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AGAINST COMPROMISE: A MECHANISM DESIGN APPROACH

by

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Against Compromise: A Mechanism Design Approach*

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Abstract

We consider the following situation. A risk-neutral plaintiff sues a risk-neutral defendant for damages that are normalized to one. The defendant knows whether she is liable or not, but the plaintiff does not. We ask what are the settlement procedure and fee-shifting rule (which, together, we call a mechanism) that minimize the rate of litigation subject to maintaining deterrence. Two main results are presented. The first is a characterization of an upper bound on the rate of settlement that is consistent with maintaining deterrence. This upper bound is shown to be independent of the litigants' litigation cost. It is further shown that any mechanism that attains this upper bound must employ the English fee-shifting rule according to which all litigation costs are shifted to the loser in trial. The second result describes a simple practicable mechanism that attains this upper bound. We discuss our results in the context of recent legal reforms in the U.S. and U.K.

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1. Introduction

There is a widespread perception that the administration of civil justice in many places around the world is severely compromised by high litigation costs and long delays. This perception is supported by comparative analysis that demonstrates that problems of cost and delay persist across national and cultural boundaries. According to some commentators, the situation in some countries is already grave enough to be considered a crisis (Zuckerman, 1999).[1]

The recognition that increased incidence of out-of-court settlements may help save time, cut costs, and reduce existing backlogs, has led to the implementation of law reforms that were backed by legislators, courts, and academics, and whose purpose was to facilitate settlements. Two notable examples are the Civil Justice Reform Act (1990) (CJRA) in the U.S., and the new Civil Procedure Rules (1998) (CPR) in Britain. Both American and British rules of procedure seek to reduce the rate of litigation by encouraging early judicial involvement in pre-trial stages, promoting the use of Alternative Dispute Resolution (ADR) mechanisms such as arbitration, mediation, and early neutral evaluation, and by using offer-of-judgment fee-shifting rules that condition the allocation of litigation costs on early settlement offers as well as on the outcome of the trial. The purpose of these rules is to encourage litigants to resolve their disputes consensually by providing persistent support for settlement throughout the litigation process, from filing to trial.[2]

These procedural measures have been scrutinized both with respect to their effectiveness in reducing cost and delay, and with respect to their possible adverse effects on justice and deterrence. Empirical studies that have examined the effects of procedural changes on the rate of filing lawsuits, on the expected time from filing to termination, and on litigants' and administrative costs have shown that active judicial involvement in settlement negotiations and referral to ADR mechanisms had no significant effect on either one of these measures (Kakalik et al. 1996a, 1996b). Theoretical research of other mechanisms, notably fee-shifting rules and strict pleading standards, has come up with no definitive conclusions with respect

[1]Even those who avoid the term crisis agree that there is an increasing problem of cost and delay. See, Woolf Interim Report, 1995; the Federal Courts Study Committee Report, 1990; and the Brookings Report, 1989. See also Galanter (1983) and Posner (1996).

[2]See Woolf Final Report (1996), and references *supra*, note 1.

to the effects of such mechanisms on the rate of litigation and litigation costs.[3] In addition, concerns have been raised about the possible implications of such reforms on the substantive content of the law, namely, justice and deterrence. Settlement has been claimed to be normatively inferior to litigation (Fiss, 1984); managerial judging has been alleged to undermine inherent values of the judicial system (Resnik, 1982); and promotion of ADR has been questioned over its possible adverse effects on deterrence (Shavell, 1996; Hay 1997).

Although the debate over civil justice reform is fraught with ambiguity about what is exactly an optimal procedural system,[4] both American and British rules of civil procedure seem to agree that the main objective should be the attainment of procedural efficiency (namely, reducing cost and delay) together with substantive justice and deterrence.[5] Yet, existing theoretical literature, for the most part, has focused on only one of these considerations. This paper presents a first attempt to address both procedural and substantive considerations, in search for an optimal procedural mechanism.

We restrict our attention to cases in which the amount of damages is not contested and the only disagreement between the parties is over the defendant's liability. We ask what is the settlement procedure and fee-shifting rule (which, together, we call a mechanism) that minimizes the rate of litigation subject to maintaining a minimal differential between the expected liability of a liable and a non-liable defendant, as prescribed by the law. For reasons that will be more fully elaborated below, we call this constraint the deterrence constraint.

We present two main results. The first result (Theorem 1) identifies an upper bound on the rate of settlement (which is equivalent to a lower bound on the rate of litigation), that is consistent with maintaining the deterrence constraint. Interestingly, this upper bound is independent of the parties' litigation costs. This normative result stands in stark contrast to the literature on litigation and settlement, which has consistently maintained that the probability of settlement would rise as litigation costs increase (e.g. Posner, 1973; Bebchuk, 1984). Furthermore, we show that the upper bound is increasing in the ex-ante probability

[3]This literature is briefly surveyed below.

[4]See, for example, Leubsdorf (1999, p. 57).

[5]Rule 1 of the American Federal Rules of Civil Procedure (FRCP) states that the rules "shall be construed and administered to secure the just, speedy and inexpensive determination of every action." Rule 1.2 of the British Civil Procedure Rules provides that "These rules are a new procedural code with the overriding objective of enabling the court to deal with cases justly" where dealing with a case justly is interpreted as saving expense and ensuring that cases are dealt with expeditiously and fairly.

that the defendant is liable. That is, as more defendants abide by substantive law, the rate of disputes that are litigated to judgment must increase. Finally, it is also shown that any mechanism that achieves the upper bond must employ the English fee-shifting rule according to which all litigation costs are shifted to the loser in trial.

The second result (Theorem 2) describes a simple practicable mechanism that attains the upper bound on the likelihood of settlement identified in the first result. This mechanism (which we call a pleading mechanism) assumes the following form: let the defendant plead liable or not. Instruct a defendant who admitted liability to pay the plaintiff the entire sum of damages. If the defendant denies her liability, let the plaintiff decide whether he wants to proceed to trial or not. If he does, shift all litigation costs to the loser in trial (following the English fee-shifting rule).

Notably, the pleading mechanism described above does not allow the parties to compromise. Either the defendant pays the plaintiff's damages in full, or the plaintiff drops the suit – no middle ground is sought or permitted. If neither party gives up, the case is litigated to judgment. This surprising feature of the optimal mechanism is a consequence of its objective of minimizing litigation subject to preserving deterrence. Compromise dilutes deterrence because it narrows the difference between the expected payment of liable and non-liable defendant. Such dilution may of course be offset by a higher rate of litigation, but at the cost of frustrating the initial goal of maximizing the rate of settlement.

In addition, under the pleading mechanism all the negotiations between the parties take place before pre-trial activity begins and before any litigation costs are incurred. It therefore follows that this mechanism minimizes not only the probability of litigation but also total litigation costs, and it is thus the most "speedy and inexpensive" mechanism among all possible mechanisms that induce the same level of deterrence.

Our results also suggest that when the disagreement between the parties is mainly about the defendant's liability, there may be no need to resort to sophisticated fee allocation rules that are based not only on findings of liability on trial but also on early settlement offers (*offer of judgment* rules), such as Rule 68 of the FRCP and part 36 of the CPR.[6] Indeed, the

[6]According to Rule 68 of the 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. Part 36 of the CPR in

literature on *offer of judgment* rules (most notably Spier, 1994a), as well as case law, have concluded that rule 68 would not facilitate settlements when liability is the main issue to be decided on trial. Yet, the possibility that there are other types of fee allocation rules that would encourage settlement has not been ruled out. Our analysis shows that when the social goals of justice and deterrence are imposed as a constraint on the settlement procedure, no fee allocation rule may outperform the simple English fee-shifting rule that is accompanied by an effective ban on late settlements.

The literature on litigation and settlement under incomplete information has often suggested that the American fee allocation rule, according to which each party bears its litigation cost irrespective of the outcome on trial, induces a higher rate of settlement than the English fee-shifting rule (see Bebchuk, 1984, and Talley, 1995; but also Reinganum and Wilde, 1986, who argued the ranking is indeterminate). Some economic and legal scholars have investigated the welfare properties of different fee allocation rules,[7] and there is also some related literature on optimal damage awards when settlement is possible (see, e.g., Spier, 1994b, and Polinsky and Rubinfeld, 1988). However, none of the studies mentioned above has tried to identify the optimal settlement procedure and fee-shifting rule when the goal is to minimize the cost of litigation subject to the constraints imposed by substantive law such as maintaining deterrence. As we show, deterrence introduces a binding constraint on the set of feasible settlement mechanisms, with the consequence that the likelihood of litigation is minimized by the English, and not the American, fee-shifting rule.

In a related paper, Spier (1997) has analyzed the welfare implications of settlement and

Britain is similar.

[7]Gravelle (1993) analyzes the effect of fee-shifting rules on both primary behaviour and litigation and settlement incentives. Yet, his model is based on a specific take-it-or-leave-it bargaining mechanism in a setting of mutual optimism which does not allow for information asymmetry (see also Landes, 1971; Posner, 1973; Gould, 1973; and Shavell, 1982). Hylton (1993) discusses the welfare effects of fee-shifting rules under a negligence regime but does not construct a comprehensive model that accounts for both primary behaviour and litigation and settlement incentives; Beckner and Katz (1995) discuss the welfare effects of fee-shifting rules when settlement is not available. In all these papers, the results about which fee-shifting rule is optimal are mostly inconclusive.

Further theoretical and empirical analysis of offer of judgment fee shifting rules may be found in Miller (1986), Rowe and Vidmar (1988), Schwarzer (1992), Anderson (1994), Anderson and Rowe (1995), Rowe and Anderson (1996), Chung (1996), Hylton (1996), and Farmer and Pecorino (2000).

deterrence in a simple bargaining model where the probability that the defendant is liable is determined endogenously. She obtained mixed results about the English rule, and showed that reliance on damage multipliers would improve overall efficiency. Hylton (2002), who considers a similar model, showed through simulation methods that reliance on the English fee-shifting rule generates higher welfare than reliance on the American rule. This paper takes a different perspective: rather than asking what would be the "optimal" level of deterrence, we optimize given a specific level of deterrence. Furthermore, unlike Spier (1994a, 1997), this paper assumes the plaintiff's threat to litigate must be credible in view of the information that is revealed in the pre-trial bargaining process (the credibility constraint). As we show, in the optimal mechanism both the deterrence and the credibility constraints must be binding.

The rest of the paper proceeds as follows. Section 2 presents the model. Section 3 is devoted to deriving an upper bound on the rate of settlement. In Section 4, we analyze the properties of the pleading mechanism described above and prove it is optimal. Section 5 concludes.

2. The Model

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 then she is required by the court to pay the plaintiff the entire sum of damages, one; if, on the other hand, the defendant prevails in court, then she does not have to pay the plaintiff anything. Both the plaintiff and the defendant incur litigation costs, denoted $c^P, c^D \geq 0$, respectively. Total litigation costs are denoted by $c \equiv c^P + c^D$. These costs can be incurred before or during the trial. Settling the case before it goes to trial allows the parties to save part or all of their litigation costs.

The defendant knows whether she is liable or not, and it is assumed that the defendant's liability can be *precisely* determined in trial (the consequences of relaxing this assumption are discussed below). Yet, before the end of trial no one except the defendant herself knows for sure whether she is liable or not. We denote the (ex-ante) probability that the plaintiff assigns to the defendant being liable by $0 \leq p \leq 1$. The plaintiff's belief, p, is assumed to be commonly known. The defendant is thus assumed to be of one of two types, denoted L and N for liable and not, respectively; the plaintiff, who holds no private information, is assumed

to have only one type.

Our approach is motivated by the idea that the goal of the legal system should be the minimization of legal costs subject to the constraints imposed by practicability and substantive justice. We are therefore interested in the question of what combination of pre-trial bargaining procedure and fee-shifting rule, which together is called a mechanism, maximizes the (ex-ante) probability of settlement among all the possible mechanisms that satisfy the constraints of *credibility* (accounting for the practicability of the mechanism) and *deterrence* (which is motivated by considerations of substantive justice). We restrict attention to fee-shifting rules, assuming that the court may only divide the total costs of litigation between the defendant and the plaintiff. It cannot "punish" or "reward" the parties through any other means, and it cannot decouple its judgment so that the award to the plaintiff would be different from the defendant's payment.[8]

Credibility is the name we give to the requirement that the plaintiff cannot be forced to litigate. He should always have the option to drop the case rather than proceed to trial. The importance of this constraint stems from the fact that because threatening a defendant who denies her liability with a high probability of trial would exert pressure on truly liable defendants to admit their liability, it is possible to increase the ex-ante likelihood of settlement by *forcing* the plaintiff to proceed to trial in some circumstances. The reason that credibility is imposed as a constraint is that we believe that forcing the plaintiff to litigate against his will is not practicable. Even if the plaintiff were threatened to be fined unless he proceeds to trial, he could always avoid litigation de facto by litigating in such a way that neither he nor the defendant incur any litigation costs.

Deterrence is taken into account through the requirement that the mechanism be such that the induced difference between the expected payment of liable and non-liable defendants may not be lower than the amount of damages, one.[9] Notably, the very same mathematical constraint can also be justified by appeal to other considerations of substantive justice such

[8]Clearly, allowing the court to punish or reward the parties beyond fee-shifting would greatly enhance its power to enforce settlement. Decoupling would also enhance the court's ability to promote deterrence and reduce administrative and litigation costs (see, e.g., Polinsky and Che, 1991). Yet, courts, as well as legislators, seem reluctant to implement such measures. We therefore take the more restrictive (and, in our view, more realistic) approach of maximizing social welfare within an existing legal culture and framework.

[9]It is sometimes necessary to set the payment of a defendant who is found liable on trial higher than actual damages (e.g. punitive damages). Our model is easily adjusted to accomodate such cases.

as corrective justice, or just allocation. Not surprisingly, as we show below, the deterrence constraint is binding in the optimal solution, which implies that the cost to the defendant from breaking her legal duties is equal to the damage this causes to the plaintiff. It therefore follows that the deterrence constraint induces the efficient level of precaution on part of the defendant. The fact that a proportion p of defendants are liable can be attributed to unobserved heterogeneity in defendants' costs of care, their inability to control their momentary level of care, or their misperceptions and inherent cognitive biases (Shavell, 1987).[10]

Credibility and deterrence are the *only* constraints we impose on the mechanism. The class of mechanisms over which we optimize is thus very general and includes in particular mechanisms in which settlement is obtained, if at all, only after some time has passed and the parties have incurred part of their litigation costs.[11] However, an additional important although implicit constraint is that before the conclusion of the trial, neither the plaintiff nor the court receive any signal about the defendant's liability that is *independent* of the defendant's actions.

3. An Upper Bound on the Likelihood of Settlement

The formal description and analysis of the optimization problem described above rely on the well known revelation principle (see, e.g., Myerson 1985), which is applied here as follows. *Any* (Bayesian) equilibrium under *any* mechanism induces: (i) probabilities with which the two types of defendant settle, denoted q_N and q_L, respectively; (ii) expected settlements for each of the two types of defendant, denoted s_N and s_L, respectively; and (iii) expected legal costs that are borne by the defendant depending on the defendant's report of her type and the 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. Restricting our attention to fee-shifting rules implies that the expected legal costs borne by the plaintiff as

[10]The probability that the defendant is liable, p, which is assumed to be exogenously given in our model, is obviously influenced by the difference between the expected payments of liable and non liable defendants as mandated by the deterrence constraint. Kaplow (1993) suggested (in a model without settlement) that problems of under- and over-deterrence should be solved through adjustments in the mandated difference between the expected payments of liable and non liable defendants rather than through fee-shifting rules.

[11]We do not model the passing of time explicitly; rather, a settlement that is reached after some litigation costs have already been incurred suggests that some time has passed.

a function of the defendant's report of her type and the outcome of the trial are given by $\widehat{c}^P_{N,N} \equiv c - \widehat{c}^D_{N,N}$, $\widehat{c}^P_{N,L} \equiv c - \widehat{c}^D_{N,L}$, $\widehat{c}^P_{L,N} \equiv c - \widehat{c}^D_{L,N}$, and $\widehat{c}^P_{L,L} \equiv c - \widehat{c}^D_{L,L}$, respectively. It is thus possible to characterize every Bayesian equilibrium under any mechanism in terms of the vector $\left(q_N, q_L, s_N, s_L, \widehat{c}^D_{N,N}, \widehat{c}^D_{N,L}, \widehat{c}^D_{L,N}, \widehat{c}^D_{L,L}\right)$.

The revelation principle implies that no loss of generality is implied by restricting attention to "truth-telling" equilibria in "direct-revelation" games in which the defendant is asked to report her type, if she reports type $i \in \{L, N\}$, then the case settles with probability q_i for the sum s_i, and with probability $1 - q_i$ the case proceeds to trial where the defendant bears litigation costs $\widehat{c}^D_{i,N}$ or $\widehat{c}^D_{i,L}$ depending on the outcome of the trial, and, importantly, where the defendant indeed reports her type truthfully.[12]

The ex-ante probability of settlement in a truthful equilibrium in a direct revelation game is given by

$$pq_L + (1-p)\, q_N$$

because with probability p the defendant is liable and the case settles with probability q_L, and with probability $1 - p$ the defendant is not liable and the case settles with probability q_N. The expected payment of a non liable defendant in such an equilibrium is given by

$$q_N\left(-s_N\right) + \left(1 - q_N\right)\left(-\widehat{c}^D_{N,N}\right)$$

because with probability q_N the case settles for s_N, and with probability $1 - q_N$ the case proceeds to court where the defendant is found not liable and so has to pay only the litigation costs $\widehat{c}^D_{N,N}$. Similarly, the expected payment of a liable defendant in such an equilibrium is given by

$$q_L\left(-s_L\right) + \left(1 - q_L\right)\left(-1 - \widehat{c}^D_{L,L}\right).$$

The equilibrium where the ex-ante probability of settlement is maximized among all equilibria under all mechanisms that satisfy credibility and deterrence may thus be characterized

[12]Intuitively, consider any Bayesian equilibrium in any game. Rename the equilibrium strategies chosen by liable and non liable defendants by L and N, respectively, and redefine the outcome function such that when the defendant employs strategy $\sigma \in \{L, N\}$, the outcome is given by $\left(q_\sigma, s_\sigma, \widehat{c}^D_{\sigma,L}, \widehat{c}^D_{\sigma,N}\right)$. Because truthful reporting in the direct revelation game induces the equilibrium outcome in the original game, and non truthful reporting generates a different possible outcome in the original game, the fact that we started with an equilibrium implies that truthful reporting must be an equilibrium as well.

as the solution to the following constrained optimization problem. Find a feasible vector $\left(q_N, q_L, s_N, s_L, \widehat{c}^D_{N,N}, \widehat{c}^D_{N,L}, \widehat{c}^D_{L,N}, \widehat{c}^D_{L,L}\right)$ that maximizes the objective function

$$pq_L + (1-p)\, q_N. \tag{OF}$$

The feasible set is defined by twelve constraints, two incentive compatibility constraints, the credibility and deterrence constraints, and eight constraints that are due to fee-shifting. The two incentive compatibility constraints, one for liable (ICL) and the other for non-liable (ICN) defendants, require that the expected payment for the defendant when she reports her type truthfully is larger than or equal to the expected payment when she reports she is of the other type.

$$q_N\left(-s_N\right) + \left(1-q_N\right)\left(-\widehat{c}^D_{N,N}\right) \geq q_L\left(-s_L\right) + \left(1-q_L\right)\left(-\widehat{c}^D_{L,N}\right), \tag{ICN}$$

$$q_L\left(-s_L\right) + \left(1-q_L\right)\left(-1-\widehat{c}^D_{L,L}\right) \geq q_N\left(-s_N\right) + \left(1-q_N\right)\left(-1-\widehat{c}^D_{N,L}\right) \tag{ICL}$$

Together, (ICN) and (ICL) ensure that truthful reporting of types is optimal for both types of the defendant.

The credibility constraint (CR) requires that conditional on being informed that the case proceeds to trial, the plaintiff, given his updated beliefs about the likelihood of prevailing in trial, prefers to continue litigating than to drop the case and get an expected payment of zero, or,

$$\frac{(1-p)\left(1-q_N\right)\left(-c^P_{N,N}\right) + p\left(1-q_L\right)\left(1-c^P_{L,L}\right)}{(1-p)\left(1-q_N\right) + p\left(1-q_L\right)} \geq 0. \tag{CR}$$

The deterrence constraint (D) requires that the difference between the expected payments of liable and non-liable defendants be larger than or equal to the size of the damages, one, or

$$q_N\left(-s_N\right) + \left(1-q_N\right)\left(-\widehat{c}^D_{N,N}\right) \geq q_L\left(-s_L\right) + \left(1-q_L\right)\left(-1-\widehat{c}^D_{L,L}\right) + 1. \tag{D}$$

Finally, fee-shifting imposes eight more constraint,

$$0 \leq \widehat{c}^D_{N,N}, \widehat{c}^D_{N,L}, \widehat{c}^D_{L,N}, \widehat{c}^D_{L,L} \leq c. \tag{Fee-Shifting}$$

Theorem 1. *If* $c \leq \frac{p}{1-p}$, *then:*

(1) *the ex-ante probability of settlement among all mechanisms that satisfy credibility and deterrence is smaller than or equal to p (it therefore follows that the rate of litigation among all mechanisms that satisfy credibility and deterrence is larger than or equal to $1-p$);*

(2) *there exists a mechanism that satisfies credibility and deterrence and that induces an ex-ante probability of settlement that is equal to p; and,*

(3) *if a mechanism that satisfies credibility and deterrence induces an ex-ante probability of settlement that is equal to p, then it must employ the English fee-shifting rule (that is, $\widehat{c}^D_{N,N} = 0$ and $\widehat{c}^D_{L,L} = c$). Namely, if the defendant is found liable in court, then she bears the entire legal costs of both parties, and if the defendant is found not liable, then it is the plaintiff who bears the entire legal costs of both parties.*

The proof, which is based on using the constraints to bound the objective function from above is relegated to the appendix. The intuition for why a mechanism that attains the upper bound specified in the theorem must employ the English fee-shifting rule is the following. If it had been commonly known whether the defendant was truly liable or not, then under the optimal mechanism, the plaintiff and defendant would have settled with probability one, and because of the deterrence constraint, the difference between the expected settlements of liable and non-liable defendants would have been equal to the sum of damages. Obviously, such a mechanism is not incentive compatible. In a world in which the defendant's true liability is not known to anyone but herself, a liable defendant has an incentive to pretend she is not liable so she can settle for less. It follows that an optimal mechanism must provide an incentive for liable defendants to admit their liability. Because the defendant's true liability can only be verified in court, the only way to do this involves going to court with a positive probability. And because going to court is costly, the probability of going to court has to be minimized under the optimal mechanism. Now, conditional on the case going to trial, it is easy to see that the English fee-shifting rule is the one that maximizes the difference between the expected payments of liable and non-liable defendants. Therefore, because the optimal mechanism should provide the "cheapest" possible incentives for being truthful, deterrence implies that it must rely on the English rule, because in this way it is possible to satisfy the deterrence constraint with the lowest possible probability of going to trial. The reason is

similar to the well-known argument that efficiency requires setting very large fines for those caught violating the law, but very small probabilities of detecting offenders (Becker, 1968).

Notably, in case $c \leq \frac{p}{1-p}$ the upper bound on the probability of settlement does not depend on the parties' litigation costs (however, the expected payments of and to the parties obviously do). Intuitively, this is due to the fact that under the English fee-shifting rule, as litigation costs increase, the plaintiff becomes less willing to proceed to trial. The defendant thus has a stronger incentive to deny her liability and refuse to settle in the hope that the plaintiff would drop the suit. Hence, as litigation costs rise, the plaintiff has a stronger incentive but the defendant has a weaker incentive to settle. Under the optimal mechanism these two effects exactly cancel each other and so the likelihood of settlement remains constant.

As mentioned above, we do not model the passing of time explicitly; rather, a settlement that is reached after some litigation costs have already been incurred may be interpreted as suggesting that some time has passed. It therefore follows that a mechanism that induces an expected payment to the plaintiff conditional on settlement that is strictly smaller than the expected payment of the defendant conditional on settlement, may be interpreted as a mechanism in which settlement is obtained after some time has passed and the litigants have already incurred part of their litigation costs. The passage of time may be thus explicitly introduced into the analysis by distinguishing between the expected payment of the two types of the defendant conditional on settlement s_L and s_N, respectively, and the expected payment to the plaintiff from the two types of the defendant conditional on settlement, denoted s_L^P and s_N^P, respectively, where the presence of litigation costs implies that it must be that $s_L^P \leq s_L$ and $s_N^P \leq s_N$. Careful inspection of the constrained optimization problem above reveals that s_L^P and s_N^P play no role in the constraints and so may be set equal to s_L and s_N, respectively. It therefore follows that under the optimal mechanism, the expected payment to the plaintiff conditional on settlement is equal to the expected conditional payment of the defendant. As explained above, this equality may be interpreted as implying that optimality requires that the parties settle immediately, before they incur any litigation costs, or not at all.

Four additional remarks are in order. First, if the condition specified in Theorem 1 is not satisfied, that is, if $c > \frac{p}{1-p}$, then, under the English fee-shifting rule, the plaintiff's threat

to sue is not credible.[13] Consequently, in this case, the defendant would refuse to admit her liability, rationally expecting the plaintiff to drop the suit. Deterrence would obviously not be satisfied in this case, but the ex-ante probability of settlement (which *includes* the case where the plaintiff drops the suit) would be one.

Second, Theorem 1 merely states that a mechanism that satisfies credibility and deterrence and that induces the highest possible ex-ante probability of settlement p exists. Except for mentioning that such an optimal mechanism must rely on the English fee-shifting rule, the theorem says nothing about how such a mechanism might look like. In the proof of Theorem 1 in the appendix, we describe a direct revelation optimal mechanism, and in the next section we describe another, more practicable, optimal mechanism.

Third, another important constraint which captures a stronger notion of practicability than credibility is that of renegotiation proofness. We say that a mechanism is renegotiation proof if upon being informed that the case proceeds to trial, there does 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.[14] Formally, renegotiation proofness requires that conditional on proceeding to trial, there does not exist a settlement offer $\widehat{s}$ such that the expected payment to the plaintiff given his updated beliefs is smaller than $\widehat{s}$, or

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

and the expected payments of both types of the defendant are larger than $\widehat{s}$, or

$$1+\widehat{c}^D_{L,L},\widehat{c}^D_{N,N}>\widehat{s}.$$

The two preceding inequalities are combined into the following renegotiation proofness (RP)

[13]This is because the expected payment to the plaintiff if the case proceeds to court is

$$p\cdot 1+(1-p)\cdot(-c)$$

which is negative if and only if

$$c>\frac{p}{1-p}.$$

[14]This restriction represents a weak notion of renegotiation proofness. A stricter notion may require that there does not exist a settlement offer that the plaintiff and *either* liable or non liable defendents prefer to proceeding to trial. We discuss this stronger notion of renegotiation proofness in the next section.

constraint:

$$\frac{(1-p)(1-q_N)\left(-c^P_{N,N}\right)+p(1-q_L)\left(1-c^P_{L,L}\right)}{(1-p)(1-q_N)+p(1-q_L)} \geq \min\left\{\widehat{c}^D_{N,N}, 1+\widehat{c}^D_{L,L}\right\} \qquad \text{(RP)}$$

Notice that the left-hand-side (LHS) of the renegotiation proofness (RP) constraint is identical to the LHS of the credibility (CR) constraint. And, because by Theorem 1 an optimal mechanism employs the English fee-shifting rule, the right-hand-side (RHS) of the renegotiation proofness (RP) constraint is equal to zero, or the RHS of the credibility (CR) constraint. It therefore follows that optimal mechanisms are renegotiation proof.

Fourth, the result reported in Theorem 1 is robust to the introduction of "noise" in the following sense. Suppose that the court may err in deciding the defendant's liability: it may rule in favor of a liable defendant with probability $e_1 \geq 0$, and against a non-liable defendant with probability $e_2 < 1 - e_1$. The methods used in the proof of Theorem 1 can be used to derive the optimal mechanism in this case as well.[15] It can be shown that in this case, the ex-ante probability of settlement is bounded from above by

$$\frac{\begin{array}{c} p(1+c)-e_2(1+p+2c+pc-c^2e_2+c^2-2ce_2-e_2) \\ -e_1(1+p+2c-e_1-e_1c)+e_1e_2(2+3c+c^2) \end{array}}{1+c-e_1(2+2c-e_1-e_1c)-e_2(2+3c+c^2-e_2-2ce_2-c^2e_2)+e_1e_2(2+3c+c^2)}$$

which converges to p as e_1 and e_2 tend to zero.[16] As before, a mechanism that attains this upper bound must employ the English fee-shifting rule.

4. Constructing an Optimal and Practicable Mechanism

Although it is possible to explicitly solve for a direct revelation mechanism that attains the bound specified in Theorem 1, such a mechanism, that calls for the defendant to announce whether she is liable or not and then instructs the plaintiff to proceed to court with certain positive probabilities that depend on the defendant's announcement, does not appear to be practicable.

[15] The precise argument may be obtained from the authors upon request.

[16] When there is noise, unless all litigation costs are borne by the plaintiff regardless of the defendant's type and outcome of the trial, the RHS of the renegotiation proofness constraint is strictly positive which implies that it is a strictly tighter constraint than credibility. Because of this reason, the bound is computed with the renegotiation proofness rather than the credibility constraint.

The sense in which direct revelation mechanisms, and in particular the optimal direct revelation mechanism, fail to be practicable is difficult to define formally.[17] The purpose of this section is to describe another optimal mechanism, which is, so we believe, truly practicable.

4.1. The Pleading Mechanism

Consider the following "pleading" mechanism. The defendant is asked to plead whether she is liable or not. If the defendant admits her liability then the court enters a judgment against her in the amount of the plaintiff's loss, one. If the defendant denies her liability then the plaintiff is asked to choose between dropping the case and litigating to trial. If the plaintiff decides to proceed to trial, then the court decides the case on its merits and allocates the litigation costs according to the English (loser reimburses the winner) fee-shifting rule.

This "pleading" mechanism can be described as a Bayesian game. We show that if $c < \frac{p}{1-p}$ then this game has a unique Bayesian equilibrium. In this equilibrium, the ex-ante probability of settlement is equal to p.[18] As before, if $c > \frac{p}{1-p}$, then, under the English fee-shifting rule, the plaintiff's threat to sue is not credible.

The argument relies on the following five lemmas.

Lemma 1. *In a Bayesian equilibrium of the pleading game, a non-liable defendant always truthfully denies her liability.*

Proof. Admitting liability implies the defendant has to pay one. Denying it implies that a non-liable defendant doesn't have to pay anything because she will win in trial and costs are allocated according to the English rule. ■

[17] Wilson (1985) and elsewhere, in what became known as the "Wilson critique," argued that truly practicable mechanisms should be independent of whatever is commonly known among the agents, such as, in the context of this paper, the plaintiff's belief, p. The motivation for this requirement is that in practice, very little, if anything at all, is commonly known among the agents. The optimal direct revelation mechanism that is described in the proof of Theorem 1 depends on p. In contrast, the pleading mechanism that is described in the next subsection does not.

[18] In the case where $c = \frac{p}{1-p}$ there exists a multiplicity of equilibria. In these equilibria, defendants always deny their liability, and the plaintiff proceeds to trial with a probability $\pi \in \left[0, \frac{1}{1+c}\right]$. Among these equilibria, only the one where $\pi = \frac{1}{1+c}$ satisfies deterrence. In this equilibrium, the probability of settlement is equal to p.

Lemma 2. *In a Bayesian equilibrium of the pleading game, a liable defendant denies her liability with a probability $d \in (0,1)$ that is strictly between zero and one.*

Proof. Suppose that a liable defendant always admits her liability. In equilibrium, 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 the litigation costs c. 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. Suppose now that a liable defendant never admits her liability. It follows that the plaintiff proceeds to trial with probability one because doing so yields $p(1) + (1-p)(-c)$ which for $c < \frac{p}{1-p}$ is more than what the plaintiff would get by dropping the case which is zero.[19] But then a liable defendant is better off pleading liable and paying one than losing $1+c$ at trial. A contradiction. ■

Lemma 3. *In a Bayesian equilibrium of the pleading game, after the defendant denies her liability, the plaintiff proceeds to trial with probability*

$$\pi = \frac{1}{1+c}.$$

Proof. The previous lemma implies 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,

$$-1 = -(1-\pi)\cdot 0 - \pi(1+c).$$

Solving for π yields the result. ■

Lemma 4. *In a Bayesian equilibrium of the pleading game, a liable defendant denies her liability with probability*

$$d = \frac{c(1-p)}{p}.$$

[19]The analysis below still follows in case $c = \frac{p}{1-p}$ and the plaintiff proceeds to trial with probability srictly less than one.

Proof. The previous lemma implies that in equilibrium, the plaintiff must be indifferent between proceeding to trial and dropping the case after the defendant has denied her liability. Bayesian updating implies that it must be that,

$$\frac{pd\,(1)+(1-p)\,(-c)}{pd+1-p}=0.$$

Solving for d yields the result. ■

Lemma 5. *The ex-ante probability of settlement in the unique Bayesian equilibrium of the pleading mechanism described above is p.*

Proof. Lemma 3 implies that the probability that a non-liable defendant settles (we interpret the plaintiff dropping the suit as a settlement of zero) under the unique equilibrium is given by

$$1-\pi=\frac{c}{1+c}.$$

The probability that a liable defendant settles under the unique equilibrium is given by

$$1-d+d\,(1-\pi)=\frac{p-c+2pc}{p\,(1+c)}.$$

The ex ante probability of settlement under the mechanism is therefore given by

$$p\cdot\frac{p-c+2pc}{p\,(1+c)}+(1-p)\cdot\frac{c}{1+c}=p.$$

■

We demonstrate that the pleading mechanism described above satisfies credibility and deterrence. Credibility follows immediately from the fact that the plaintiff may refuse to proceed to litigation if he so wishes, and deterrence follows from the fact, as can be immediately verified, the expected payments of liable and non-liable defendants in the unique Bayesian equilibrium are one and zero, respectively. We therefore have the following result.

Theorem 2. *The following pleading mechanism minimizes both the likelihood of litigation and total litigation costs among all the mechanisms that satisfy credibility and deterrence: the defendant is asked to plead whether she is liable or not. If the defendant admits her liability then the court enters a judgment against her in the amount of the plaintiff's loss.*

If the defendant denies her liability then the plaintiff is asked to choose between dropping the case and litigating to trial. If the plaintiff decides to proceed to trial, then the court decides the case on its merits and allocates the litigation costs according to the English (loser reimburses the winner) fee-shifting rule.

Importantly, the optimal pleading mechanism described in Theorem 2 does not allow the parties to compromise. Either the defendant pays the plaintiff's damages in full, or the plaintiff drops the suit – no middle ground is sought or allowed. Intuitively, the reason that the high and low settlements are one and zero, respectively (we interpret the plaintiff dropping the suit as a settlement of zero), is that an optimal mechanism must provide the plaintiff with sufficient encouragement to proceed to trial after the defendant denies her liability in order to ensure that the sanction against liable defendants is exercised with a sufficiently high probability. To achieve this aim, the settlement offered to the plaintiff after the defendant denies her liability is set equal to zero (it cannot be set lower because of the credibility constraint). This gives the plaintiff a strong incentive to proceed to trial after the defendant has denied her liability because by dropping the case he would get at most zero, which is equal to what he would get if he did not initiate the suit to begin with. The fact that the deterrence constraint is binding in the optimal solution then implies that the high settlement is set equal to the sum of damages, one.

4.2. Renegotiation Proofness of the Pleading Mechanism

The practicability of the optimal pleading mechanism described in Theorem 2 depends on whether the litigants would be able to bypass it by settling either before or during the operation of the mechanism. It is straightforward to see that given that the court relies on the optimal pleading mechanism, the parties would not want to settle the case ex-ante. Because any positive offer to settle would be correctly interpreted by the plaintiff as an admission of liability, the plaintiff would rationally refuse to settle for anything less than the entire sum of damages, one, which he would win by litigating the case to trial. Because the expected payment of a liable defendant under the optimal pleading mechanism is equal to one, no settlement is possible at this stage. The optimal pleading mechanism is thus renegotiation proof in the sense defined in the previous section.[20]

[20] As explained in the previous section, renegotiation proofness follows anyway from credibility.

The situation after the defendant pleads not liable is more delicate. Any positive offer to settle at this stage would still be correctly interpreted by the plaintiff as an admission of liability. However, now, while a liable defendant expects to pay $1+c$ if the case is litigated to trial, the plaintiff only expects to win 1, which implies that the two may settle at this stage undermining the equilibrium and with it, the optimality of the pleading mechanism. In other words, although the pleading mechanism is ex-ante renegotiation proof as explained above, it is not ex-post renegotiation proof. Ensuring ex-post renegotiation proofness is a serious problem. Because litigating to trial involves litigation costs, *any* mechanism, including the optimal direct revelation mechanism that is described in the proof of Theorem 1, that requires the parties to proceed to trial with a positive probability cannot be ex-post renegotiation proof. In a model with no noise, the only mechanisms that can be ex-post renegotiation proof are those that send the parties to trial with probability zero, but such mechanisms cannot possibly satisfy the deterrence constraint because if the defendant can avoid appearing in court, then it is impossible to find out whether she is truly liable or not and sanction her in case she is liable.

In order to ensure the ex-post renegotiation proofness of the optimal pleading mechanism the court must therefore be able to block any settlement $s \in [1, 1+c]$ between the plaintiff and the defendant which is obtained after the defendant pleaded not liable and the plaintiff announced that he proceeds to trial. The court can prevent such settlements by declaring any such settlement illegal and refusing to enforce it.[21] Thus, after any such settlement the plaintiff would not be precluded from filing the lawsuit again, forcing the defendant to litigate the same claim that was presumably already settled. Similarly, the defendant, for her part, may always refuse to perform her obligations according to the settlement agreement, as the plaintiff would not have any means for enforcing them, except for filing the suit again.[22]

[21] For an economic and legal analysis of the possible undesirability of enforcement of renegotiated agreements in general, see Jolls (1997) and the literature cited therein. For a similar approach in the context of litigation and settlement see Shavell (1997).

[22] Notice that the argument above does not conflict with our assumption that the plaintiff cannot be forced to litigate the suit. That is, ex-post renegotiation proofness is a strictly stronger constraint than credibility. As explained in Section 2 above, the plaintiff may always *unilaterally* drop the case without any cooperation with the defendant. However, once cooperation is required, as would be the case if the two litigants want to settle, then the litigants' adverse incentives, ex post, would eliminate the possibility of any agreement to opt out of the mechanism.

Although the parties may rely on non-judicial enforcement mechanisms, such mechanisms would usually be available only when the parties have continuous close relationships, in which case they would probably refrain from bringing their dispute to court in the first place (Ellickson, 1991; Bernstein, 1992). Moreover, the court may supplement its refusal to enforce the settlement with a fine on one of the settling parties. This would expose her to extortion by the other party, further increasing the risk of unauthorized settlement.

Yet another possibility is to consider any (documented) attempt by the defendant to settle the case after the plaintiff announced he will proceed to trial as proof that the defendant is indeed liable. That is, the plaintiff can secretly record any offer to settle for a sum $s \in [1, 1+c]$ and take it to court where he would be immediately awarded the full damages, one, without having to incur any litigation costs. Such a scheme will ensure that the optimal pleading mechanism is ex-post renegotiation proof if the court's judgement is imprecise. To see this, suppose that the court may err, and with probability $e_1 > 0$ find that a liable defendant is not liable. In this case, the expected payment of a liable defendant upon being informed that the plaintiff proceeds to court is $(1-e_1)(1+c)$. A liable defendant would thus not be willing to settle for more than $(1-e_1)(1+c)$, while a plaintiff would insist on getting at least 1. If e_1 is sufficiently large, specifically, if e_1 is such that $(1-e_1)(1+c) < 1$, or if $e_1 > \frac{c}{1+c}$, then settlement would not be feasible and the pleading mechanism described in the proof of Theorem 2 would be ex-post renegotiation proof.[23]

Short of banning late settlements, courts can also use other, less extreme, means for discouraging such settlements. For one thing, courts may simply refrain from encouraging the parties to settle. Our results indicate that contrary to the common wisdom that guides recent procedural reforms, courts should not take an active role in facilitating settlements and should not encourage parties to use alternative means for resolving their disputes. Rather,

[23]The pleading mechanism described in Theorem 2 is not optimal when there is noise, but it is approximately optimal. The only difference being that when there is noise, optimality requires that a defendant that admits her liability pays the plaintiff the sum

$$\frac{(1+c)(p-c+pc)+e_1\left(c-2p-3pc+e_1pc+e_1p\right)-e_2\left(2pc+p+c^2p\right)+e_1e_2\left(p+2cp+pc^2\right)}{\begin{array}{c}(1+c)(p-c+pc)+e_1\left(c^2+c-2p-3cp-pc^2+e_1pc+e_1p\right)\\ +e_2\left(c^2+c-4pc-2p-2c^2p+2e_2pc+e_2pc^2+e_2p\right)+e_1e_2\left(2p+3pc+pc^2\right)\end{array}}$$

which, remarkably enough, is quite close to one. The plaintiff still gets zero if he drops the suit after the defendant pleaded not liable, and the English fee-shifting is employed if the case is litigated to trial.

managerial judging should concentrate on efficient use of judicial and lawyer time, and not on promotion of settlement. This consideration points to other means for substituting early for late settlements such as the setting of firm timetables, shortening the time between filing and trial, and front-loading litigation costs as closely as possible to the pleadings stage – all measures that could decrease the time available for renegotiation. Interestingly, Kakalik et al. (1996a, 1996b) who examined the implementation of the CJRA in 20 federal district courts found that early judicial management, including setting trial schedule and reduction of time to discovery had a statistically significant negative effect on time to disposition (although having no combined effect on lawyer work hours). Following this study, the judicial conference of the U.S. courts has recommended setting early and firm trial dates and shorter discovery periods in complex civil cases (Judicial Conference Report, 1996). Also notable is the use of pre-action protocols under the CPR, which aim to resolve or at least clarify a dispute before issuing a claim, thus focusing effort on early settlements. There is some empirical evidence that the number of filings as well as last-minute settlements has dropped whereas the rate of settlement has increased since adoption of the CPR.[24]

5. Conclusion

Normatively, our claim that under the optimal settlement mechanism that is described in this paper compromise and (late) settlement should be discouraged must be distinguished from other claims against settlement. Previous literature has asserted that adjudication should be preferred to settlement whenever the latter dilutes the substantive goals of justice (Fiss, 1984) and deterrence (Shavell, 1997; Polinsky and Rubinfeld, 1988). In our model, the objective is to maximize the rate of settlement subject to maintaining substantive social goals such as deterrence and justice. Our finding that compromise as well as late settlements should be discouraged is therefore a result of a welfare maximization exercise, in which both the satisfaction of substantive goals and the minimization of cost and delay are sought. Our analysis suggests that the pursuit of alternative ways to encourage settlement throughout

[24]See Emerging Findings: An Early Evaluation of the Civil Justice Reforms, March 2001, available from <http://www.lcd.gov.uk/civil/emerge/emerge.htm#part5d> and Further Findings: A Continuing Evaluation of the Civil Justice Reforms, August 2002, available from <http://www.lcd.gov.uk/civil/reform/ffreform.htm#part1>.

the litigation process may be misguided because of the imbalance it may create between the conflicting goals of encouraging settlement and substantive law, and between early and late settlement.

Preference for the English fee-shifting rule in the optimal mechanism is another feature of the consideration of both substantive and procedural goals. Within the ongoing debate over which liability-based fee allocation rule is best, the English or the American, and whether *offer of judgment* rules indeed promote settlement, this paper supports the use of the English fee-shifting rule.

Finally, the model presented in this paper abstracted away from consideration of the effect of the English rule on litigation expenditure (see e.g. Katz, 1987; Plott, 1987), and on the set of lawsuits that are filed (see, e.g., Rosenberg and Shavell, 1985; and Katz, 1990). Both of these considerations may have substantial welfare consequences. Further research is thus called for in order to extend the mechanism design framework presented in this paper to more comprehensive settings that would account for these and other considerations involved in the litigation and settlement process.

Appendix

Proof of Theorem 1. The proof is based on solving the problem of maximizing the objective function (OF) subject to the constraints ICL, ICN, CR, D, and those induced by fee-shifting. The solution of this constrained optimization problem proceeds according to the following steps:

Step 1: Eliminate the constraint ICN. If the maximal value of the objective function in the relaxed problem is smaller than or equal to p, then a fortiori the value of the objective function in the original problem is smaller than or equal to p.

Step 2: 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:

$$q_N\left(1+c-s_N\right) \leq q_L\left(1+\widehat{c}^D_{L,L}-s_L\right)+c-\widehat{c}^D_{L,L} \tag{ICL}$$

$$\frac{\left(1-p\right)q_N\left(c-\widehat{c}^D_{N,N}\right)+\left(1-p\right)\widehat{c}^D_{N,N}+p\widehat{c}^D_{L,L}+p-c}{p\left(1+\widehat{c}^D_{L,L}-c\right)} \geq q_L \tag{CR}$$

$$q_N\left(s_N-\widehat{c}^D_{N,N}\right) \leq q_L\left(s_L-1-\widehat{c}^D_{L,L}\right)+\widehat{c}^D_{L,L}-\widehat{c}^D_{N,N} \tag{D}$$

Step 3: Further inspection of the constraints reveals that under the optimal solution, ICL must be binding. Suppose it is not binding and the optimal solution is such that $q_N < 1$. 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. Suppose now that ICL is not binding and $q_N = 1$. Observe that it is possible to decrease slightly the value of s_N and increase slightly the value of q_L. 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 CR as it is written in step 1 is larger than or equal to zero. Otherwise, the problem is infeasible, which, as we establish below, is false. It can be verified that when this LHS is smaller than

one, it is increasing in $\widehat{c}^D_{L,L}$, and when it is larger than one, it is decreasing in $\widehat{c}^D_{L,L}$. Since q_L cannot be larger than one anyway, replacing $\widehat{c}^D_{L,L}$ with c in the LHS of CR relaxes this constraint as much as possible. We may therefore replace CR with the following constraint

$$\frac{(1-p)\,q_N\left(c-\widehat{c}^D_{N,N}\right)+(1-p)\,\widehat{c}^D_{N,N}+pc+p-c}{p}\geq q_L. \tag{CR}$$

If the maximal value of the objective function in the relaxed problem is smaller than or equal to p, then a fortiori the value of the objective function in the original problem is smaller than or equal to p.

Step 5: ICL binding implies that D may be rewritten as

$$q_N \leq \frac{c-\widehat{c}^D_{N,N}}{1+c-\widehat{c}^D_{N,N}} \tag{D}$$

Step 6: Replacing q_L and q_N with their upper bounds from steps 4 and 5, respectively, we may bound the objective function by a function of $\widehat{c}^D_{N,N}$ alone as follows,

$$\begin{aligned} pq_L+(1-p)\,q_N &\leq (1-p)\,\frac{\left(c-\widehat{c}^D_{N,N}\right)^2}{1+c-\widehat{c}^D_{N,N}}+(1-p)\,\widehat{c}^D_{N,N}+pc+p-c \\ &\quad +\frac{(1-p)\left(c-\widehat{c}^D_{N,N}\right)}{1+c-\widehat{c}^D_{N,N}} \\ &= (1-p)\left(c-\widehat{c}^D_{N,N}\right)+(1-p)\,\widehat{c}^D_{N,N}+pc+p-c \\ &= p. \end{aligned}$$

Step 7: By step 2 $\widehat{c}^D_{L,N}=\widehat{c}^D_{N,L}=c$. Step 4 suggests $\widehat{c}^D_{L,L}=c$, and step 5 suggests $\widehat{c}^D_{N,N}=0$ and $q_N=\frac{c}{1+c}$. Assuming that ICL, CR, and D are binding, it is possible to solve for q_L, s_N and s_L:

$$\begin{aligned} q_L &= \frac{p-c+2pc}{p\,(1+c)} \\ s_N &= 0 \\ s_L &= \frac{p-c+2pc-(1-p)c^2}{p-c+2pc} \end{aligned}$$

Because this solution satisfies all the constraints, and as can be verified, induces an ex-ante probability of settlement that is equal to p, the direct revelation mechanism in which the defendant is asked to report her type, if she reports the type N the case settles with

probability $q_N = \frac{c}{1+c}$ for $s_N = 0$ and she reports L the case settles with probability $q_L = \frac{p-c+2pc}{p(1+c)}$ for $s_L = \frac{p-c+2pc-(1-p)c^2}{p-c+2pc}$. If the case proceeds to trial and it is revealed that the defendant reported her type truthfully, then litigation costs are divided according to the English fee-shifting rule ($\widehat{c}^D_{N,N} = 0$ and $\widehat{c}^D_{L,L} = c$); if it is revealed that the defendant reported her type incorrectly, then she bears the entire legal costs of both parties ($\widehat{c}^D_{L,N} = \widehat{c}^D_{N,L} = c$).

To complete the proof of the theorem, note that part (1) in the statement of the theorem follows from step 6; part (2) follows from step 7; and part (3) follows from steps 4 and 5, which show that employing the English fee-shifting rule relaxes the constraints as much as possible. ■

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