as the difference in parties' skill or ability to produce pieces of information used at trial. Although rules of (civil) procedure treat defendants and plaintiffs symmetrically with respect to (the right of) information acquisition, they do not create neither the conditions of a privileged access to information for any party, nor prevent the existence of asymmetries in what information can be acquired (Osborne, 1999)). To put it differently, the acquisition of information during the discovery process is less a matter of parties' fundamental rights granted by the legal rules, more of an issue of the existence of efficiency differential regarding the production function of information between litigants, and thus a matter of production cost for such an information. This requires to introduce a third party to the dispute, namely the parties' lawyers, as another source of inefficiency.

The canonical approach of the relationship between lawyers and their clients focuses on agency problems: when the lawyer's effort is not observable by his client leads to conflicting interests regarding the choice of the best solution for the dispute. The literature describes the need to implement incentive compensation schemes to reward the attorneys in case of trial, which may be of three types: hourly fees, for which the payment must decrease with the number of hours spent by the lawyer on the case (see: Klement and Neeman (2004), Lynk (1990)); or contingent fees, where the payment must be contingent to the client's outcome obtained at trial; or conditional fees, where lawyers are rewarded only in case of success (see: Emons (2004a), Emons (2004b), Emons and Garoupa (2004), Lynk (1990), Miceli and Segerson (1991)). Interestingly enough, Osborne

(1999) shows that the effective structure of attorneys fees may reveal the *ex ante* informational status of the parties with regard to the outcome of the case; at least, it is a good proxy of attorneys' predictive ability. His data show that defendants (supposed to be more informed) almost always pay fixed or hourly fees to their attorneys, while it is more common that plaintiffs' attorneys are rewarded with contingent fees.

But the strategic role of lawyer fees is related to other relevant features: specifically, they are used to influence the verdict rendered by the Court and to a certain extent, this depends on the skill and experience of the lawyer. Lawsuit analysis based on rent-seeking arguments (see: Farmer and Pecorino (1999), Gong and McAfee (2000), Katz (1987), Plott (1987)) elaborated long ago on the idea that each partie in a dispute makes investments in the evidence production, testimonies and so on, which may be used by the Courts to set the case. More recently, the assumption of *ex post* moral hazard and the issue of truthful revelation of the parties' private information to Courts have been investigated (see: Emons and Fluet (2005), Froeb and Kobayashi (2001), Shin (1998)). The existence of a tradeoff between parties' incentives to disclose private information and the benefits associated with the strategic misrepresentation or falsification (destruction) of evidence has led to a renewal of the debate on the efficiency of procedural rules and the choice of adversarial *versus* inquisitorial procedures. Finally, legal expenditures and the purchase of lawyers services may be used as a signal of the quality of the case presented by the parties (see: Baye, Kovenock and de Vries (2005)).

In this paper, we also address the issue of the strategic use of legal expenditures, but through a different channel than those usually recognized in the literature, and more in congruence with Osborne's (1999) empirical findings. We assume that parties opposed in a litigation enter the discovery process with both different information about the case and different technologies of information production. This reflects that the relevant information regarding the case may be unequally spread between the litigants at the beginning of the lawsuit, as well as they may be unequally endowed in terms of skill or ability to predict the case at trial. As a result, when they finally finish the discovery process, they bear different legal costs which are private information. Basically, if parties have access to the same technology of information production but are *ex ante* unequally endowed in terms of information, then the less informed party will bear *ex post* a higher cost of information production. By the same token, *ex ante* equally informed parties will experience *ex post* differences in legal expenditures as long as there are significant differences in the individual marginal product of effort for information production. This is captured in the paper by a key assumption, namely that parties' legal expenditures are private information. As long as the characteristics of the technology of information production are private information,

these investments in information acquisition are not observable by the other party. In contrast with the rent seeking, falsification and quality signalling literatures, we consider the limit case where individual legal expenditures have no effect on the plaintiff's probability of prevailing at trial. An alternative view would be to assume that both parties' investments in the discovery process and information production have an effect on the equilibrium value of plaintiff's rate of success at trial. However, the main point for the analysis would still be that the characteristics of the technology of information production are private information. Our assumption is a simplification designed to focus on the role of informational asymmetries resulting from the parties' skill in predicting a given outcome at trial, requiring, all else equal, different amount of investments in information production.

We incorporate this assumption in a seminal IA-based model of lawsuits. This enables us to study the selection of cases that settle or go to trial, in contrast with other contributions on the strategic use of legal costs (rent seeking, falsification and signalling quality literatures) which do not explicitly address the issue of an alternative out-of-Court solution to litigation. In order to be as close as possible to the informational structure suggested by Osborne's (1999) data, we consider in section 2 the case where the defendant is the informed party, the plaintiff only observing the distribution of possible costs for the defendant. In such a framework (one-sided asymmetric information) we discuss the screening role of the plaintiff's settlement demand, and investigate the impact of fee-shifting rules both on the frequency of trials and on (private) aggregate expenditures associated with a trial. We show that the American rule yields more trials and higher (unconditional) expected expenditures at trial than under the French or British ones. In section 3, we develop the case of a bilateral asymmetric information on the parties' legal costs. We stress that the plaintiff's settlement demand may have now both a signalling and a screening role, but the way it works depends on the fee-shifting rule that applies. We show for example that under the American rule, the settlement demand has no signalling role, and thus whether there is one or two-sided information the equilibrium is the same. However, under both the French and British rules, it appears that a higher settlement amount signals a plaintiff with higher costs at trial (hence, a lower skilled individual), such that the trials rate is higher than in the one-sided asymmetric information case. We show that the case with two-sided asymmetric information only leads to a partial ranking regarding the effect of fee-shifting on the trials rate. Finally, section 4 concludes and discusses some alternative interpretations of our key assumption.

## 2 The model with one-sided asymmetric information

We extend the screening game *à la* Bebchuck (1988) to the case where the private information corresponds to the litigation costs of the defendant. This assumption captures the fact that the plaintiff does not observe the skill or ability of the defendant to produce the pieces of information and evidence that will be used at trial. In other words, the characteristics of the defendant's evidence production function are private information: hence, the defendant's legal cost is private information.

### 2.1 assumptions and notations

The damage set by the Court when the trial is in favour of the plaintiff, denoted  $\theta$ , the probability that the plaintiff wins at trial (denoted  $\pi$ ) and the plaintiff's litigation costs, denoted  $c_p$ , are public information. In contrast, the defendant's litigation costs  $c_d$  are private information. The plaintiff only knows that the value of the defendant cost (labelled defendant's type in the rest of the paper) is a random variable  $c_d \in [\underline{c}_d, \bar{c}_d]$  distributed according to a cumulative function  $F(c_d)$  and a density  $f(c_d)$ . For the sake of simplicity, we will assume that:

**Assumption 1:** the rate of hazard  $\frac{f}{1-F}$  is increasing.

The pretrial bargaining process has three main stages:

- At stage 0, Nature chooses the type of the defendant  $c_d$ ;
- At stage 1, the plaintiff makes a (one-shot) demand  $s$  to the defendant in order to settle amicably their case.
- At stage 2, the defendant either accepts the demand, hence the case settles, or he rejects it and then the parties go to trial.

The defendant's and the plaintiff's payoffs in case of trial may be described as a lottery:  $(\theta + c_d + \beta c_p, \pi; c_d(1 - \alpha), (1 - \pi))$  for the defendant and:  $(\theta - c_p + \beta c_p, \pi; -c_p - \alpha c_d, (1 - \pi))$  for the plaintiff (when he faces a defendant's type  $c_d$ ), where the specific values of  $\alpha$  and  $\beta$  depend on the allocation rule of judicial costs applied by the Court, and may be understood as follows.  $\alpha$  is the proportion of the defendant's costs borne by the plaintiff when he loses with probability  $(1 - \pi)$  at trial. Similarly,  $\beta$  is the proportion of the plaintiff's costs borne by the defendant when the

plaintiff wins at trial with probability  $\pi$ . Several well known rules<sup>1</sup> may be characterized as special cases of this general parametrization. The American rule where each party simply bears its own costs is obtained when  $\alpha = \beta = 0$ . The British rule, according to which the party loosing at trial has to bear the aggregate costs of the trial, is the case where  $\alpha = \beta = 1$ . The "pro-plaintiff" rule whereby the plaintiff bears no litigation costs when he wins but only his own costs when he loses is obtained for  $\alpha = 0$  and  $\beta = 1$ . The symmetrical case of the "pro-defendant" rule holds for  $\alpha = 1$  and  $\beta = 0$ . Finally, the French rule, where the judge has the discretionary power to transfer to the loosing party a part of the winner's costs (called "depens", such as taxes, expertise expenditures, but excluding attorney's fees) corresponds to the situation where  $\alpha \in [0, 1]$  and  $\beta \in [0, 1]$ . The costs allocation rule is also public information.

In the rest of the paper, we use the following notations for the outcome at trial of the parties. Given (possibly his expectation of) the defendant type, a plaintiff of type  $c_p$  earns a payment equal to:

$$u_p(c_p; c_d) = \pi\theta - k_p \text{ with } k_p = (1 - \beta\pi)c_p + \alpha(1 - \pi)c_d$$

and symmetrically, for a (maybe, expected) plaintiff's type, a defendant bears a cost at trial which is:

$$u_d(c_d; c_p) = \pi\theta + k_d \text{ with } k_d = \beta\pi c_p + (1 - \alpha(1 - \pi))c_d$$

In order to consider only suits which are socially worth, we assume that:

**Assumption 2:**  $\theta > c_p + \bar{c}_d$ .

meaning that the value of the damage is larger than the total transaction costs borne by parties, comprising the largest defendant; this implies finally that:  $\theta > c_p + c_d$  for any pair  $(c_p, c_d)$ .

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<sup>1</sup>See also Shavell (1982). Our parametrization is general enough to encompass a greater variety of rules, including the Marshall, Quayle and Matthew rules discussed in Baye, Kovenock and de Vries (2005) - which simply requires that  $\alpha \in [0, \infty)$  and  $\beta \in [0, \infty)$ .



## 2.2 the separating equilibrium

The equilibrium<sup>2</sup> is described in terms of a settlement demand by the plaintiff to the defendant and a probability of trial (equivalently, the plaintiff's belief on the type of the marginal defendant). The pretrial bargaining game is solved as follows.

At stage 2, given  $s$  the settlement demand proposed by the plaintiff at stage 1, the expected cost of the defendant is:

$$U_d(c_d, s; c_p) = \begin{cases} s & \text{if the defendant accepts} \\ u_d(c_d; c_p) & \text{if he rejects} \end{cases}$$

given that any defendant for which  $s \leq u_d(c_d; c_p)$  will accept, and any  $s > u_d(c_d; c_p)$  will respectively reject the demand. Hence at stage 1, the plaintiff's belief on the marginal defendant's type denoted<sup>3</sup>  $c_s$ , the one who is indifferent between litigate and settle, is given by:

$$s = u_d(c_s; c_p) \Leftrightarrow c_s = \frac{s - \pi(\theta + \beta c_p)}{1 - \alpha(1 - \pi)}$$

The best demand  $s^*$  for the plaintiff is the solution of the maximization of his ex ante total benefit for the case: with probability  $(1 - F(c_s))$ , the plaintiff faces a defendant who will be prone to accept the settlement demand  $s$ , and with probability  $F(c_s)$  he may expect to face a defendant who will prefer to go to trial, in which case, the plaintiff undertakes a risk conditional on the type of the defendant. The plaintiff's expected total benefit function is thus:

$$U_p(s; c_s) = (1 - F(c_s))s + F(c_s)u_p(c_p; E(c_d|c_d < c_s)) \quad (1)$$

where  $E(c_d|c_d < c_s) = \int_{\underline{c}_d}^{c_s} \frac{c_d f(c_d)}{F(c_s)} dc_d$  is the expected cost of the defendant conditional to the types going to trial. Note that  $U_p(s; c_s)$  may be written as:

$$(1 - F(c_s))s + F(c_s)(\pi\theta - (1 - \beta\pi)c_p) - \alpha(1 - \pi) \left( \int_{\underline{c}_d}^{c_s} c_d f(c_d) dc_d \right)$$

which is more tractable for explicit optimization.

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<sup>2</sup>Basically, the concept of Bayesian equilibrium applies: literally, the equilibrium corresponds to 1/ a strategy for the defendant (either accept the demand or reject it) depending on his type, and 2/ a strategy for the plaintiff (a settlement demand) associated to a belief on the defendant's type, such that given the belief of the plaintiff, the equilibrium strategy of each party is the best response to the equilibrium strategy of the other party, and given the equilibrium strategies, that belief is correct.

<sup>3</sup>The notation  $c_s$  means that there is a one to one correspondence between the settlement demand and the borderline defendant who accepts it.

**Proposition 1** *Under assumption 1, the solution to the maximization of (1), is unique and corresponds to the demand  $s^*$  and the marginal defendant  $c_d^* = c_{s^*}$  which are implicitly obtained by solving the system:*

$$s^* = \pi(\theta + \beta c_p) + (1 - \alpha(1 - \pi))c_d^* \quad (2)$$

$$\left(\frac{1 - F}{f}\right)_{|c_d^*} = \frac{c_p + c_d^*}{1 - \alpha(1 - \pi)} \quad (3)$$

such that the frequency of trials is  $F(c_d^*)$ .

**Proof.** For an interior solution  $(s^*, c_d^*)$ , the first order condition writes as:

$$(1 - F(c_d^*)) - f(c_d^*) \frac{s^* - u_p(c_p; c_d^*)}{1 - \alpha(1 - \pi)} = 0 \quad (4)$$

The first term is the marginal benefit of the equilibrium demand  $s^*$ . Indeed, in equilibrium, the plaintiff will get a marginal increase in  $s^*$  with a probability of  $1 - F(c_d^*)$ . The second term is the marginal cost of the equilibrium demand, which is the result of the impact of the demand:

- on the probability of an amicable settlement:

$$\frac{d}{ds}(1 - F(c_d(s))) = -f(c_d^*) \frac{1}{1 - \alpha(1 - \pi)} < 0$$

- on the gains of the negotiation evaluated for the marginal defendant:

$$s^* - u_p(c_p; c_d^*) = u_d(c_d^*; c_p) - u_p(c_p; c_d^*) = c_p + c_d^* > 0$$

Substituting and rearranging condition (4) leads to (3). Given that the RHS in (3) is increasing in  $c_d$ , it is obvious that both the unicity and the second order condition are met under assumption 1 (see also figure 1). ■

The separating equilibrium described in proposition 1 exhibits that some hidden information still exists in equilibrium, or equivalently that the defendants' private information is only partially revealed. Defendants who prefer to settle their case and accept to pay the amicable compensation are still hidden types, pooled together with the borderline type  $c_d^*$ . The plaintiff only knows that they are randomly chosen in  $[c_d^*, \bar{c}_d]$  but has no longer incentives to separate them. In contrast, any defendant who rejects the demand and goes to trial will by this way reveal his private information, the plaintiff learning at trial that he is one of the specific type in the set  $[c_d, c_d^*]$ .

Thus, the cases going to trial are selected among those with the smaller costs, that is according to our intuition, among those for which the technology of information production is more efficient in the sense that the legal expenditures required to predict a given outcome at trial are the smaller. In contrast, the cases settled would have turned more expensive should they have gone to trial.

### 2.3 comparative statics

A complete set of comparative statics may be easily performed, the results of which are summarized in the next table for  $\alpha > 0$  and  $\beta > 0$ :

	$\pi$	$c_p$	$\alpha$	$\beta$	$\theta$
$c_d^*$	+	-	-	<i>ind.</i>	<i>ind.</i>
$s^*$	+	?	-	+	+

and, without any loss of understanding, the reader who is not interested in the details may directly skip to the next paragraph.

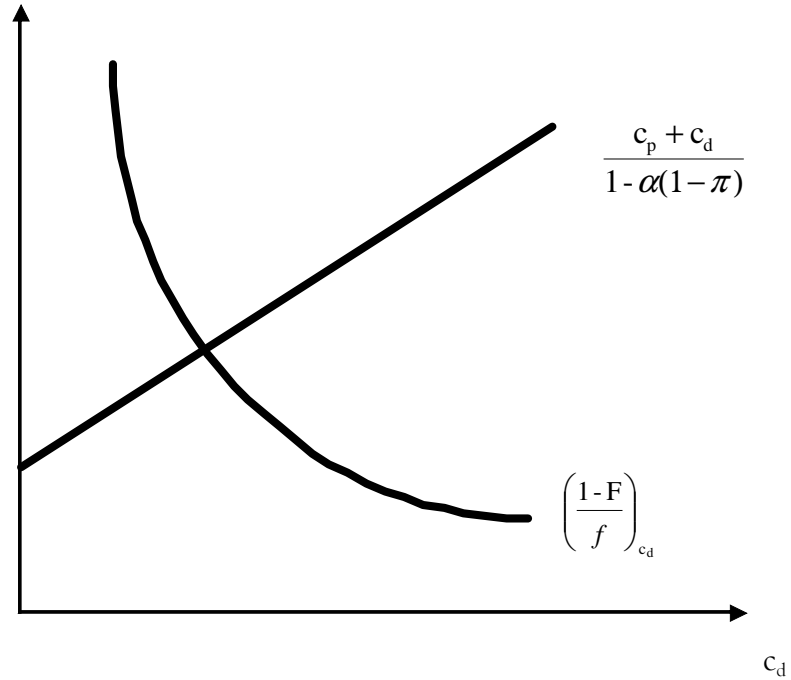


FIGURE 1 : *Graph of condition (3)*

Using the graph of condition (3) (see figure 1) and noting that under assumption 1 the curve  $\left(\frac{1-F}{f}\right)_{c_d}$  is decreasing in  $c_d$ , it is straightforward that the various parameters of the model affect the equilibrium value of the marginal defendant only through their scale effect on the straight line  $\frac{c_p + c_d}{1 - \alpha(1 - \pi)}$ . As a result, a change in a parameter which leads to an upward (downward) shift of  $\frac{c_p + c_d}{1 - \alpha(1 - \pi)}$  or of its slope, will decrease (respectively, increase) the optimal borderline type  $c_d^*$  and thus will reduce (resp. increase) the frequency of trials  $F(c_d^*)$ . On the other hand, according to (2) the change in a parameter affects the equilibrium settlement demand possibly through two different channels: there may exist a direct effect, plus an indirect effect driven by the change in

the marginal defendant.

Thus, the incidence of each parameter may be detailed as follows:

- **effects on the trials rate:**

An increase in  $c_p$  or  $\alpha$  will reduce the likelihood of settlement, while a increase in  $\pi$  will increase it. Further, we remark that the rate of trials at equilibrium is independent of  $\beta$  the proportion of the plaintiff's costs borne by the defendant. The same remark applies for  $\theta$ , the damages set by Courts.

- **effects on the settlement demand:**

An increase in  $\alpha$  or a decrease in  $\pi$  will reduce  $s^*$  for two reasons: both have a direct effect (holding  $c_d^*$  fixed) which is negative on  $s^*$ , and both induce a decrease in  $c_d^*$ . An increase in  $\beta$  or  $\theta$  will increase  $s^*$  only through the direct effect. Finally, the effect on  $s^*$  of increasing  $c_p$  is ambiguous: on the one hand, the direct effect is positive (holding  $c_d^*$  fixed, an increase in  $c_p$  will raise  $s^*$ ), but the indirect effect is negative (an increase in  $c_p$  will reduce  $c_d^*$ ) - thus, depending on the rate to which the ratio  $\frac{1-F}{f}$  decreases and on the size of parameters such as  $\alpha, \beta, \pi$ ;  $s^*$  may either increase or decrease with  $c_p$ .

## 2.4 fee shifting rules

The influence of fee shifting on the equilibrium may be understood once we remark that the RHS in (3) reflects the choice of a specific rule to allocate legal costs: for the American rule ( $\alpha = \beta = 0$ ) and the pro-plaintiff one ( $\alpha = 0, \beta = 1$ ), it is written  $c_p + c_d^*$ , while for the British one ( $\alpha = \beta = 1$ ) and the pro-defendant one ( $\alpha = 1, \beta = 0$ ) we obtain:  $\frac{c_p + c_d^*}{\pi}$ . Thus for any  $\alpha \in ]0, 1[$  (and independantly of  $\beta \in ]0, 1[$ ) it comes that:

$$1 > 1 - \alpha(1 - \pi) > \pi$$

Under assumption 1, the result is obvious using (3):

$$c_{dPP}^* = c_{dUS}^* > c_d^* > c_{dUK}^* = c_{dPD}^*$$

Hence:

**Proposition 2** *The frequency of trials is the highest both under the American and the pro-plaintiff rules, and the lowest both under the British and the pro-defendant rules.*

In a similar manner, it is possible to evaluate the cost of a dispute and to compare its value under the various rules. First, define as  $CE$  the total expenditures of parties conditional on trial (the *conditional* expected cost of a trial), as the sum of the plaintiff's expenditures and of the defendant's expenditures in case a trial occurs<sup>4</sup>; the equilibrium value of  $CE^*$  is given by:

$$CE^* = c_p + \int_{c_d}^{c_d^*} c_d \frac{f(c_d)}{F(c_d^*)} dc_d$$

The value of  $CE^*$  takes into account that given the initial population of defendants, only some of them will finally go to trial. According to proposition 2, it is straightforward that despite the ranking of the defendant's marginal type between the various fee-shifting rules, the conditional mean of the defendant going to trial, namely  $\int_{c_d}^{c_d^*} c_d \frac{f(c_d)}{F(c_d^*)} dc_d$ , is not comparable across these rules: thus any ranking for  $CE^*$ ,  $CE_{US}^*$ ,  $CE_{PD}^*$ ,  $CE_{PP}^*$  and  $CE_{UK}^*$  is possible<sup>5</sup>. The main implication of this result is that in the empirical studies dealing with the comparison between the various systems, any result may be obtained on a priori ground - in the sense that the model may rationalize any ranking thanks to a *ad hoc* assumption regarding the shape of  $F$ .

However, from a welfare point of view, it is more convenient to consider the unconditional expected total cost of a trial, which writes:

$$UE^* = F(c_d^*)c_p + \int_{c_d}^{c_d^*} c_d dF(c_d)$$

Given the ranking order on the border line type, it is obvious that  $UE_{US}^* = UE_{PP}^* > UE^* > UE_{UK}^* = UE_{PD}^*$ , hence:

**Proposition 3** *The unconditional expected total cost of a trial is the highest under both the American and the proplaintiff ones, and the lowest under both the British and prodefendant ones.*

Finally, it can be seen that the comparison under the various rules of the settlement amounts generally leads to an incomplete ranking. For example, we have the following:

**Proposition 4** *i) The settlement demand is decreasing in  $c_p$  under the American and the prodefendant rules, but it is increasing in  $c_p$  under the British one; finally under the proplaintiff rule, the relationship between the settlement demand and  $c_p$  is ambiguous.*

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<sup>4</sup>We only consider the private costs of a trial, implicitly assuming that public expenditures represent a fixed cost, which is ruled out from the analysis.

<sup>5</sup>This result parallels the one obtained by Shavell (1996) when discussing the influence of fee-shifting in Bebhuk's seminal model.

ii) We simultaneously have  $s_{PP}^* > s_{US}^* > s_{PD}^*$  and  $s_{PP}^* > s_{UK}^* > s_{PD}^*$ , but  $s_{US}^*$  and  $s_{UK}^*$  are not directly comparable.

**Proof.** i) Remark first that using (2), we have for the different rules:

$$\begin{aligned} s_{US}^* &= \pi\theta + c_{dUS}^* \\ s_{PP}^* &= \pi(\theta + c_p) + c_{dPP}^* \\ s_{PD}^* &= \pi(\theta + c_{dPD}^*) \\ s_{UK}^* &= \pi(\theta + c_p + c_{dUK}^*) \end{aligned}$$

Moreover, it is easy to see thanks to figure 1 that the marginal defendant decreases with  $c_p$  under the various rules. Then, result i) is straightforward under the American rule and the prodefendant rule, since there is only an indirect effect (through the effect on the marginal defendant) of  $c_p$  on  $s^*$ . On the other hand, simple algebra for the British rule and the proplaintiff one shows that:

$$\begin{aligned} \frac{ds_{UK}^*}{dc_p} &= \pi \left( 1 - \frac{1}{1 - \pi \left( \frac{1-F}{f} \right)' |_{c_{dUK}^*}} \right) > 0 \\ \frac{ds_{PP}^*}{dc_p} &= \pi - \frac{1}{1 - \pi \left( \frac{1-F}{f} \right)' |_{c_{dPP}^*}} \geq 0 \end{aligned}$$

since  $1 - \pi \left( \frac{1-F}{f} \right)' |_{c_{dUK}^*} > 1$  under assumption 1.

ii) Straightforward since  $c_{dPP}^* = c_{dUS}^* > c_d^* > c_{dUK}^* = c_{dPD}^*$ . ■

Unless additional conditions are considered, it is not possible to obtain the full ranking of the settlement demands. More importantly and interestingly, proposition 2 exhibits results which are in contrast to those generally obtained in the literature. In the IA-based models of litigation (Bebchuck (1984), Reinganum and Wilde (1986), Che and Yi (1993)), as well as in the "optimistic" approach (Hughes and Snyder (1995), Shavell (1982)), it obtains that the American rule leads to fewer trials than the English one. Finally, proposition 3 is just the opposite to the prediction made by Bayes, Kovenock and de Vries (2005) in their auction-based model of litigations; in contrast, it is fully consistent with the rent-seeking analysis of litigations (see: Farmer and Pecorino (1999), Gong and McAfee (2000), Katz (1987), Plott (1987)) where legal expenditures are endogenously determined<sup>6</sup>.

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<sup>6</sup>Strictly speaking, the ambiguity found in rent-seeking models regarding the comparison between the various systems is generally resolved thanks to some additional restrictions on the "contest-success" function.

Remark that proposition 4 shows that the relationship between the plaintiff's type and the settlement demand is model specific, to the extent that it depends on the particular fee-shifting rule that applies: this is important to remember this because it explains why the analysis will be more involved when turning to the model with bilateral information.

## 2.5 an example: the uniform distribution

Let us assume that the defendant's type is uniformly distributed on the intervalle  $[c_d, \bar{c}_d]$ . As a result, the LHS in (3) is written as  $\left(\frac{1-F}{f}\right)_{|c_d^*} = \bar{c}_d - c_d^*$ , and explicitly solving (3) for  $c_d^*$  yields:

$$c_d^* = \left(\frac{1 - \alpha(1 - \pi)}{2 - \alpha(1 - \pi)}\right) \left(\bar{c}_d - \frac{c_p}{1 - \alpha(1 - \pi)}\right) \quad (5)$$

The settlement demand (2) in this case may be framed in several ways as follows:

$$\begin{aligned} s^* &\equiv u_d(c_d^*; c_p) \\ &= u_p(c_p; c_d^*) + (c_p + c_d^*) \\ &= u_p(c_p; \bar{c}_d) + \frac{c_p + \bar{c}_d}{2 - \alpha(1 - \pi)} \end{aligned} \quad (6)$$

The first and second lines in (6) recall the very definition of the settlement amount: in the case of "a one-shot" bargaining process, the advantage is to the first mover (the plaintiff) who demands an amount just equal to the willingness to pay of the borderline defendant. This allows the plaintiff to obtain in case of an amicable settlement an amount which is (strictly) larger than his willingness to accept (at the margin, *i.e.* against the marginal defendant's type), and thus fully extracts the gains of the negotiation from the borderline defendant. However, given that this one is pooled together with larger types, the plaintiff has to give up part of the negotiation surplus for these larger types<sup>7</sup>. The third line, to sum up, means that everything goes as if the plaintiff's equilibrium demand is the sum of the smallest demand  $u_p(c_p; \bar{c}_d)$  corresponding to the case where he expects to face the weakest defendant (*i.e.* having the largest cost) plus an adjustment term  $\frac{c_p + \bar{c}_d}{2 - \alpha(1 - \pi)} = (c_p + \bar{c}_d) - (1 - \alpha(1 - \pi))(\bar{c}_d - c_d^*)$  corresponding to the part of the surplus extracted by the plaintiff, reflecting the distortion due to the asymmetric information and required in order to induce at least some of the defendants to reveal their type.

It is obvious that the size of the adjustment term  $\frac{c_p + \bar{c}_d}{2 - \alpha(1 - \pi)}$  increases with  $\alpha$ , thus reflecting the influence of fee-shifting, or equivalently: the larger  $\alpha$ , the smaller the informational rent of the

<sup>7</sup>It is straightforward to see that for all  $c_d > c_d^*$ ,  $s^*$  may also be written as  $s^* = u_p(c_p; c_d) + (c_p + c_d) - (1 - \alpha(1 - \pi))(c_d - c_d^*)$ . Thus, the defendant's informational rent increases with  $c_d$ .

defendant<sup>8</sup>. More specifically, since:

$$\frac{1}{2} < \frac{1}{2 - \alpha(1 - \pi)} < \frac{1}{1 + \pi}$$

the surplus extracted by the plaintiff is the smallest under the American and the proplaintiff rules, but the largest under the British and the prodefendant rules (all else equal).

### 3 Litigations with two-sided asymmetric information

#### 3.1 information and parties' outcome

We extend the analysis to the case where both the defendant's cost and the plaintiff's cost are private information (each party observes its own type, but not the other party's type), although their probability distributions are common knowledge:

- the defendant knows that the cost for the plaintiff is a random variable  $c_p \in [\underline{c}_p, \bar{c}_p]$  distributed according to a probability function  $G(c_p)$  and a density  $g(c_p)$ ;

- once more, the plaintiff knows that the cost for the defendant is a random variable  $c_d \in [\underline{c}_d, \bar{c}_d]$  distributed according to a probability function  $F(c_d)$  and a density  $f(c_d)$ .

The timing of the game is the same as in the previous section, and  $s$  still denotes the demand of settlement made by the plaintiff to the defendant. Moreover, we still maintain for simplicity assumption 1 and replace assumption 2 with the following one:

**Assumption 3:**  $\theta > \bar{c}_p + \bar{c}_d$ .

which also implies that:  $\theta > c_p + c_d$  for any pair  $(c_p, c_d)$ .

#### 3.2 the separating equilibrium

In stage 2, the defendant has to decide whether either he accepts the settlement demand, or he goes to trial, conditionally on the belief on the plaintiff's type  $\gamma(s) = E[c_p|s]$  which is the conditional mathematical expectation of the plaintiff's cost assessed by the defendant when he faces a settlement demand  $s$ . It is natural to assume as a consistency requirement on defendant's beliefs that  $\gamma(s) \in [\underline{c}_p, \bar{c}_p]$ . Given his beliefs, the interim expected cost of the defendant (once he has received a demand  $s$ ) is:

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<sup>8</sup>The informational rent of the defendant accepting the demand is the complement  $\frac{1 - \alpha(1 - \pi)}{2 - \alpha(1 - \pi)}(c_p + \bar{c}_d)$ .



$$U_d(c_d, s; \gamma(s)) = \begin{cases} s & \text{if the defendant accepts} \\ u_d(c_d; \gamma(s)) & \text{if he rejects} \end{cases}$$

since, given  $\gamma(s)$ , the objective of the defendant is to bear the smallest loss as possible.

At stage 1, the plaintiff with type  $c_p$  chooses his best demand  $s$  given his belief on the type of the defendant  $c(s)$ <sup>9</sup>. The plaintiff knows that any defendant accepting his demand reveals that his true type satisfies  $c_d \geq c(s)$ , while any defendant rejecting it reveals that his type satisfies  $c_d < c(s)$ . Thus, for any settlement demand of the plaintiff, there will exist a belief on the borderline defendant defined by:

$$u_d(c(s); \gamma(s)) = s \Leftrightarrow c(s) = \frac{s - \pi(\theta + \beta\gamma(s))}{1 - \alpha(1 - \pi)} \quad (7)$$

such that the probability of settling the case is  $1 - F(c(s))$ . Once more, a natural consistency requirement of plaintiff's belief is given by:  $c(s) \in [\underline{c}_d, \bar{c}_d]$ .

This enables us to write the (total) expected benefit of the plaintiff  $c_p$  for a settlement demand  $s$  as:

$$U_p(c_p, s; c(s)) = (1 - F(c(s)))s + F(c(s))u_p(c_p; E(c_d|c_d < c(s)))$$

given (7), and with  $E(c_d|c_d < c(s)) = \int_{\underline{c}_d}^{c(s)} c_d \frac{f(c_d)}{F(c(s))} dc_d$ .

In a separating equilibrium<sup>10</sup>, it must be that two equilibrium conditions are satisfied:

$$\begin{aligned} c(s^*) &= \frac{s^* - \pi(\theta + \beta\gamma(s^*))}{1 - \alpha(1 - \pi)} \\ \gamma(s^*) &= c_p \end{aligned}$$

meaning that beliefs are correct in equilibrium. As a result, the best settlement demand of plaintiff  $c_p \in [\underline{c}_p, \bar{c}_p]$ , which is denoted  $s^* = s(c_p)$ , is the solution to:

$$\max_{s \in [u_d(\underline{c}_d; c_p), u_d(\bar{c}_d; c_p)]} U_p(c_p, s; c(s))$$

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<sup>9</sup>The notation  $c(s)$  now means that, on the one hand, the belief of the plaintiff is supposed to be a (differentiable) function of  $s$ , and on the other hand, that the higher the settlement demand made by the plaintiff, the higher his belief on the defendant's type.

<sup>10</sup>It is now well known that a basic property of signalling games is the multiplicity of equilibria, most of them being sorted out by a refinement of the bayesian equilibrium concept. Specifically, there exists a multiplicity of pooling equilibria which may be eliminated using the Cho-Kreps criterion for example; this is also the case with most of the separating equilibria.

Remark that the restriction on the equilibrium value of the settlement demand  $s^* \in [u_d(c_d; c_p), u_d(\bar{c}_d; c_p)]$ , reflects the consistency requirement on plaintiff's belief  $c(s^*) \in [\underline{c}_d, \bar{c}_d]$ . As usual,  $s^*$  is characterized through the first order condition:

$$(1 - F(c(s^*))) - f(c(s^*))(s^* - u_p(c_p; c(s^*)))c'(s^*) = 0 \quad (8)$$

with the equilibrium condition  $c(s^*) = \frac{s^* - \pi(\theta + \beta c_p)}{1 - \alpha(1 - \pi)}$ . The first LHS in (8) is the marginal benefit of the settlement demand for the plaintiff; the second one is the marginal cost of the settlement demand, which is given by the product of the impact of an increase of  $s$  on the probability of settlement  $f(c(s^*))c'(s^*)$  times the value of the negotiation gains  $s^* - u_p(c_p; c(s^*)) = u_d(c(s^*); c_p) - u_p(c_p; c(s^*)) = c_p + c(s^*)$ .

Finally, using the value of parties' payoff, and then rearranging (6), gives us the next differential equation which allows to describe the dynamics of the  $c_p$  plaintiff's beliefs in equilibrium:

$$\left( \frac{1 - F}{f} \right)_{|c(s^*)} = (c_p + c(s^*)) \times c'(s^*) \quad (9)$$

with the associated equilibrium value of the settlement demand:

$$s^* = u_d(c(s^*); c_p) \quad (10)$$

The system (9)-(10) fully describes the separating equilibrium of the two-sided asymmetric information litigation game, but without an additional assumption on the ratio  $\frac{1-F}{f}$ , it cannot be explicitly solved. In fact, two different cases occur.

### 3.3 on the informational value of plaintiff's type

We prove the following general result which holds under the American and the prodefendant rules:

**Proposition 5** *Assume that either i)  $\alpha = \beta = 0$  or ii)  $\alpha = 1, \beta = 0$ . The separating equilibrium is such that  $s(c_p)$  is a decreasing function of  $c_p$ , and the frequency of trial is equal to that of the one-sided asymmetric information case.*

See the proof in appendix A. The intuition is that in case of plaintiff's victory at trial, the defendant bears no additional costs over his own judicial expenditures for both the American and the prodefendant rule. Thus, the information on plaintiff's type has no value for the defendant - equivalently, the proposal made by the plaintiff has no signalling role under the American and

prodefendant rules in contrast to the three others cases (French, proplaintiff or British rules). As a result, the two-sided asymmetric information introduces no more distortion than the one-sided case under such fee-shifting rules.

In contrast, for the French, proplaintiff and British rules we have:

**Proposition 6** *Assume that  $0 < \alpha \leq 1$  and  $0 < \beta \leq 1$ . The separating equilibrium is such that  $s(c_p)$  is an increasing function of  $c_p$ , and the frequency of trial is larger than in the one-sided asymmetric information case.*

**Proof.** Assume that there exists a unique  $s^*$  solution to the system (9)-(10). Note first that by the Second Order Condition (SOC thereafter), it is required after differentiating (10) that:

$$\begin{aligned} \left(\frac{1-F}{f}\right)'_{|c(s^*)} c'(s^*) - (c_p + c(s^*)) \times c''(s^*) - c'(s^*)(1 + \alpha(1 - \pi)c'(s^*)) &\leq 0 \\ \Downarrow \\ \left(\left(\frac{1-F}{f}\right)'_{|c(s^*)} - (1 + \alpha(1 - \pi)c'(s^*))\right) c'(s^*) - (c_p + c(s^*)) \times c''(s^*) &\leq 0 \end{aligned}$$

According to (9) we also have after differentiation:

$$\begin{aligned} \left(\frac{1-F}{f}\right)'_{|c(s^*)} c'(s^*) &= (c(s^*) + c_p) \times c''(s^*) + (c'(s^*))^2 \\ \Downarrow \\ -(c(s^*) + c_p) \times c''(s^*) &= c'(s^*) \left( c'(s^*) - \left(\frac{1-F}{f}\right)'_{|c(s^*)} \right) \end{aligned}$$

which enables us to write the SOC as:

$$c'(s^*)(c'(s^*)(1 - \alpha(1 - \pi)) - 1) \leq 0$$

Thus, the SOC requires that  $1 - c'(s^*)(1 - \alpha(1 - \pi)) \geq 0$ , or equivalently that  $c'(s^*) < \frac{1}{1 - \alpha(1 - \pi)}$ . Thus the RHS of (9) is smaller than the one in (3); hence comparing (3) and (9) given that  $\frac{1-F}{f}$  is decreasing, we have  $c_d^* < c(s^*)$ , all else held equal.

Now, differentiating (10), we have:

$$\frac{ds^*}{dc_p} = \frac{\pi\beta}{1 - c'(s^*)(1 - \alpha(1 - \pi))}$$

with  $1 - c'(s^*)(1 - \alpha(1 - \pi)) > 0 \Rightarrow \frac{ds^*}{dc_p} \geq 0$  but  $1 - c'(s^*)(1 - \alpha(1 - \pi)) < 0 \Rightarrow \frac{ds^*}{dc_p} \leq 0$ . As a result of the SOC,  $s(c_p)$  cannot be a decreasing function of  $c_p$ .

Remark that the result extends to the British and the proplaintiff rules, since when  $\alpha = \beta = 1$  we have (differentiating (10) with  $\alpha = \beta = 1$ ):

$$\frac{ds_{UK}^*}{dc_p} = \frac{\pi}{1 - c'(s_{UK}^*)\pi} > 0$$

with the SOC which is written as  $c'(s_{UK}^*)(c'(s_{UK}^*)\pi - 1) \leq 0$ , while when when  $\alpha = 1, \beta = 0$  we have (differentiating (10) with  $\alpha = 1, \beta = 0$ ):

$$\frac{ds_{PP}^*}{dc_p} = \frac{\pi}{1 - c'(s_{PP}^*)} > 0$$

with the SOC which is written as  $c'(s_{UK}^*)(c'(s_{UK}^*) - 1) \leq 0$ . Hence, under the French, the British and the proplaintiff rules, the higher the plaintiff's type the higher the settlement demand. ■

As compared with the screening game of the previous section, it is worth stressing that the settlement demand is designed to fulfill two different aims in terms of information disclosure under the British, French or proplaintiff rules. On the one hand, the settlement amount always entails a screening action among the defendants, enabling the plaintiff to separate the highest types from the smallest ones; the former choose to settle in order to save on litigation costs and thus only partially reveal their private information (there still remains some hidden information among this group since they are pooled together with the borderline type), while the latter prefer to litigate before the Court and will finally fully reveal their type at trial. On the other hand, the plaintiff's proposal allows him to signal his own type, the higher his cost at trial the higher his settlement demand - and the plaintiff's type is fully revealed in equilibrium<sup>11</sup>.

On the other hand, proposition 6 suggests that more trials occur (for a given fee-shifting rule) as more information distortion arises with two-sided symmetric information: the plaintiff has to distort his demand to signal his type *and* screen the defendant's own type, thus yielding a higher rejection rate of the amicable settlement demand. However, comparing the equilibrium rate of trials and the aggregate cost of a trial across the different fee-shifting rules is no longer easy to perform. Some additional insights may be obtained in some more specific cases regarding the assumption on the distribution of types.

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<sup>11</sup>As a result, the case with two-sided asymmetric information on the parties' costs helps to solve the ambiguity found in the screening model, concerning the influence of plaintiff's type on the settlement demand under the French rule and the proplaintiff one. The perfectly revealing demand must be increasing.

### 3.4 continuing the example: the uniform distribution

In this paragraph, we come back to the case where the type of the defendant follows a uniform probability distribution on  $[\underline{c}_d, \bar{c}_d]$ . For both the American and the prodefendant rules, the results and discussion of paragraph 2.5 apply. Hence, we add some elements for the three other rules where  $0 < \alpha \leq 1$  and  $0 < \beta \leq 1$ ; equation (9) is written as:

$$\bar{c}_d - c(s^*) = (c_p + c(s^*)) \times c'(s^*) \quad (11)$$

and the following proposition holds:

**Proposition 7** *Assume that  $\bar{c}_p < (1 - \alpha(1 - \pi))(\bar{c}_d - \underline{c}_d) - \underline{c}_d$ . When it exists, the unique equilibrium is characterized by the demand function  $s(c_p)$  and the belief function  $c(s(c_p))$  which solve:*

$$s(c_p) = \pi(\theta + \beta c_p) + (1 - \alpha(1 - \pi))c(s(c_p)) \quad (12)$$

$$c(s(c_p)) = \bar{c}_d - \left[ \Omega(c_p) \times e^{-(2-\alpha(1-\pi))c(s(c_p))-\beta\pi c_p} \right]^{\left(\frac{1}{c_p+\bar{c}_d}\right)} \quad (13)$$

where  $\Omega(c_p) = \left(\frac{\bar{c}_p+\bar{c}_d}{2-\alpha(1-\pi)}\right)^{(\bar{c}_p+\bar{c}_d)} \times e^{(1-\alpha(1-\pi))\bar{c}_d-(1-\beta\pi)\bar{c}_p}$ .

For the complete proof see appendix B. We also show that the next condition holds in equilibrium (see also proposition 5):

$$c(s(c_p)) > \left(\frac{1-\alpha(1-\pi)}{2-\alpha(1-\pi)}\right) \left(\bar{c}_d - \frac{c_p}{1-\alpha(1-\pi)}\right) \quad (14)$$

which is useful to prove the following result:

**Proposition 8** *i) The rate of trial and the settlement demand are larger under the pro-plaintiff rule than under the American rule.*

*ii) The rate of trial and the settlement demand are larger under the British rule than under the pro-defendant rule.*

This is straightforward using proposition 2 and proposition 5, given that according to (14) we have:

$$\begin{aligned} c(s(c_p))_{UK} &> \left(\frac{\pi}{1+\pi}\right) \left(\bar{c}_d - \frac{c_p}{\pi}\right) \equiv c(s(c_p))_{PD} \\ c(s(c_p))_{PP} &> \frac{\bar{c}_d - c_p}{2} \equiv c(s(c_p))_{US} \end{aligned}$$

However, a complete ranking of the fee-shifting rules is not available. Specifically, comparing the American, the French and British rules leads to an ambiguous result. To see why, let us rewrite (13) as:

$$\bar{c}_d - c = \Delta \equiv \left[ \Omega(c_p) \times e^{-(2-\alpha(1-\pi))c-\beta\pi c_p} \right]^{\left(\frac{1}{c_p+\bar{c}_d}\right)}$$

Simple calculations show that both  $\alpha$  and  $\beta$  have an ambiguous influence on the RHS; moreover,  $\Delta \geq c_p + c$ , implying now for example that the American rule may lead to fewer trials than the British one. The intuition is that under the British or French rules, the settlement amount is increasing in the plaintiff's type, thus signaling that the higher the amicable settlement demand, the weaker the plaintiff's skill: from the defendant's point of view, this explains a higher rejection rate and a higher trial rate. However, under the American rule, a higher settlement demand signals in contrast a stronger skilled plaintiff, which justifies a higher acceptance rate and lesser trials.

It is worth noticing that the equilibrium demand which solves (12)-(13) writes similarly to the screening game as:

$$\begin{aligned} s(c_p) &\equiv u_d(c(s(c_p)); c_p) \\ &= u_p(c_p; c(s(c_p))) + (c_p + c(s(c_p))) \\ &= u_p(c_p; \bar{c}_d) + (c_p + \bar{c}_d) - (1 - \alpha(1 - \pi)) \Delta \end{aligned}$$

In other words, for the British, the pro-plaintiff and the French rules, everything goes as if the equilibrium settlement amount proposed by the plaintiff corresponds to a undistorted level,  $u_p(c_p; \bar{c}_d)$ , when the plaintiff's type is common knowledge and he believes he faces the weakest defendant's type ( $\bar{c}_d$ ), plus  $(c_p + \bar{c}_d) - (1 - \alpha(1 - \pi)) \Delta > 0$  an adjustment term (surplus extracted to the intra-marginal defendants) reflecting that the plaintiff must distort his demand now in order to signal his own type and at the same time to give incentives to reveal the defendant's type. In contrast with the one sided-asymmetric information model, this distortion now depends on the two main parameters of the fee-shifting rule,  $\alpha$  (as in the screening game) but also  $\beta$ , reflecting both the signalling and screening role of the settlement demand. Thus, the distortion  $(c_p + \bar{c}_d) - (1 - \alpha(1 - \pi)) \Delta$  may increase or decrease with  $\alpha$  and  $\beta$ . As a result, there is no longer a clearcut ranking regarding the size of the distortion according to the choice of a fee-shifting rule now. Only a partial ranking may be performed as recalled in proposition 8.

The analysis suggests that starting with the American rule ( $\alpha = 0 = \beta$ ) and increasing  $\beta$  to obtain the pro-plaintiff rule ( $\alpha = 0, \beta = 1$ ), the informational value of the plaintiff's type increases; thus the surplus extracted by the plaintiff (the settlement demand) increases but the trial rate

increases (the defendant rejects more often). By the same token, starting with the pro-defendant rule ( $\alpha = 1, \beta = 0$ ) and increasing  $\beta$  to obtain the British rule ( $\alpha = 1 = \beta$ ), the informational value of plaintiff's type also increases; thus the surplus extracted by the plaintiff (the settlement demand) increases, but the trial rate increases (the defendant rejects more often).

## 4 Conclusion

Both the empirical evidence and the theoretical analysis of litigations have suggested a link between litigation expenditures and parties' ability to predict the outcome of a trial. The paper elaborates on this idea in the case where the information on parties' skill and investments in the discovery process is private. More specifically, we have analysed the influence of private information concerning litigants' costs and the informational role of the settlement amount. Assuming first that the defendants' type is private information, we have shown that the plaintiff's settlement demand has a screening role, leading the highest-skilled/lowest-cost defendants to go to trial and in contrast the weakest-skilled/highest-cost ones who settle. Moreover, in contrast with results generally obtained in the literature, we have found that the American rule yields more trials and a higher aggregate expected cost at trial than the French and/or British ones. In the case where both parties' litigation costs are private information, we have also shown that the trial rate is never lower than in the one-sided asymmetric information case, and for both the French and British fee-shifting rules where it is actually strictly higher. This reflects that the higher the settlement demand, the weaker the plaintiff's skill, justifying a higher rejection rate by the defendants. However, under the American rule, a higher settlement demand signals a stronger skilled plaintiff which leads to a higher defendant's acceptance rate. Thus, the influence of fee-shifting rules becomes ambiguous, and it is not clear that the American rule always yields more trials and higher expected aggregate expenditures at trial.

The paper focuses on the characteristics of the technology of information and evidence production as a major explanation for differences between litigants' legal expenditures. However, our framework has a broader scope, since at least two alternative interpretations are consistent with the present analysis and would yield similar results. The first one relies on the idea that litigants have generally limited wealth to invest in litigations, and/or they face a financial (borrowing) constraint. In each case, such a constraint imposes to litigants an upper bound for their legal expenditures. which is reached too soon for litigants, preventing to attain the levels required to maximize their expected gain (and chances to win) at trial. Note that such an assumption is perfectly consistent with the one in the paper: wealth-constrained litigants who cannot have illimited

legal expenditures may be expected to choose low-skilled and limited experienced attorneys, in contrast to unconstrained ones who may have the opportunity to employ attorneys representing the best quality/expenditure trade-off.

The second alternative interpretation applies especially to the case where litigants are firms: legal expenditures may thus be linked to attorney's wages as these are firms' employees. These expenditures correspond to up-front investments to which firms commit since they may be engaged in costly litigations latter on. However, as the firm may face at the same time several litigious cases (of heterogenous nature: labor law, contract, tort, product-liability, property or intellectual property), not all the firms' attorneys will expertise and work on each of the cases. The information regarding the number and identity of the attorneys who are appointed to a given case is private information. Let us emphasize that this last explanation is also consistent with our model, and thus would have the same consequences as those discussed in the paper.

Note also that both may justify our major assumption that, not only parties legal expenditures are private information, but that they may be seen as fixed, pre-determined costs in contrast to the assumption used in other papers (see the rent seeking, falsification or the signalling quality literatures) which analyse them as endogenous decisions. However, the main issue of the paper is not whether legal expenditures are exogenous or not, but how the existence of asymmetric information on parties' costs at trial affects the selection of cases that settle or go to trial. While all litigants have incentives to invest in the discovery process in order to improve their assessment of the outcome at trial and/or improve their own probability of prevailing at trial, only those having the best efficiency/cost ratio will have an advantage in going to trial. From this point of view, the outcome is in a sense paradoxical as compared to those of the literature (especially the rent-seeking models, for example), since our general result is that efficient pretrial negotiations select cases having the smallest legal expenditures to go to trial.

Finally a third interpretation is worth mentioning. A major source of (bi-lateral) information asymmetry is the value of time for individuals engaged in a dispute. Due to the legal delays and/or the existence of courts' congestion, litigants cannot obtain instanteneous judgments for their case. As a result, the costs associated with the litigation comprise on the one hand legal expenditures which are in a sense the direct costs required to solve the dispute (in the pretrial period, or in case of appearance before the Court: attorneys fees, taxes and so on); but on the other hand, there also exists indirect costs from the value of time and/or outside opportunity costs which increase with the length of the procedure<sup>12</sup>, and it is not easy for a party to have a relevent assessment of its

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<sup>12</sup>The implicit value of time has been examined on by Spier (1992) who provided an analysis of the dynamics of the pretrial bargaining process, focusing on the role of parties' impatience; see also Marceau and Mongrain (2003)



opponent's value of time and other indirect costs. However, taking such indirect costs into account is of major importance in litigations since it will allow to sort out between individuals prone to quickly accept an amicable settlement obtained with very short delay due to large indirect costs, and those having lower opportunity costs allowing them to go to trial. Note however that, excepted when Courts allow for punitive damages or damage multipliers based on (at least a part of these) indirect costs, they are supposed to have no influence on the choice of a fee-shifting rule, while they may be relevant to understand litigants' decisions regarding attorneys' payments. Thus, in the spirit of Osborne (1999)'s contribution, the assessment and role of these indirect costs in the litigation process is a challenge for future research.

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who analyze the issue of class actions formation as a result of a war of attrition between plaintiffs.

## APPENDIX A

### PROOF OF PROPOSITION 5

i) For the American rule, according to (10) (and setting  $\alpha = \beta = 0$ ) we have:

$$s_{US}^* = \pi\theta + c(s_{US}^*)$$

It comes that:

$$\frac{ds_{US}^*}{dc_p} = c'(s_{US}^*) \frac{ds_{US}^*}{dc_p} \Rightarrow c'(s_{US}^*) = 1$$

implying that the SOC is written as  $c'(s_{US}^*)(c'(s_{US}^*) - 1) = 0$ . Thus using (9), the equilibrium dynamics of plaintiff's beliefs is characterized by:

$$\left(\frac{1-F}{f}\right)_{|c(s_{US}^*)} = c_p + c(s_{US}^*)$$

Hence, the settlement amount must be a decreasing function of plaintiff's type under assumption 1, since similarly to the screening game, we have:  $\frac{ds_{US}^*}{dc_p} = \frac{1}{\left(\frac{1-F}{f}\right)'_{|c(s_{US}^*)} - 1} < 0$ .

ii) According to (10) and setting  $\alpha = 1, \beta = 0$ , we have now:

$$s_{PD}^* = \pi(\theta + c(s_{US}^*))$$

It comes that:

$$\frac{ds_{PD}^*}{dc_p} = \pi c'(s_{PD}^*) \frac{ds_{PD}^*}{dc_p} \Rightarrow c'(s_{US}^*) = 1/\pi$$

implying that the SOC is written as  $c'(s_{US}^*)(\pi c'(s_{US}^*) - 1) = 0$ . Thus, the same qualitative result that:  $\frac{ds_{PD}^*}{dc_p} = \frac{1}{\left(\frac{1-F}{f}\right)'_{|c(s_{PD}^*)} - 1} < 0$  may be proven under the pro-defendant rule.

## APPENDIX B

### PROOF OF PROPOSITION 7

A/ First, we solve the system (10)-(11). An equivalent form for (11) which is more tractable is:

$$\begin{aligned}
 \left( \frac{c_p + c}{\bar{c}_d - c} \right) \times c' &= 1 \\
 &\Downarrow \\
 \left( \frac{c_p + \bar{c}_d}{\bar{c}_d - c} - 1 \right) \times \frac{dc}{ds} &= 1 \\
 &\Downarrow \\
 \left( \frac{c_p + \bar{c}_d}{\bar{c}_d - c} - 1 \right) dc &= ds
 \end{aligned}$$

Integrating both sides gives:

$$\begin{aligned}
 \int \frac{c_p + \bar{c}_d}{\bar{c}_d - c} dc - \int dc &= \int ds + K \Rightarrow \\
 K e^{-(c+s)} &= (\bar{c}_d - c)^{(c_p + \bar{c}_d)}
 \end{aligned} \tag{15}$$

where  $K$  is the constant of integration. Hence the system (10)-(11) also writes:

$$s = \pi(\theta + \beta c_p) + (1 - \alpha(1 - \pi)) c \tag{16}$$

$$c = \bar{c}_d - \left[ K \times e^{-(s+c)} \right]^{\left( \frac{1}{c_p + \bar{c}_d} \right)} \tag{17}$$

The constant of integration depends on a boundary condition appropriately defined: in this set up, it is natural to consider that the solution to (15) satisfies the property of "no distortion at the top" (see Macho-Stadler and Pérez-Castrillo (1997) for a general proof) - thus, using directly the results in paragraph 2.5 for the equilibrium demand at  $\bar{c}_p$ , one obtains for  $s(\bar{c}_p) \in [u_d(\underline{c}_d; \bar{c}_p), u_d(\bar{c}_d; \bar{c}_p)]$ :

$$s(\bar{c}_p) = u_p(\bar{c}_p; \bar{c}_d) + \frac{\bar{c}_d + \bar{c}_p}{2 - \alpha(1 - \pi)} \tag{18}$$

which belongs to the required interval as long as:

$$\begin{aligned}
 \bar{c}_d - \underline{c}_d &> \frac{\bar{c}_p + \bar{c}_d}{2 - \alpha(1 - \pi)} \\
 &\Downarrow \\
 \bar{c}_p &< (1 - \alpha(1 - \pi)) (\bar{c}_d - \underline{c}_d) - \underline{c}_d
 \end{aligned} \tag{19}$$

which is used in proposition 7. The constant  $K$  may now be explicitly determined: first, using:

$$\begin{aligned} s(\bar{c}_p) &= u_p(\bar{c}_p; \bar{c}_d) + \frac{\bar{c}_d + \bar{c}_p}{2 - \alpha(1 - \pi)} \\ &= \pi(\theta + \beta\bar{c}_p) + (1 - \alpha(1 - \pi)) c(s(\bar{c}_p)) \end{aligned}$$

allows us to solve for  $c(s(\bar{c}_p)) = \bar{c}_d - \frac{\bar{c}_d + \bar{c}_p}{2 - \alpha(1 - \pi)} > 0$  according to (18); then evaluating (14) at  $\bar{c}_p$  we have:

$$K = \left( \frac{\bar{c}_p + \bar{c}_d}{2 - \alpha(1 - \pi)} \right)^{\bar{c}_p + \bar{c}_d} \times e^{s(\bar{c}_p) + c(s(\bar{c}_p))}$$

Now substituting for  $K$  in the general form (16) and then rearranging yields the implicit solution (12)-(13).

B/ Second, we study the existence and unicity of the separating equilibrium under the SOC requirement. This is formally equivalent to prove the unicity of the pair  $(s, c)$  which solves the system:

$$s = \pi(\theta + \beta c_p) + (1 - \alpha(1 - \pi)) c \Leftrightarrow c = h(s) \quad (20)$$

$$LnK - s = c + (c_p + \bar{c}_d) Ln(\bar{c}_d - c) \Leftrightarrow c = g(s) \quad (21)$$

In the space  $(s, c)$ , the function  $h$  in (19) is a straightline with a slope satisfying  $h'(s) = \frac{1}{1 - \alpha(1 - \pi)} > 1$ . The second one  $g$  in (20) is an increasing and concave function with  $g'(s) = \frac{1}{\frac{c_p + \bar{c}_d}{\bar{c}_d - g(s)} - 1} = \frac{\bar{c}_d - c}{c_p + c} > 0$ .

Let us show that  $h$  and  $g$  may intersect either never, once or twice. Remark that at  $s(\bar{c}_p)$  the first relationship gives us:  $c = h(s(\bar{c}_p)) \Rightarrow c = \frac{s(\bar{c}_p) - \pi(\theta + \beta c_p)}{1 - \alpha(1 - \pi)} \equiv c(s(\bar{c}_p))$  by construction, while the second one gives:  $c = g(s(\bar{c}_p)) \Rightarrow c = c(s(\bar{c}_p)) + Ln \left( \frac{\bar{c}_p + \bar{c}_d}{2 - \alpha(1 - \pi)} \right)^{(\bar{c}_p + \bar{c}_d)} - Ln(\bar{c}_d - c)^{(c_p + \bar{c}_d)} \geq c(s(\bar{c}_p))$  given that  $Ln \left( \frac{\bar{c}_p + \bar{c}_d}{2 - \alpha(1 - \pi)} \right)^{(\bar{c}_p + \bar{c}_d)} - Ln(\bar{c}_d - c)^{(c_p + \bar{c}_d)} \geq 0$ . Thus the curve  $g$  may be above  $h$  at  $s(\bar{c}_p)$ ; in this case, given that  $h$  is strictly increasing while  $g$  is strictly concave, they cannot intersect twice: there is a unique value of  $(s, c)$  which solves (19)-(20). But when  $h$  is above  $g$  at  $s(\bar{c}_p)$  then they may not intersect at all or they may intersect twice.

C/ When  $h$  and  $g$  intersect once or twice, let us prove finally that at equilibrium,  $h$  must be steeper than  $g$ . On the one hand, by the FOC, we have  $\frac{\bar{c}_d - c}{c_p + c} = c'$ ; on the second, by the SOC, we must have  $1 - c'(1 - \alpha(1 - \pi)) \geq 0$ : hence the unique solution must satisfy:  $\frac{1}{1 - \alpha(1 - \pi)} \geq c'$ ; obviously, this condition is met when  $h$  and  $g$  intersect once. Hence, any equilibrium must satisfy the condition (14) in the texte.

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