Optimal Design of Settlement Devices for Cases of Disputed Liability: Fee-Shifting Rules and *Pleadings* Mechanisms

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Optimal Design of Settlement Devices for Cases of Disputed Liability: Fee-Shifting Rules and *Pleadings* Mechanisms

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Abstract

We study the effect of alternative fee shifting rules on the probability of settlement when the defendant's liability is under dispute. Using a mechanism design approach we demonstrate that the probability of settlement is maximized by a particular *Pleadings* mechanism: Both parties are given the choice to opt into the mechanism; if they choose to do so, the defendant is asked to plead liable or not. Based on the defendant's pleading the plaintiff is offered a settlement amount which if accepted would be binding to both parties. If the plaintiff refuses the offer, then the case goes to trial and the allocation of litigation costs between the parties is set according to the outcome of the trial and the defendant's pleading of liability. When the background rule for allocation of litigation costs is given by the American rule, we show that the probability of settlement is maximized by requiring the plaintiff to bear both litigants' costs when the defendant has admitted liability irrespective of the outcome of the trial, and by applying the Pro-Plaintiff rule in the event that the defendent has denied liability. Extensions that allow for court inaccuracy, different background rules, variable shares of costs shifted, and detterence are considered.

Jel Classification numbers: D82, K41

Keywords: Litigation, Settlement, Fee-shifting, Pleadings.

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1. Introduction

There is a widespread perception that the administration of civil justice is severely compromised by high litigation costs and long delays.[1] Going to court to claim or defend one's rights is becoming nearly impossible for people with limited means and so seriously delayed for others that justice may be at risk of being denied. According to some commentators, the situation is already grave enough to suggest that civil justice is in a state of "crisis of some kind" (Zuckerman, 1999). The recognition that increased incidence of out of court settlements may help save time, cut costs, and reduce existing backlogs, has led civil justice reformers to consider various ways for facilitating settlements.[2] This paper explores one such measure – the use of cost allocation rules – in cases where the main controversy between the litigants concerns the defendant's liability.

Settlements provide a Pareto improvement over litigation. They eliminate the inherent uncertainty involved in litigation, and reduce at least part of what may be considerable litigation costs.[3] Nevertheless, some cases fail to settle, often because of information asymmetries between the litigants.[4] Typically, a plaintiff knows his true damages which he would only prove in trial, while a defendant knows both which measures of care are relevant and which measures of care she took. Like in many other bargaining settings, such informational asymmetries are bound to result in a positive probability of failure to reach the Pareto efficient outcome (Myerson and Satterthwaite, 1983).

The allocation of litigation costs at the end of trial may affect litigants' incentives to settle, and consequently also the likelihood of settlement. For example, Bebchuk (1984) has

[1] For example, in his Interim Report to the Lord Chancellor on the civil justice system in England and Wales,Lord Woolf writes,

> "Throughout the common law world there is acute concern over the many problems which exist in the resolution of disputes by the civil courts. The problems are basically the same. They concern the processes leading to the decisions made by the courts, rather than the decisions themselves. The process is too expensive, too slow and too complex." (Woolf, 1995, ch. 2)

[2] Two notable reforms are the adoption of the Civil Justice Reform Act (1990), codified at 28 U.S.C. §471-482, in the U.S. federal courts, and the adoption of the new Civil Procedure Rules (1998) in Britain. Both reforms encourage early judicial involvement in pre-trial stages, and the use of Alternative Dispute Resolution (ADR) mechanisms, like arbitration and mediation. See also the Alternative Dispute Resolution Act (1998), codified at 28 U.S.C. §651-658.

[3] See e.g. Landes (1971), Posner (1973), and Gould (1973).

[4] See for example Bebchuk (1984), Reinganum and Wilde (1986), and Schweizer (1989), for models of pre-trial negotiations under incomplete information.

demonstrated that if the defendant privately knows his liability the probability of settlement would be lowest under the *English* fee shifting rule, according to which the prevailing party is reimbursed for its costs by the loser, and highest under the *American* rule,[5] according to which each party bears its own litigation costs irrespective of the outcome of trial. In between are the *Pro-Plaintiff* rule, which shifts the plaintiff's costs to the defendant whenever the plaintiff prevails, but requires each party to bear its own costs when the defendant prevails,[6] and the *Pro-Defendant* rule which shifts the defendant's costs to the plaintiff whenever the defendant prevails, yet requires each litigant to bear its own costs when the plaintiff prevails. Essentially, the *English* rule maximizes the amount that depends on the trial's outcome, and consequently also maximizes the difference in the expected value of litigating against liable and non-liable defendants. This worsens the adverse selection problem (that is, the likelihood that a defendant who claims to be non liable is actually found liable increases) and consequently also increases the likelihood of litigation.[7] In comparison, the *American* rule decreases the difference between the expected value of litigating against liable and non-liable defendants. Indeed, according to this reasoning, the *Reverse English* rule, by which the winner in trial reimburses the loser for the latter's costs, would result in the highest rate of settlement, even compared to the *American* rule, because it further reduces the difference between the expected value of litigating against liable and non-liable defendants (Kaplow, 1993; and Talley, 1995).

In general, fee-shifting rules may be more complex than the rules described above. In addition to the outcome of the trial, fee allocation may also depend on the early settlement offers made by the litigants.[8] In particular, if one party makes a settlement offer that the other rejects, fee allocation may depend on the relation between the offer made and

[5]For the American attorney fee shifting rule and its history see *Alyeska Pipeline Serv. Co. v. Wilderness Soc'y*, 421 U.S. 240, 247 (1975).

[6]In the U.S. many federal statutes include fee-shifting provisions under which courts may order the defendant to pay the plaintiff fees if the latter prevails. Although some of these statutes allow shifting of attorney fees to the prevailing 'party,' their application is very limited when it is the defendant that prevails. See *Christiansburg Garment v. EEOC* 434 U.D. 412 (1978), holding that a prevailing defendant is to be awarded attorney's fees according to §706(k) of Title VII of the Civil Rights Act of 1967 only when the court finds that the plaintiff's action was frivolous, unreasonable, or without foundation.

[7]For a comprehensive analysis of the effect of outcome based cost allocation rules on the probability of settlement in a model with symmetric information and mutual optimism see Shavell (1982).

[8]Fee shifting may also depend on the margin of victory, or how strong the court perceives the case to be at the end of the trial. See also Bebchuk and Chang (1996) and Rule 11 of the Federal Rules of Civil Procedure.

the eventual judgment. Such rules are often called *offer of judgment* rules. For example, according to Rule 68 of the American Rules of Civil Procedure (FRCP) a defendant may serve upon the plaintiff an offer of judgment that the plaintiff may accept within 10 days. An offer that is not accepted within this time is deemed withdrawn, and if the final judgment obtained by the plaintiff is less favorable than the offer, the plaintiff must pay the defendant all costs, except attorney fees, incurred after the making of the offer. In Britain, Order 22 of the Rules of the Supreme Court (1965) and Order 11 of the County Court Rules (1981), allow a defendant in debt or damages lawsuit to make a payment into court in respect of the claims made against her, serving as a settlement offer which the plaintiff could accept within 21 days. If the plaintiff does not accept the defendant's offer and eventual judgment is larger than the amount offered by the defendant, then the plaintiff has to pay the defendant all costs, including attorney fees, incurred after the time the offer was made.[9] These rules were replaced by Part 36 of the Civil Procedure Rules (1998) (CPR), which supplemented the above provision with a corresponding provision on the plaintiff's side. The plaintiff can now make a settlement offer which the defendant may accept within 21 days. If the defendant does not accept the offer and the eventual judgment is higher, then the defendant must pay an additional interest up to 10% over the judgment amount, including the plaintiff's costs.

Because *offer of judgment* rules have been introduced with the explicit goal of encouraging settlements and avoiding protracted litigation,[10] their effect on the likelihood of settlement has been extensively analyzed yet without producing any clear conclusions.[11] However, attention has mostly been confined to the effect of *offer of judgment* rules on the probability of settlement in cases where the main disagreement between the parties is over the amount to be awarded to the plaintiff. In cases where the main dispute between the parties revolves around the defendant's liability, *offer of judgment* rules can be shown to be either ineffective or to tend to discourage settlements.[12] To see this, note that if the amount that is awarded

[9]When litigation does not concern a claim for a debt or damages (for example, a claim for an injunction), the defendant could still make a non-pecuniary settlement offer, whose effect is to protect the offeror as far as its costs are concerned if the oferee is subsequently held to have unreasonably refused to accept the offer. See *Calderbank v. Calderbank* [1976] Fam. 93 C.A..

[10]See Wright and Miller (1996) § 3001, and Woolf (1996, p. 112).

[11]See e.g. Miller (1986), Rowe and Vidmar (1988), Schwarzer (1992), Anderson (1994), Spier (1994), Anderson and Rowe (1995), Rowe and Anderson (1996), Chung (1996), Hylton (1996), and Farmer and Pecorino (2000).

[12]We are aware of only three relevant studies. Farmer and Pecorino (2000) examined the effect of Rule 68 on the probability of settlement when the defendant holds private information concerning her liability and the actual judgment in case the plaintiff prevails is uncertain. This setting allows for judgment variability both

to the plaintiff when he prevails is fixed in advance, then he may refuse any offers lower than this amount without triggering a change in the fee-shifting rule. The rule can only be triggered when the defendant prevails in trial. When the background rule is given by the *English* rule, the plaintiff must reimburse the defendant if the latter prevails anyway, so an *offer of judgment* rule cannot change the fee allocation nor can it affect the probability of settlement. When the background rule is given by the *American* rule, then any positive offer of judgment, be it small as it may, would change the fee allocation rule to a *Pro-Defendant* rule. A defendant would therefore rationally offer such a *sham* offer, and as explained above, the resulting *Pro-Defendant* rule would lead to a lower rate of settlement.

Interestingly, a similar reasoning lead the U.S. Supreme Court to hold that Rule 68 has no application when the defendant prevails on trial. In *Delta Airlines v. August*[13] a plaintiff filed a complaint against a defendant, alleging she was discharged from her position as a flight attendant solely because of her race. The plaintiff sought reinstatement, approximately $20,000 in backpay, attorney's fees, and costs. A few months after the complaint was filed, the defendant made a formal offer of judgment to the plaintiff in the amount of $450. The offer was rejected, the case was tried, and the plaintiff lost. In refusing to apply Rule 68 the court reasoned that:

> "The purpose of Rule 68 is to encourage the settlement of litigation. In all litigation, the adverse consequences of potential defeat provide both parties with an incentive to settle in advance of trial. Rule 68 provides an additional inducement to settle in those cases in which there is a strong probability that the plaintiff will obtain a judgment but the amount of recovery is uncertain."[14]

In this paper we explore the effect of alternative fee shifting rules on the probability of settlement when the defendant's liability is under dispute. Using a mechanism design approach we demonstrate that the probability of settlement is maximized by a rather straightforward mechanism which we call a *Pleadings* mechanism. Such a mechanism allows the defendant to plead liable or not. Following the defendant's pleading, the mechanism does two things. First, it sets a fee allocation rule, which is a function of the defendant's pleading and the outcome of the trial. Second, it fixes a proposed settlement that depends on the defendant's

on the liability and the damages issues. In this setting they show that Rule 68 may encourage settlement. Spier (1994) and Chung (1996) both consider the effect of Rule 68 on the probability of settlement when only the defendant's liability is disputed, and conclude that it may discourage settlement.

[13] 450 U.S. 346.

[14] *Id.* at 352.

pleading, which the plaintiff may either accept or reject. When the background fee allocation rule is given by the *American* rule, the probability of settlement is maximized by requiring the plaintiff to bear both litigants' costs if the defendant has admitted liability, irrespective of the outcome of the trial; and by applying the *Pro-Plaintiff* rule in the event that the defendant has denied liability. If the defendant has acknowledged her liability, the settlement offered to the plaintiff should be set so as to make the plaintiff indifferent between participating in the mechanism and insisting on taking the case to court (where costs are allocated according to the *American rule).* If the defendant has denied her liability, the settlement offer should be set equal to the defendant's litigation costs.

This result extends the literature on optimal fee shifting rules, which consists mainly of Spier (1994).[15] While this was not the focus of her analysis, Spier (1994) claimed that in cases of disputed liability the probability of settlement is maximized by allowing the litigants to opt for the *English* rule. The reason that Spier's result is different from ours is that she assumed that plaintiffs could be "forced" to litigate, thereby exerting pressure on liable defendants to admit their liability. However, if, as we assume here, plaintiffs may choose whether to litigate after a settlement offer was made, then an additional constraint, which we call the *credibility* constraint, should be added into the analysis. This credibility constraint turns out to be binding in the optimal solution in a way that affects the optimal mechanism. Intuitively, when the defendant does not acknowledge her liability the fee shifting rule must be as favorable as possible for the plaintiff, so as to provide a *credible* threat of litigation even in instances in which there is a low ex-ante probability that the defendant is liable. In contrast, when the defendant admits her liability litigation should be discouraged and the defendant should be rewarded for her willingness to admit her responsibility. The idea is to strike an optimal balance between the plaintiff's threat to litigate on the one hand, and the defendant's willingness to acknowledge liability and avoid protracted litigation, on the other.

The *English rule* does just the opposite of what was described above. It penalizes the defendant for admitting liability by allowing the plaintiff to then threaten her with increased litigation costs, and it sanctions the plaintiff in the event that the defendant denies her liability and then prevails in court, making litigation riskier for the plaintiff.[16]

[15] Our analysis is also related to the literature on optimal auditing (see, e.g., Mookherjee and Png (1989) and the references therein) because the probability of a trial plays a similar role to the probability of a costly audit. However, we consider the use of different instruments (fee-shifting) to maximize a different objective function (the probability of settlement) under somewhat different constraints.

[16] Spier acknowledges that the English Rule may not be optimal in practice because in practice it is applied

Furthermore, our analysis demonstrates that fee shifting rules alone do not suffice to maximize the probability of settlement and that active involvement of the court in the form of generating settlement offers is also required. This insight is somewhat obscured in Spier's analysis due to her focus on cases where judgment amounts are under dispute, especially in relation to current Rule 68 which is based on the defendant's settlement offer. By initiating settlement offers that depend on the defendant's pleading the court can affect the relative bargaining power of the two parties. It is thus able to "reward" a defendant who admits her liability by setting the settlement as low as possible, and "punish" a defendant who denies her liability by setting the settlement as high as possible. Our analysis thus supports the universal inclination of civil justice reformers to encourage active participation of judges in settlement negotiations.[17]

The rest of the paper is organized as follows. In Section 2 we present the basic model and analyze a simple example. Then, in Section 3, we derive the cost allocation rule that maximizes the probability of settlement when the defendant's liability is disputed. Next, in Section 4 we consider several extensions of the basic model including allowing for court inaccuracy, different background rules, and variable shares of costs shifted. We also derive the optimal cost allocation rule under the additional constraint that the level of deterrence should be held fixed. Section 5 concludes. All proofs are relegated to the Appendix.

2. The Basic Model: Description and Motivation

We consider the following situation. A risk-neutral plaintiff sues a risk-neutral defendant for damages that are normalized to one. If the case proceeds to trial and the defendant is found liable she has to pay the plaintiff the entire sum of damages, whereas if she prevails she does not have to pay anything. Both the plaintiff and the defendant incur litigation costs, denoted $c^P, c^D \geq 0$, respectively. Total litigation costs are denoted by $c \equiv c^P + c^D$. Unless otherwise specified we assume that the court follows the *American* rule for allocating costs. That is, in either case, whether the court finds the defendant liable or not, each litigant bears his or her own litigation costs.[18]

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whether or not settlement offers are made, whereas her analysis assumed that the background rule is given by the American Rule. Our analysis provides a different rational for the suboptimality of the English rule. Namely, the fact that it violates our "credibility" constraint.

[17] For a critique of early and active invovlement of judges in pre-trial stages see Resnik (1982).

[18] The implications of relying on different background rules for the allocation of costs are discussed in Section 4.3 below.

The defendant knows whether she is liable or not, and it is initially assumed that the defendant's liability can be *precisely* determined in trial (in section 4.1 below we relax this assumption and allow for court error). Yet, before the end of trial no one except the defendant herself knows for sure whether the defendant is liable or not. We denote the (ex-ante) probability that the plaintiff assigns to the defendant being liable by $0 \leq p \leq 1$. For simplicity, we assume that the plaintiff's belief, p, is commonly known.

The plaintiff and defendant may settle the case before it goes to trial, and save their litigation costs. Assume for simplicity the following form of pre-trial negotiations: the defendant makes a binding take-it-or-leave-it settlement offer s. The plaintiff either agrees to settle or not. If the plaintiff refuses the defendant's settlement offer, the case proceeds to court where the litigants' costs are allocated according to the *American rule.*

Among all possible sequential equilibria of this simple game, only one satisfies the following weak negotiation proofness refinement: Whenever the parties should proceed to court, there should not exist any settlement offer that both liable and non liable defendants as well as the plaintiff, given his updated beliefs, all strictly prefer to proceeding to trial. Take-it-or-leave-it bargaining makes little sense without this refinement, both in the context of the simple game described above, and more generally.

In equilibrium a non liable defendant offers to settle for c^D; a liable defendant offers to settle for c^D with some positive probability $\left(\text{given by } \frac{(1-p)c}{p(1-c)}\right)$ and for $1 - c^P$ with the complimentary probability; the plaintiff always agrees to settle for $1 - c^P$, and upon receiving an offer to settle for c^D, he proceeds to court with a positive probability (given by $1 - c$), and he agrees to settle with the complimentary probability. Thus, along the equilibrium play path, the plaintiff always settles with a defendant who admits her liability by offering to settle for $1 - c^P$. As for a defendant who essentially denies her liability by making a low settlement offer, the plaintiff settles with her with some positive probability less than 1. This probability is such that a liable defendant is indifferent between admitting her liability and denying it.[19] This equilibrium suggests that the ex-ante probability of settlement would increase if liable defendants could be rewarded for admitting their liability, and sanctioned for denying it.

To encourage a liable defendant to admit her liability she may be rewarded both by a favorite fee-shifting rule and by a low settlement offer. The maximum cost that may be

[19]To complete the definition of the equilibrium, suppose that the plaintiff believes that any settlement offer that is different from either c^D or $1 - c^P$ is made by a liable defendant. Therefore, upon recieving such an offer, the plaintiff proceeds to trial if and only if the offer is below $1 - c^P$, and agrees to settle otherwise.

imposed on the plaintiff after he takes the case to court is the sum of the litigants' litigation costs, c. Consequently, the high settlement offer cannot be set lower than $1 - c$. In fact, it may be necessary to set the high settlement offer strictly higher than $1 - c$, because the plaintiff must be willing to opt into the mechanism and therefore his expected payoff must not be lower than what it would be if he were to proceed to trial against all defendants under the *American* rule, namely $p - c^p$.

To discourage a liable defendant from denying her liability the low settlement offer must be set as high as possible, and the fee allocation rule must penalize the liable defendant. However, since the sanction through fee allocation is only implemented trial, the plaintiff must be given sufficient encouragement to litigate in order to ensure that the probability that the sanction is exercised is sufficiently high. To achieve this aim, cost allocation may favor the plaintiff not only when he prevails but also when he loses. Below, we show that after the defendant has denied her liability, it is optimal to allocate litigation costs according to the *Pro-Plaintiff* rule, and to set the lower settlement equal to c^D.[20]

Assuming that the background rule is given by the *American* rule, and that both litigants must opt into the settlement mechanism, the intuitive considerations described above suggest that the unique equilibrium under the following *pleadings* mechanism is a practicable way for generating a higher ex-ante likelihood of settlement than the specific equilibrium under the particular negotiation game described above:

The litigants are given the choice to opt into the mechanism. If both choose to do so, the defendant is asked to plead whether she is liable or not. If she denies her liability, the plaintiff is offered to settle for c^D, whereas if the defendant admits her liability, the plaintiff is offered to settle for $\max\left\{\frac{p-c+pc^P c^D}{p-c+pc^P}, 1-c\right\}$ (this is the lowest amount that would ensure that the plaintiff gets his expected litigation payoff, $p - c^P$, without inducing him to proceed to trial). If the plaintiff accepts the settlement offer then it is binding on both parties. If the plaintiff refuses the offer, the case continues to trial where the allocation of litigation costs between the litigants assumes the following form: If the defendant admitted her liability, then all litigation costs are shifted to the plaintiff. If the defendant denied her liability, then litigation costs are allocated according to the *pro-plaintiff* rule.

The following table describes the proposed *pleadings* mechanism:

[20]Note that c^D is the upper bound on what a non liable defendant who may insist that the case is litigated under the *American* rule, would be willing to settle for.

	Defendant admitted liability	Defendant denied liability
Settlement	$S = \max\left\{\frac{p-c+pc^P c^D}{p-c+pc^P}, 1-c\right\}$	$S = c^D$
Defendant found liable	All costs shifted to plaintiff	All costs shifted to defendant
Defendant found not liable	All costs shifted to plaintiff	Each litigant bears its own costs

The probability of settlement under the proposed *pleadings* mechanism is equal to $\min\left\{\frac{p\left(p-c^D\right)}{(p+pc^P-c)}, \frac{p+c-p(c+c^D)}{1-c^D}\right\}$ compared to p under the simple bargaining equilibrium described above. Figure 1 depicts the probability of settlement under the pleadings mechanism and the simple negotiation game for different values of $1 \geq p \geq c$ for the case where $\frac{c}{2} = c^P = c^D = 0.2$.[21] The graph looks qualitatively similar for other values of c, c^D, and c^P as well.

[Figure 1]

The next section shows that the intuitive considerations presented here capture all the important aspects of the problem. Indeed, the *pleadings* mechanism described above is not only better than the particular negotiation game that precedes it, but the best in a large class of "practicable" negotiation procedures.

3. The Basic Model: General Analysis

We are interested in the question of what combination of pre-trial bargaining procedure and fee-shifting rule, which together we call a fee-shifting mechanism, maximizes the (ex-ante) probability of settlement.

We say that a fee-shifting mechanism is *practicable* if in addition to the restrictions imposed by the fee-shifting rule it also satisfies the following three constraints:[22]

Voluntary Participation. The litigants may not be made worse off relative to their situation if the case is litigated to judgment and costs are allocated according to the *American rule.* It follows that a practicable mechanism must ensure that a liable defendant does not pay more than $1 + c^D$ in expectation, that a non liable defendant does not pay more than c^D in expectation, and that the plaintiff is paid an expected sum of at least $p - c^P$.

[21] As we show below, the probability of settlement can be set equal to 1 for values of $p < c$.

[22] True practicability would require additional restrictions, some of which are difficult to express formally. However, as will become clearer below, the *pleadings* mechanism which forms the center of our analysis is practicable also according to some such more demanding notions of practicability.

Credibility. The plaintiff cannot be forced to litigate. He should always have the option to drop the case, or to settle for the lowest possible settlement offer specified by the mechanism. The importance of this constraint stems from the fact that it is possible (but not practicable) to increase the ex-ante likelihood of settlement by *forcing* the plaintiff to proceed to trial in some circumstances.

Renegotiation Proofness. Whenever according to the mechanism the parties should proceed to court, there should not exist any settlement offer that both liable and non liable defendants as well as the plaintiff, given his updated beliefs, all strictly prefer to proceeding to trial.[23]

We distinguish among the following three categories of cases: (1) $p < c^P$, (2) $c^P \leq p \leq c$, and (3) $c < p$. Cases in category (1) are characterized by their negative ex-ante value to the plaintiff if he insists on taking the case to court. In such cases, the defendant, who is assumed to know p, may simply refuse to negotiate with the plaintiff, (rationally) expecting the plaintiff to drop the suit.[24] Cases in category (2) have a positive expected value for the plaintiff but the defendant may still credibly refuse to pay the plaintiff more than the suit's nuisance value, which is equal to the defendant's expected litigation costs. In particular, the following procedure ensures a settlement: for cases in category (1), settle for $s = 0$; and for cases in category (2), settle for some $s \in \left[p - c^P, c^D\right]$. For all cases in categories (1) and (2), the plaintiff as well as both types of the defendant would (rationally) prefer to settle for s than to insist on taking the case to court. Therefore, for the rest of this paper, we confine our attention to the more interesting category of cases, where $c < p$.

Consider the following type of mechanism which we call a *pleadings* mechanism. The plaintiff and the defendant are given the choice to opt into the mechanism. If they choose to do so, the defendant is asked to plead whether she is liable or not. Based on the defendant's pleading the plaintiff is offered a settlement amount, which, if accepted, would be binding on both parties. If the plaintiff refuses the offer, the case continues to trial and the allocation of litigation costs between the litigants is fixed according to the outcome of the trial and the defendant's pleading. A *pleadings* mechanism is thus characterized by three instruments $\left\langle \underline{s}, \overline{s}, c^D(\cdot,\cdot)\right\rangle$: "high" and "low" settlement offers, denoted $\overline{s}$ and $\underline{s}$, that are made by the

[23]This restriction represents a rather weak notion of renegotiation proofness. A stricter notion may require only that there does not exist a settlement offer that the plaintiff and either liable or non liable defendents prefer to proceeding to trial.

[24]See Rosenberg and Shavell (1985), Bebchuk (1988, 1996), and Katz (1990), for descriptions of various settings in which plaintiffs may still extract positive settlements in such cases.

court after the defendant enters a pleading of liable or not, respectively, and a fee-shifting rule $0 \leq c^D(\cdot,\cdot) \leq c$ that specifies the part of litigation costs to be borne by the defendant as a function of her pleading and the outcome of the trial.[25] The plaintiff is required to bear the rest of the costs, $c^P(\cdot,\cdot) = c - c^D(\cdot,\cdot)$.

We obtain the following main result,

Proposition 1. *If*

$$p \geq \frac{c^2}{c^2 + c^D - (c^D)^2},$$

then the a pleadings mechanism with $\underline{s} = c^D$, $\overline{s} = \frac{p-c+pc^P c^D}{p-c+pc^P}$, *and a fee-shifting rule according to which all costs are shifted to the plaintiff if he proceeds to trial after the defendant pleaded liable, and allocated according to the pro-plaintiff rule if the defendant pleaded not liable, maximizes the likelihood of settlement among all practicable mechanisms.*

A couple of remarks are in order. First, recall that for the case where $p \leq c$, settlement can be ensured. For the case where $p \geq \frac{c^2}{c^2+c^D-(c^D)^2}$, the *pleadings* mechanism described in the proposition is optimal, and for the case where $c < p < \frac{c^2}{c^2+c^D-(c^D)^2}$, it is not optimal. To appreciate how strong is the restriction on the values of p, c, and c^D, that is implied by the proposition, we depict these three ranges under the assumption that the defendant's and plaintiff's litigation costs are equal in the figure below.[26]

[Figure 2]

Second, it can be verified that the likelihood of settlement under the pleadings mechanism described in the proposition is decreasing in $\overline{s}$. The parameter $\overline{s}$ is thus set as low as possible given the plaintiff's voluntary participation constraint. In the "problematic" range where $c < p < \frac{c^2}{c^2+c^D-(c^D)^2}$, this calls for setting $\overline{s}$ below $1 - c$. If the plaintiff could be forced to settle in this case, then the pleadings mechanism that is described in the proposition would be optimal among all practicable mechanisms whenever $p \geq c$ (that is, the plaintiff's voluntary participation constraint would be satisfied in all such cases). The problem however is that if $\overline{s}$ is less than $1 - c$, then the plaintiff is better off proceeding to trial after the defendant admits liability, which changes the defendant's incentive to admit liability and destroys the mechanism's optimality. It is natural in this case to replace the pleadings mechanism

[25] **Discuss DECOUPLING.**

[26] For values of the parameters that satisfy $\frac{c^2}{c^2+c^D-(c^D)^2} \leq p \leq c$ the pleadings mechanism described in the propositon coincides with the mechanism that ensures settlement described above.

described in the proposition with another where $\overline{s}$ is set equal to $1-c$, but unfortunately, such a mechanism is not optimal, and the closer p is to c, the bigger the difference between the ex-ante probability of settlement under this mechanism and under the optimal practicable mechanism.[27]

The full proof of the proposition is relegated to the appendix. Here we provide part of the intuition. First, we note that the pleadings mechanism described in the statement of the proposition is indeed practicable. Because both the defendant and plaintiff may opt out of the mechanism, it satisfies the constraint of voluntary participation. Credibility follows immediately upon observing that by the rules of the *pleadings* mechanism, the plaintiff may always settle for a non negative amount rather than proceed to trial. Finally, inspection of the formal description of the renegotiation proofness constraint in the appendix reveals that it is satisfied by setting the low settlement offer $\underline{s}$ equal to c^D.

The proof proceeds as follows. Any equilibrium under any mechanism induces: (i) probabilities with which the two types of the defendant settle, denoted $q(N)$ and $q(L)$, respectively; (ii) expected settlements for each of the two types of the defendant, denoted $s(N)$ and $s(L)$, respectively;[28] and (iii) expected shares of the total legal costs to be born by the defendant depending on the defendant's type and outcome of the trial, denoted $\widehat{c}^D(N,N)$, $\widehat{c}^D(N,L)$, $\widehat{c}^D(L,N)$, and $\widehat{c}^D(L,L)$, respectively. The equilibrium where the ex-ante probability of settlement is maximized among all equilibria under all practicable mechanisms may thus be characterized as the solution to the following constrained optimization problem:

$$\max_{s(\cdot),q(\cdot),\widehat{c}^D(\cdot,\cdot)} pq(L) + (1-p)\,q(N)$$

subject to the constraints that are implied by voluntary participation, credibility, and renegotiation proofness, together with an additional incentive compatibility constraint that ensures

[27]The following point may be better appreciated after looking at the first part of the proof of the proposition. The problem is that our notion of practicability is "missing a constraint." In the same way that credibility requires the plaintiff to be willing to proceed to trial when called to, we should also have a constraint that the plaintiff be willing to settle when asked to. The problem is that we cannot specify such a constraint in our framework because it only allows the specification of *expected* settlement as a function of the defendent's type, but the plaintiff should be willing to settle after each one of the possible settlement offers.

[28]Specifically, we restrict our attention to the case where, in addition, it is assumed that

$$\begin{aligned} s(L) &\leq 1+c \\ s(N) &\leq 1. \end{aligned}$$

We make use of this assumption in Step 6 in the proof of the Proposition 1 in the appendix.

that the solution is indeed induced by some equilibrium of some mechanism. In the proof we explicitly solve this constrained optimization problem and demonstrate that the unique equilibrium under the pleadings mechanism described in the statement of Proposition 1 achieves the same expected probability of settlement. Hence it is optimal among all practicable mechanisms.

4. Extensions of the Basic Model

4.1. Uncertain Trial Outcomes

We relax the assumption that the defendant's liability can be precisely determined in court. Suppose that the court may err, so that with probability e_1 it rules in favor of a liable defendant, and with probability e_2 it rules against a non liable defendant.

We obtain the following general result.

Proposition 2. *Suppose that e_1 and e_2 are "close" to 0. If p is "sufficiently large" relative to the litigants' costs, then a pleadings mechanism with $\underline{s} = c^D + e_2$, and a fee-shifting rule according to which all costs are shifted to the plaintiff if he proceeds to trial after the defendant pleaded liable, and allocated according to an approximate pro-plaintiff rule if the defendant pleaded not liable, maximizes the likelihood of settlement among all practicable mechanisms. Specifically, if the defendant pleaded not liable but was found liable in court she has to bear the entire legal costs of both parties; however, if she was indeed declared not liable in court, she only has to bear what is approximately her own cost $\frac{c^D - ce_2}{1-e_2}$.*

Two remarks are in order. First, the proof of the proposition only applies to values of e_1 and e_2 are "sufficiently close" to 0, yet, numerical analysis indicates that the result holds for all values of $0 \leq e_1 < 1 - e_2 \leq 1$. Second, the restriction that p be sufficiently large relative to the litigants' costs and the specific value of $\overline{s}$ are both approximately equal to their values in the statement of Proposition 1. However, under the more general treatment here, they cannot be given a simple expression and for this reason are not explicitly stated.

4.2. Share of Costs to be Shifted

American law distinguishes for the purpose of fee-shifting between attorney fees and other litigation costs. Attorney fees are allocated according to the American fee allocation rule, by which each party bears its attorney fees irrespective of the outcome of the trial.[29] As for other costs, they are shifted to the loser according to Rule 54(d) of the FRCP.[30] In general, Rule 68 does not apply to attorney fees, but only to other litigation costs.[31] Due to a large extent to its narrow application, Rule 68 has rarely been invoked and is generally believed to have had little effect. Proposals to amend it recommend that attorney fees also be included in the cost shifting triggered by the Rule.[32]

Our analysis indeed proves that the larger the share of litigation costs that the court can shift between the parties, the higher the probability of settlement under the optimal and other mechanisms. This is due to the following reason: suppose that the court is allowed to shift a share $0 \leq r \leq 1$ of total litigation cost c. Thus the minimal and maximal costs that may be born by the plaintiff and the defendant are given by $(1-r)\,c^P$ and $c^P + rc^D$ and $(1-r)\,c^D$ and $c^D + rc^P$, respectively. The fee-shifting constraint in the appendix then becomes

$$\begin{aligned} c^P(\cdot,\cdot) &= c - \widehat{c}^D(\cdot,\cdot) \\ (1-r)\,c^D &\leq \widehat{c}^D(\cdot,\cdot) \leq c^D + rc^p. \end{aligned}$$

Increasing r from 0 to 1 relaxes this constraint and therefore (weakly) increases the value of the objective function, namely, the ex-ante probability of settlement.[33]

[29]For the American attorney fee shifting rule and its history see *Alyeska Pipeline Serv. Co. v. Wilderness Soc'y*, 421 U.S. 240, 247 (1975).

[30]See also 28 U.S.C. ss. 1920 and 1923, specifying the costs that may be taxed in the federal courts. Rule 68 applies only to these costs. *See Thomas v. Caudill*, (D.C. Ind. 1993), 150 F.R.D. 147.

[31]For this interpretation of Rule 68, and the exception to this interpretation under some Fee-Shifting statutes see *Marek v. Chesny,* 473 US 1 (1985).

[32]See Preliminary Draft of Proposed Amendments to the Federal Rules of Civil Procedure, 1983, 98 F.R.D. 339, 361-367; Preliminary Draft of Proposed Amendments to the Federal Rules of Appellate Procedure, Federal Rules of Civil Procedure, Federal Rules of Criminal Procedure and Rules Governing Section 2255 Proceedings in the United States District Courts, 1984, 102 F.R.D. 407, 432-437. ****CHECK***

[33]Theoretically, the ratio of cost to be shifted can also be set higher than 1, implying the possibility of sanctioning a litigant beyond cost shifting. Indeed, under Rule 36.1 of the English Civil Procedure Rules the court may order a defendant who was held liable for more than a settlement the plaintiff previously proposed to pay the plaintiff up to 10% of any sum of money awarded to the plaintiff, *in addition* to the plaintiff's costs. CHECK!!!

Our analysis is restricted to fee shifting. It can be shown that by setting r sufficiently high or low, it is always possible to force the litigants to settle.

4.3. Accounting for Fairness and Deterrence

The discussion so far has assumed that the sole objective of the mechanism is to maximize the probability of settlement. Litigation, however, should serve the primary goals of deterrence and justice. A social planner should aspire not to minimize litigation costs but to maximize social welfare, taking the costs and benefits of primary behavior and fairness considerations into account.[34] Although such a broad analysis is beyond the scope of this paper, we suggest here how the goals of deterrence and fairness may be incorporated into the model, and their possible effect on the optimal fee allocation rule. We do so by imposing an additional *deterrence* constraint that requires the difference between a liable defendant's and a non-liable defendant's expected losses not to be lower than the amount of damages, one.

Proposition 3. *The following pleadings mechanism maximizes the likelihood of settlement among all practicable mechanisms that satisfy the deterrence constraint. All costs are shifted to the plaintiff if he proceeds to trial after the defendant pleaded liable. If the defendant pleaded not liable, then costs are allocated according to the following rule: if* $p \geq \frac{c^D}{c}$*, then costs are allocated according to the English rule; and if* $p < \frac{c^D}{c}$*, then if the defendant was found liable in court she has to pay the entire litigation costs* c*, and if she was not found liable, then she has to bear a cost equal to* $\underline{s} < c^D$*. Analogously, if* $p \geq \frac{c^D}{c}$*, then the low settlement offer* $\underline{s}$ *is equal to zero, and the high settlement offer* $\overline{s}$ *is equal to one; and if* $p < \frac{c^D}{c}$*, then the low settlement offer is equal to some* $\underline{s} \in \left(0, c^D\right)$*, and the high settlement offer is equal to* $\overline{s} = 1 + \underline{s}$*.*

Intuitively, accounting for deterrence requires that the differences between the expected payoffs of liable and non liable defendants be as large as possible. This makes the *English* rule optimal. The binding constraint turns out to be the plaintiff's voluntary participation. If $p \geq \frac{c^D}{c}$ (that is when p is "large" which implies that the defendant is likely to be found liable in trial), the expected payoff to the plaintiff under the *English* rule is larger or equal than under the background *American* rule and so the *English* rule is optimal. However, if $p < \frac{c^D}{c}$ (that is when p is "small" which implies that the defendant is likely to be found not liable in trial), the expected payoff to the plaintiff under the *English* rule is smaller than under the background *American* rule, and so both the settlement offers and the *English* rule have to be further distorted in favor of the plaintiff to ensure his voluntary participation.

[34] See for example Polinsky and Rubinfeld (1988), Spier (1994), and Shavell (1997).

4.4. Alternative Background Cost Allocation Rules

The next proposition characterizes the optimal mechanism when the background rule for the allocation of costs is given by the English rule.

Proposition 4. *Suppose that the background rule is given by the English rule. If p is "sufficiently large" relative to the litigants' costs, then a pleadings mechanism with $\underline{s} = 0$, and a fee-shifting rule according to which all costs are shifted to the plaintiff if he proceeds to trial after the defendant pleaded liable, and allocated according to the English rule if the defendant pleaded not liable, maximizes the likelihood of settlement among all practicable mechanisms.*

Another interesting question to which the next proposition provides a partial answer is how different background rules compare in terms of their induced optimal probabilities of settlement.

Proposition 5. *A background rule that makes the defendant relatively worse off when she prevails and relatively better off when she loses induces a higher or equal ex-ante optimal probability of settlement.*

We may thus rank different background rules according to their induces optimal probabilities of settlement. In particular, it follows that the American background rule induces a larger or equal optimal probability of settlement than the English background rule.[35]

5. Conclusion

In their effort to reduce the volume of litigation reformers of modern legal systems have often sought to facilitate settlements both by encouraging active court participation in settlement negotiations, and by changing the allocation of litigation costs. This paper proposes a unified view of these measures, suggesting that when the main disputed issue between the parties concerns the defendant's liability, both measures should be combined: courts should both initiate settlement offers and determine cost allocation rules as a function of the defendant's pleadings. In order to encourage liable defendants to step forward and admit their liability they should be rewarded for doing so with a generous settlement offer and a favorable fee allocation rule. In order to discourage defendants from denying their liability, upon doing

[35] In the same way, the 'reverse' English background rule induces a larger or equal optimal probability of settlement than the American background rule (Talley, 1995).

so they should be offered a high settlement offer and an unfavorable fee allocation rule. Furthermore, plaintiffs must be encouraged to pose a credible threat to litigate following such denial. We demonstrate that the optimal way to provide such incentives is through our proposed *Pleadings* mechanisms.

Appendix

Proof of Proposition 1 The proof is divided into two parts. In part 1, we explicitly solve for the equilibrium probabilities of settlement, settlement offers, and fee shifting rule that maximizes the ex-ante probability of settlement. In part 2, we show that the unique equilibrium under the *pleadings* mechanism that is described in the statement of the proposition induces the same probabilities of settlement. It follows that this *pleadings* mechanism maximizes the likelihood of settlement among all practicable mechanisms.

As explained above, we are interested in solving the following constrained optimization problem:

$$\max_{s(\cdot),q(\cdot),\widehat{c}^D(\cdot,\cdot)} pq(L) + (1-p)\,q\,(N)$$

subject to the following series of constraints: Two incentive compatibility constraints for the two types of the defendant. These IC constraints ensure that the obtained solution to the optimization problem $\langle s\,(\cdot)\,, q\,(\cdot)\,, \widehat{c}^D\,(\cdot,\cdot)\rangle$ is indeed induced by some equilibrium under some mechanism. Their violation implies that at least one type of the defendant may profitably mimic the other type's behavior, undermining the equilibrium.

$$q\,(N)\,(-s\,(N)) + (1-q\,(N))\left(-\widehat{c}^D\,(N,N)\right) \geq q\,(L)\,(-s\,(L)) + (1-q\,(L))\left(-\widehat{c}^D\,(L,N)\right), \tag{ICN}$$

$$q\,(L)\,(-s\,(L)) + (1-q\,(L))\left(-1-\widehat{c}^D\,(L,L)\right) \geq q\,(N)\,(-s\,(N)) + (1-q\,(N))\left(-1-\widehat{c}^D\,(N,L)\right). \tag{ICL}$$

Three voluntary participation constraints for the two types of the defendant and the plaintiff.

$$q\,(N)\,(-s\,(N)) + (1-q\,(N))\left(-\widehat{c}^D\,(N,N)\right) \geq -c^D, \tag{VPN}$$

$$q\,(L)\,(-s\,(L)) + (1-q\,(L))\left(-1-\widehat{c}^D\,(L,L)\right) \geq -1-c^D, \tag{VPL}$$

$$\begin{aligned} & p\left[q\,(L)\,s\,(L) + (1-q\,(L))\left(1-c^P\,(L,L)\right)\right] \\ & +(1-p)\left[q\,(N)\,s\,(N) + (1-q\,(N))\left(-c^P\,(N,N)\right)\right] \\ \geq\;\; & p - c^P. \end{aligned} \tag{VPP}$$

The credibility constraint, which requires that conditional on going to trial the expected payment to the plaintiff conditional on his updated beliefs must be larger or equal than the expected low settlement offer.

$$\frac{(1-p)\,(1-q\,(N))\left(-c^P\,(N,N)\right)}{(1-p)\,(1-q\,(N)) + p\,(1-q\,(L))} + \frac{p\,(1-q\,(L))\left(1-c^P\,(L,L)\right)}{(1-p)\,(1-q\,(N)) + p\,(1-q\,(L))} \geq S(N). \tag{CR}$$

The constraints imposed by fee-shifting, namely that the court may only divide the total cost between the defendant and the plaintiff. It cannot "punish" or "reward" the parties through any other means. Obviously, allowing it to do so would greatly enhance its power to enforce settlement.

$$\begin{aligned} c^P(\cdot,\cdot) &= c - \widehat{c}^D(\cdot,\cdot), \\ 0 &\leq \widehat{c}^D(\cdot,\cdot) \leq c. \end{aligned} \tag{Fee-Shifting}$$

As explained above, renegotiation proofness requires that there does not exist a settlement offer $\widehat{s}$ that the plaintiff and both types of the defendant all strictly prefer to proceeding to trial given the updated probabilities. Namely, there does not exist a number $\widehat{s}$ such that the expected payoff to the plaintiff given his beliefs if he proceeds to trial is smaller than $\widehat{s}$, or

$$\frac{(1-p)(1-q(N))\left(-c^P(N,N)\right)}{(1-p)(1-q(N))+p(1-q(L))} + \frac{p(1-q(L))\left(1-c^P(L,L)\right)}{(1-p)(1-q(N))+p(1-q(L))} < \widehat{s},$$

and the expected payoff to both types of the defendant if the case proceeds to trial are larger than $\widehat{s}$, or

$$1+\widehat{c}^D(L,L), \widehat{c}^D(N,N) > \widehat{s}.$$

Since by assumption $c<1$, it follows that $1+\widehat{c}^D(L,L) \geq \widehat{c}^D(N,N)$ and the preceding three inequalities may be replaced by the next one:

$$\frac{(1-p)(1-q(N))\left(-c^P(N,N)\right)}{(1-p)(1-q(N))+p(1-q(L))} + \frac{p(1-q(L))\left(1-c^P(L,L)\right)}{(1-p)(1-q(N))+p(1-q(L))} \geq \widehat{c}^D(N,N) \tag{RP}$$

1. Solving for the Best Equilibrium under any Practicable Mechanism

Step 0: Observe that setting $q(N)=q(L)=1$ is not feasible. Inspection of the constraints reveals that it implies $c \geq p$, a contradiction.

Step 1: Inspection of the constraints reveals that setting $\widehat{c}^D(L,N) = \widehat{c}^D(N,L) = c$, i.e., as high as possible, relaxes the constraints. Intuitively, "lying" is penalized. We may therefore simplify the constraints as follows:

$$q(N)\left(s(N)-\widehat{c}^D(N,N)\right) \leq q(L)(s(L)-c)+c-\widehat{c}^D(N,N) \tag{ICN}$$

$$q(N)(1+c-s(N)) \leq q(L)\left(1+\widehat{c}^D(L,L)-s(L)\right)+c-\widehat{c}^D(L,L) \tag{ICL}$$

$$q\left(N\right)\left(s\left(N\right)-\widehat{c}^{D}\left(N,N\right)\right)+\widehat{c}^{D}\left(N,N\right)\leq c^{D} \tag{VPN}$$

$$q\left(L\right)\left(s\left(L\right)-1-\widehat{c}^{D}\left(L,L\right)\right)\leq c^{D}-\widehat{c}^{D}\left(L,L\right) \tag{VPL}$$

$$\frac{\left(1-p\right)q\left(N\right)\left(s\left(N\right)+c-\widehat{c}^{D}\left(N,N\right)\right)-p\widehat{c}^{D}\left(N,N\right)+p\widehat{c}^{D}\left(L,L\right)+\widehat{c}^{D}\left(N,N\right)-c^{D}}{p\left(1+\widehat{c}^{D}\left(L,L\right)-s\left(L\right)-c\right)}\geq q\left(L\right) \tag{VPP}$$

$$\frac{\left(1-p\right)q\left(N\right)\left(s(N)+c-\widehat{c}^{D}\left(N,N\right)\right)-p\widehat{c}^{D}\left(N,N\right)+p\widehat{c}^{D}\left(L,L\right)+\widehat{c}^{D}\left(N,N\right)+p-c-s(N)}{p\left(1+\widehat{c}^{D}\left(L,L\right)-s(N)-c\right)}\geq q\left(L\right) \tag{CR}$$

$$\frac{\left(1-p\right)q\left(N\right)c-p\widehat{c}^{D}\left(N,N\right)+p\widehat{c}^{D}\left(L,L\right)+p-c}{p\left(1+\widehat{c}^{D}\left(L,L\right)-c-\widehat{c}^{D}\left(N,N\right)\right)}\geq q\left(L\right) \tag{RP}$$

Step 2: Intuitive considerations suggest that IC1 and VP2 are not binding in the optimal solution.[36] We therefore solve a relaxed problem without these constraints. At the end, we verify that the solution obtained indeed satisfies these constraints.

Step 3: Inspection of the constraints reveals that under the optimal solution, IC2 must be binding. To establish this, we note, first, that the optimal solution must be such that $q(N)<1$. Assuming otherwise and plugging $q(N)=1$ into IC1 and IC2 implies

$$s\left(N\right)\leq q\left(L\right)s\left(L\right)+c\left(1-q\left(L\right)\right),$$

and,

$$q\left(L\right)s\left(L\right)+\left(1-q\left(L\right)\right)\left(1+\widehat{c}^{D}\left(L,L\right)\right)\leq s\left(N\right),$$

respectively. By Step 0, $q(N)=1$ implies that $q\left(L\right)<1$. Thus, the two preceding inequalities imply that

$$1+\widehat{c}^{D}\left(L,L\right)\leq c.$$

It follows that

$$1\leq 1+\widehat{c}^{D}\left(L,L\right)\leq c<p<1.$$

[36]That is, the non liable defendent type does not benefit from imitating the liable defendent type (ICN), and the liable defendent type must be given a positive rent to induce it to be truthful (VPL).

A contradiction. Suppose then that ICL is not binding. Observe that it is then possible to increase $q(N)$ and decrease $s(N)$ slightly so that $q(N)s(N)$ remains constant. This change increases the value of the objective function and as can be readily verified, does not violate any of the other constraints.

Step 4: We may assume, without loss of generality, that the left-hand-sides (LHS) of VPP, CR, and RP, as they are written in step 1, are all smaller than 1 and larger or equal than zero. Otherwise, since $q(L)$ anyway cannot be larger than 1 or smaller than zero, these constraints may either be ignored, or the problem is infeasible which we know is not true. Under this assumption, observe that increasing the value of $\widehat{c}^D(L,L)$ relaxes VPP, CR, and RP. It follows then that $\widehat{c}^D(L,L)$ should be set as high as possible in the optimal solution, i.e., $\widehat{c}^D(L,L) = c$. Plugging this into the constraints, they can be further simplified into:

$$q(N)(1+c-s(N)) = q(L)(1+c-s(L)) \tag{ICL}$$

$$q(N)\left(s(N) - \widehat{c}^D(N,N)\right) + \widehat{c}^D(N,N) \leq c^D \tag{VPN}$$

$$\frac{(1-p)\,q(N)\left(s(N) + c - \widehat{c}^D(N,N)\right) - p\widehat{c}^D(N,N) + pc + \widehat{c}^D(N,N) - c^D}{p(1-s(L))} \geq q(L) \tag{VPP}$$

$$\frac{(1-p)\,q(N)\left(s(N) + c - \widehat{c}^D(N,N)\right) - p\widehat{c}^D(N,N) + pc + \widehat{c}^D(N,N) + p - c - s(N)}{p(1-s(N))} \geq q(L) \tag{CR}$$

$$\frac{(1-p)\,q(N)\,c - p\widehat{c}^D(N,N) + pc + p - c}{p\left(1-\widehat{c}^D(N,N)\right)} \geq q(L) \tag{RP}$$

Notice also that the fact that IC2 is binding implies that the optimal solution satisfies monotonicity, or,

$$q(L) \geq q(N) \Leftrightarrow s(L) \geq s(N).$$

Step 5: Inspection of ICL reveals that $s(L)$ should be set as high as possible (but not higher than $1+c$) to allow $q(L)$ to be set as high as possible. Since the LHS of VPP can be made arbitrarily high by setting $s(L)$ arbitrarily close to 1, it follows that the (upper bound on the) value of $q(L)$ is determined by CR and RP and not by VPP.

Step 6: Thus in the optimal solution, the value of $\widehat{c}^D(N,N)$ (and other parameters) should be set so as to maximize the LHS of CR and RP. The fact that the derivative of the LHS of RP with respect to $\widehat{c}^D(N,N)$ is non positive, and that the derivative of the LHS of CR with respect to $\widehat{c}^D(N,N)$ is non negative (iff $1 \geq s(N)$) implies that $\widehat{c}^D(N,N)$ should be set equal to $s(N)$ where the two LHSs of CR and RP are equal to one another and so the two constraints coincide. This allows us to further simplify the constraints to:

$$q(L)(1+c-s(L)) = q(N)(1+c-s(N)) \tag{ICL}$$

$$s(N) \leq c^D \tag{VPL}$$

$$\frac{(1-p)\,q(N)\,c - ps(N) + pc + s(N) - c^D}{p(1-s(L))} \geq q(L) \tag{VPP}$$

$$\frac{(1-p)\,q(N)\,c - ps(N) + pc + p - c}{p(1-s(N))} = q(L) \tag{CR,RP}$$

Step 7: Further inspection of the constraints in the form presented in Step 6 reveals that

VPP should be binding in the optimal solution. Otherwise, $s(L)$ can be decreased, and the values of $q(N)$ and $q(L)$ can be further increased.

Step 8: Thus, for a fixed value for $s(N)$, the original problem is reduced to solving three equations (IC2, VPP, and CR,RP binding) with three unknowns $q(N)$, $q(L)$, and $s(L)$. The solution, which is parametrized by the value of $s(N)$, is given by:

$$\begin{aligned}
q(N) &= \frac{2pc(1-s(N)) + (1-p)\,s(N)(1-s(N)) - c^D(1-s(N)) - c^2(1-p)}{2pc(1-s(N)) - c^2(1-p) - ps(N)(2-s(N)) + cs(N) + p - c} \\
q(L) &= \frac{p^2(1-s(N))^2 + p^2c(3-2s(N)) + c^2(1-p)^2 - pc\left(2-c^D\right) + c\left(s(N)-c^D\right)}{p\left(2pc(1-s(N)) - ps(N)(2-s(N)) - c^2(1-p) + cs(N) + p - c\right)}
\end{aligned}$$

We show that the ex-ante likelihood of settlement is increasing in $s(N)$ and is therefore maximized at $s(N) = c^D$. Plugging the values of $q(N)$ and $q(L)$ from the equations above into the objective function and differentiating according to $s(N)$ yields:

$$\frac{c(2p-1)(1-p) + p(1-p)^2 - pc^D(1-p)}{(p-c+pc-ps(N))^2},$$

which is non negative for all values of $0 \leq s(N) \leq c^D \leq c \leq p \leq 1$. To see this note that the numerator is minimized at $c^D = c$ where it is equal to

$$(p-c)(1-p)^2 \geq 0.$$

With some additional algebraic manipulation, the solution can be simplified as follows:

$$\begin{aligned} q(N) &= \frac{\left(1+c^P\right)pc^P + c\left(p-c\right)}{\left(1+c^P\right)\left(pc^P+p-c\right)} \\ q(L) &= \frac{p\left(p+p\left(c^P\right)^2-2\left(c^P\right)^2\right)+p\left(c+2c^P\right)\left(p-c^D\right)-2pc+c^2}{p\left(1+c^P\right)\left(pc^P+p-c\right)} \end{aligned}$$

$$\begin{aligned} s(N) &= c^D \\ s(L) &= \frac{p^2\left(1+c^P\right)\left(1+c^Dc^P\right)-cp\left(2-p-c^P\right)+c^2\left(1-p\right)^2+c^3\left(1-p\right)}{p^2\left(3c^P-c^D-\left(c^P\right)^2\right)+p\left(\left(c^P\right)^2+2c+c^Dc^P\right)-c^2\left(1-p\right)} \end{aligned}$$

and the value of the objective function in terms of the parameters is given by:

$$\frac{p\left(p-c^D\right)}{p+pc^P-c}.$$

Step 9: Finally, we verify that the proposed solution is also the solution to the original constrained optimization problem by showing that it satisfies ICN and VPL. VPL must be satisfied because both VPN and VPP are binding in the optimal solution where the probability of settlement is positive. It follows that all the (positive) surplus goes to type L from which it follows that its voluntary participation constraint must be satisfied. To prove that ICN is satisfied, note that the proposed solution is such that $q(N) < q(L)$ and $s(L) > s(N)$. (deduced from monotonicity upon plugging $s\left(N\right) = c^D$ into VPP and RP binding). Because VPN is binding in the proposed solution, to show that ICN is satisfied it is sufficient to show that

$$c^D \leq q\left(L\right)s\left(L\right)+c\left(1-q\left(L\right)\right),$$

or

$$q\left(L\right)\left(c-s\left(L\right)\right) \leq c-c^D.$$

ICL binding implies,

$$q\left(L\right)\left(1+c-s\left(L\right)\right) = q\left(N\right)\left(1+c-s\left(N\right)\right).$$

Because $q(L) > q(N)$, it follows that

$$q\left(L\right)\left(c-s\left(L\right)\right) \leq q\left(N\right)\left(c-s\left(N\right)\right).$$

Finally, ICN follows from the fact that

$$\begin{aligned} q\left(L\right)\left(c-s\left(L\right)\right) &\leq q\left(N\right)\left(c-s\left(N\right)\right) \\ &\leq c-c^D \end{aligned}$$

because $q(N) \leq 1$.

2. The Unique Equilibrium Under the Pleadings Mechanism Described in the Proposition Maximizes the Probability of Settlement Among all Practicable Mechanisms

Consider the *pleadings* mechanism that is described in the statement of the proposition with $\underline{s}= c^D$, and $\overline{s} = \frac{p-c+pc^P c^D}{p-c+pc^P}$. We describe the unique equilibrium under this pleadings mechanism and demonstrate its optimality through the following series of lemmas.

Lemma 1. *Suppose that* $p \geq \frac{c^2}{c^2+c^D-(c^D)^2}$. *Then, in equilibrium, the plaintiff always settles for* $\overline{s} \geq 1-c$ *after the defendant admits she is liable.*

Proof. Follows from the fact that the condition $p \geq \frac{c^2}{c^2+c^D-(c^D)^2}$ is equivalent to $\frac{p-c+pc^P c^D}{p-c+pc^P} \geq 1-c$. ■

Let r_L and r_N denote the probabilities that the two types of the defendant state their types truthfully. Namely, r_L denotes the probability that a liable defendant admits her liability, and r_N denotes the probability a non liable defendant denies it.

Lemma 2. *In equilibrium, a non liable defendant always truthfully denies her liability,* $r_N = 1$.

Proof. Denote the probability that the plaintiff proceeds to trial after the defendant denied she is liable by π. A non liable defendant denies her liability if doing so generates a higher expected payoff than admitting liability, or

$$-\left(1-p_N\right)\underline{s} - p_N c^D > -\overline{s}.$$

Recalling that $c^D = \underline{s}$, the previous inequality is satisfied if and only if

$$\overline{s} > \underline{s},$$

if and only if,

$$\frac{p-c+pc^P c^D}{p-c+pc^P} \geq c^D$$

if and only if $c^D \leq 1$. ■

Lemma 3. *In equilibrium, a liable defendant denies her liability with a positive probability,* $r_L < 1$.

Proof. Suppose otherwise that a liable defendant always admits her liability. It must be then that a defendant that denies her liability is indeed not liable, and the plaintiff, realizing this, would decline to proceed to trial following the defendant's denial of liability because he will lose and will have to incur his litigation costs c^P. But if the plaintiff does not litigate upon a denial of liability, liable defendants will benefit from denying their liability, contradicting the assumption that they are truthful with probability 1. ■

Lemma 4. *In equilibrium, a liable defendant admits her liability with a positive probability,* $r_L > 0$.

Proof. Suppose otherwise that a liable defendant never admits her liability. It follows that the plaintiff proceeds to trial with probability one because doing so yields $p\,(1)+(1-p)\left(-c^P\right)$ which is more than what the plaintiff can get by settling, $\underline{s}$, if

$$p > \frac{c}{1+c^P}.$$

which is satisfied by the assumption that $p \geq c$. But then a liable defendant is better off settling for $\overline{s}$ than losing $1+c$ at trial. A contradiction. ■

Lemma 5. *In equilibrium, after the defendant denies her liability, the plaintiff agrees to settles for* $\underline{s} = c^D$ *with probability*

$$\pi = \frac{\overline{s} - \underline{s}}{1+c^P}.$$

Proof. Lemmas 3 and 4 imply that the probability that the plaintiff proceeds to trial after the defendant denies her liability must be such that a liable defendant is indifferent between admitting or denying her liability, namely,

$$-\overline{s} = -\left(1-\pi\right)\underline{s} - \pi\left(1+c\right).$$

Solving for π yields the result. ■

Lemma 6. *In equilibrium, a liable defendant admits her liability with probability*

$$r_L = \frac{p\left(1+c^P\right)-c}{p\left(1-c^D\right)}.$$

Proof. Lemma 5 implies that in equilibrium, the plaintiff must be indifferent between proceeding to trial and settling after the defendant denied her liability. Bayesian updating implies that it must be that,

$$\frac{p\,(1-r_L)\,(1)+(1-p)\left(-c^P\right)}{p\,(1-r_L)+1-p}=\underline{s}.$$

Solving for r_L yields the result. ■

Lemma 7. *The ex-ante probability of settlement in the unique equilibrium of the pleadings mechanism described in the statement of the theorem is the highest possible among all practicable mechanisms.*

Proof. Lemma 5 implies that the probability that a non liable defendant settles under the unique equilibrium of the pleading mechanism described in the statement of the proposition is given by,

$$1-\pi=1-\frac{\overline{s}-\underline{s}}{1+c^P}.$$

Plugging in the values of $\overline{s}$ and $\underline{s}$ and simplifying shows this expression to be equal to $q(N)$.

The probability that a liable defendant settles under the unique equilibrium of the pleading mechanism described in the statement of the theorem is given by,

$$r_L+(1-r_L)\,(1-\pi)\,.$$

As before, plugging in the appropriate values and simplifying shows this expression to be equal to $q(L)$. It follows that the equilibrium of the pleading mechanism described in the statement of the theorem is the highest possible among all practicable mechanisms. ■

Proof of Proposition 2. When $e_1=e_2=0$ the solution to the general optimization problem described in the proof of Proposition 1 is obtained at the point where $\widehat{c}^D\,(N,N)=c^D$, $\widehat{c}^D\,(L,L)=\widehat{c}^D\,(L,N)=\widehat{c}^D\,(N,L)=c$, and the constraints ICL, VPN, VPP, CR, and RP are binding. It can be verified that the point where $\widehat{c}^D\,(N,N)=c^D$, $\widehat{c}^D\,(L,L)=\widehat{c}^D\,(N,L)=c$, $\widehat{c}^D\,(L,N)=0$, and the constraints ICL, VPN, VPP, CR, and RP are binding is also an optimal solution, and so it the entire line that connects these two points. Continuity considerations suggest that for values of e_1 and e_2 that are sufficiently close to 0, at least one of the points on the line that connects these two points should remain optimal.

It can be verified that at any point where VPL, CR and RP are binding

$$\widehat{c}^D\,(N,N)=\frac{c^D-pce_2}{1-e_2}$$

and

$$s(N) = c^D + e_2.$$

In addition, in the optimal solution, the constraint $\widehat{c}^D(L, L) \leq c$ should still be binding. We may solve the equations given the fact that ICL, VPP, and CR-RP are binding for the values of $q(N)$, $q(L)$, and $s(L)$. This gives us all the information we need in order to compute the *pleadings* mechanism that induces the same probability of settlement as the optimal mechanism as in the second part of the proof of Proposition 1. ■

Proof of Proposition 3. The proof is similar to the proof of Proposition 1 and is not reproduced here. If $p \geq \frac{c^D}{c}$, then the optimal solution of the general problem is obtained at the point where $\widehat{c}^D(N, N) = 0$, $\widehat{c}^D(L, L) = \widehat{c}^D(L, N) = \widehat{c}^D(N, L) = c$, and the constraints ICL, CR, RP, and Deterrence are binding. If $p < \frac{c^D}{c}$, then the optimal solution of the general problem is obtained at the point where $\widehat{c}^D(L, L) = \widehat{c}^D(L, N) = \widehat{c}^D(N, L) = c$, and the constraints VPP, ICL, CR, RP, and Deterrence are binding. Derivation of the optimal pleadings mechanism and the proof of its optimality are done in the same way as in the second part of the proof of Proposition 1. ■

Proof of Proposition 4. The proof is similar to the proof of Proposition 1 and is not reproduced here. ■

Proof of Proposition 5. Inspection of the proof of Proposition 1 reveals that in the optimal practicable mechanism under any background rule, the voluntary participation constraint of a liable defendant is lax whereas that of a non liable defendant and of the plaintiff is binding. It follows that a background rule that makes a non liable defendant relatively worse off relaxes a binding constraint and therefore results in an improvement in the value of the objective function. ■

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