Contingent fees are widely used to pay for lawyers’ services in the United States, particularly in personal injury actions. Policy debate tends to justify this on the (equity) ground of ensuring wide access to justice. However, recent literature has also emphasized certain efficiency benefits from allowing the use of contingent fees, including the sharing of case risk, the signaling and screening of case merits and lawyer ability, and the enhancement of price competition.1

Despite this, many jurisdictions, such as England and Wales and several U.S. states, prohibit use of contingent fees on the grounds that they create a conflict of interest between lawyer and client. A particular concern here relates to the influence of litigation costs. For example, the Royal Commission on Legal Services, set up in 1979 to consider the regulation of the legal profession in England and Wales, argued that contingent fees may harm clients because “the lawyer pays all the cost of the case in return for his proportion of the damages, [and therefore] he is exposed to strong temptation to settle the claim before incurring a heavy expense of preparing for trial.

I. Introduction

Contingent fees are widely used to pay for lawyers’ services in the United States, particularly in personal injury actions. Policy debate tends to justify this on the (equity) ground of ensuring wide access to justice. However, recent literature has also emphasized certain efficiency benefits from allowing the use of contingent fees, including the sharing of case risk, the signaling and screening of case merits and lawyer ability, and the enhancement of price competition.1

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and of trial itself, although it may be in his client’s interests to do so” [Benson (1979), para. 16.4].

This view has prevailed in England and Wales during subsequent policy debate, and has received some support in the literature. Schwartz and Mitchell (1970) compare the number of hours that a contingent fee lawyer will put into a case with the number that an informed client would demand. They show that the presence of diminishing returns to lawyers’ effort can lead to settlement before the client would wish, given linearly increasing case expenses. Both Miller (1987) and Emons (1998) also interpret costs as creating a conflict of interest when the lawyer is advising on whether to settle or go to trial under contingent fees. Gravelle and Waterson (1993) adapt Miller’s model and consider a defendant, uninformed about his opponent’s damages, making a “take-it-or-leave-it” offer of settlement that the plaintiff’s side must accept or reject. In each model, bearing costs weakens the contingent fee lawyer’s bargaining position, causing her to settle the case more often than the client would wish, and for lower sums.

In this paper, we argue that the “one-shot” nature of these models leaves them unable easily to accommodate a potentially important feature of the joint role played by contingent fees and litigation costs. Assuming just one period of bargaining restricts bargainer’s opportunities for strategic behavior by preventing strategies in early rounds from influencing opponents’ behavior in later rounds. However, in a dynamic setting, the willingness to sink litigation costs in the future might give credibility to a lawyer seeking to bargain hard (i.e., reject low offers) to achieve a higher settlement offer and higher contingent payment. To pick up Benson’s earlier example, the possible onset of trial costs need not deter a contingent fee lawyer from pursuing the case but may, instead, enable her to signal her confidence to her opponent. As a result, contingent fees may improve lawyers’ incentives to bargain hard, thereby raising settlement offers and, if high offers are forthcoming, speeding settlement; a conjecture in Swanson (1991).

The present paper seeks to establish the potential for such “hard bargaining,” and to see how it affects settlement timing and clients’ payoffs. We consider a model of a civil dispute with two periods of pretrial bargaining, in which the plaintiff’s lawyer is paid on a contingent fee basis; i.e., we generalize Miller (1987) and Gravelle and Waterson (1993) to a dynamic setting. We compare the Perfect Bayesian Equilibrium when the plaintiff’s lawyer bears case costs and when these costs are zero. The defendant makes settlement offers to the plaintiff’s lawyer based on his beliefs about how badly damaged the plaintiff is. Knowing this information herself, the lawyer’s financial interest (through the contingent fee) gives her an incentive to use this information asymmetry

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2Of course, whether the lawyer bears all these costs is an empirical question. However, a conflict according to Benson’s definition will occur whenever the lawyer and plaintiff bear asymmetric amounts of case cost [Miller (1987)].

3For the most recent policy debate, see Law Society (1989), Bar Council (1989), Lord Chancellor’s Department (1989), and Rickman (1994). Following this 1989 debate, the Courts and Legal Services Act 1990 has introduced a “conditional fee,” where payment of an hourly (i.e., input-based) fee is contingent on winning, but the size of the fee is not related to output (size of winnings). See Gravelle and Waterson (1993) for an analysis of this conditional fee.

4See Dixit (1980). Another way to think about this argument is that it questions the assumption made by Schwartz and Mitchell (1970) that there are smooth diminishing returns to lawyer effort. Instead, it might be possible for the lawyer to shift up her “production function” at different points by strategic bargaining.

5The issue of how to reduce delay and backlogs in litigation is also policy relevant on both sides of the Atlantic [see Kakalik et al. (1990), Woolf (1996)]. Thus, there is wider policy value to fee arrangements that provide incentives for speedy settlement.

6We do not seek to investigate the optimal (first-best) contingent fee contract but, rather, the way that lawyers’ responses to contingent payment itself can affect settlement.
and push for a high settlement offer. We find, in contrast, the Benson’s (1979) assertion (above), that taking bargaining costs into account improves the plaintiff’s lawyer’s credibility when rejecting low offers: her rejections are not costless (the “hard bargaining effect”). However, the effects of more high offers on settlement timing can be offset by the fact that hard bargaining means rejecting low offers, so that the overall settlement timing results are ambiguous. Further, the plaintiff often fails to benefit from this strategy because his lawyer attempts to offload the bargaining costs faced through (1) the settlement offer accepted (the “cost effect”), and (2) the contingent fee required to cover her opportunity costs. Thus, although the model confirms the potential for hard bargaining under contingent fees, it highlights several forces that mitigate against any benefits this might have for the plaintiff.

The paper is structured as follows. The next section describes the model of pretrial bargaining and solves for the Perfect Bayesian Equilibrium strategies of the plaintiff’s lawyer and the defendant, both when the former does and does not face case costs. The third section then introduces price competition amongst plaintiffs’ lawyers to make the contingent fee percentage endogenous and allow us to compare the outcomes when the lawyer does and does not bear costs. Section IV presents the results on settlement timing and the plaintiff’s payoffs, and considers the effects of case characteristics. Section V concludes the paper.

II. The Model and Equilibrium Strategies

The Model

The model follows Spier (1992) in adapting Fudenberg and Tirole (1983) to the civil litigation context. Unlike Spier, however, we are interested in looking at contingent fees and the way bargaining strategies differ with the plaintiff’s lawyer’s costs of litigation. Hence, we also draw on Miller (1987).

A plaintiff has filed a suit against a defendant for damages, $x$, caused to him in an accident. Being ill-informed about legal procedure, the plaintiff has retained a lawyer to assess the strength of his case and negotiate on his behalf. To keep things simple, we assume that the defendant has not hired a lawyer. It is accepted that the defendant is liable for the accident, but only the plaintiff’s side knows the extent of the damage he has suffered. His opponent knows that this damage is either high or low ($x$ and $x\#$ respectively, where $x > x\# > 0$), and has priors such that $\Pr(x = x) = \pi$ and $\Pr(x = x\#) = 1 - \pi$. All parties (plaintiff, defendant, lawyer) are risk neutral and have common discount factor $\delta \in (0, 1)$.

We simplify the pretrial negotiations by assuming that bargaining takes place over two rounds, before trial (see Figure 1); this is sufficient to illustrate the dynamics of interest without complicating the analysis. In the first period, the defendant makes a settle-
ment offer based on his prior beliefs. If this is accepted, the case ends. If it is rejected, Period 2 commences and the defendant (having updated his beliefs in response to the rejection) makes a second offer. If trial is reached, in Period 3, the defendant pays $x$ if the plaintiff is “high-damage” and $\bar{x}$ if the plaintiff is “low-damage”, i.e., the court makes the correct decision. 11

The defendant’s strategies are a pair of settlement offers $S_1$ in Period 1 and $S_2$ in Period 2. If $S_1$ is rejected, the defendant uses Bayes’ rule to update his beliefs to the posterior $\{\mu(S_1), 1 - \mu(S_1)\}$, where $\mu(S_1) = \Pr(S_1 | S_1 \text{ rejected})$. The plaintiff’s lawyer’s strategies consist of a pair of acceptance probabilities as responses to $S_1$ and $S_2$. A lawyer representing a low-damage plaintiff plays $a_1(S_1)$ and $a_2(S_2)$, where $a_t(S_t) = 1$ implies acceptance and $a_t(S_t) = 0$ implies rejection of an offer, $t = 1, 2$. Similarly, a high-damage lawyer’s strategies are $\bar{a}_1(S_1)$ and $\bar{a}_2(S_2) \in [0, 1]$.

(1984); Spier (1992). Our results are robust to such amendments. Both Spier (1992) and Daughety and Reinganum (1994) interpret the finite horizon model as a postfiling one, where a trial date has already been set.

11 An exogenous probability of court error could be added without altering the main results. Rubinfeld and Sappington (1987) also show that a lawyer’s willingness to sink costs can act as a signal to the court and, thereby, endogenise its probability of error. We ignore this possibility to focus on the lawyer’s bargaining with the opponent.

FIG. 1. Two-period litigation model.
The plaintiff pays a fraction $\alpha \in (0, 1)$ of his settlement amount (or trial award) to his lawyer. Thus, the plaintiff’s lawyer’s payoff is contingent upon her performance for her client. We also assume that there are per period costs associated with bargaining, $c \geq 0$ for the plaintiff’s side and $h \geq 0$ for the defendant. For example, these may be the ongoing disbursements required to prepare the case and include such items as expert witness fees, filing, and travel costs [see Kritzer et al. (1984)]. In common with Benson (1979) and Miller (1987) *inter alia*, the plaintiff’s lawyer pays $c$. In the Lawyer’s Costs section below, we shall compare the results when $c = 0$ and when $c = C > 0$. First, we compute the equilibrium for any value of $c$.

Finally, we assume the American rule for allocating legal costs is in use; thus, each side bears its own costs. Of course, with the court outcome known in advance, assuming a degree of cost shifting (as under the English rule) would be of quantitative significance only; no strategic considerations or qualitative properties of the equilibria would be affected.

**Perfect Bayesian Equilibrium**

We compute the Perfect Bayesian Equilibrium (PBE). Let $\tilde{S}_2$ be the highest settlement offer that the defendant would make in Period 2. Because, under the American cost rule, and with concern for disbursements, the plaintiff’s lawyer expects to receive $\delta(\alpha \bar{x} - c)$ at trial, this settlement offer must solve $\alpha \tilde{S}_2 = \delta(\alpha \bar{x} - c)$. Arguing similarly for the lowest Period 2 settlement offer that the defendant can realistically make ($\tilde{S}_2$), we have

$$\tilde{S}_2 = \delta \left( \bar{x} - \frac{c}{\alpha} \right) \quad \text{and} \quad \tilde{S}_2 = \delta \left( \bar{x} - \frac{c}{\alpha} \right).$$

Similarly, define the highest and lowest Period 1 settlement offers to be

$$\tilde{S}_1 = \delta \left( \tilde{S}_2 - \frac{c}{\alpha} \right) \quad \text{and} \quad \tilde{S}_1 = \delta \left( \tilde{S}_2 - \frac{c}{\alpha} \right).$$

Notice that, excluding $\delta$, two factors can lower the settlement offer: being based on $\bar{x}$ rather than $\bar{x}$, and a higher degree of future cost extraction (higher $c$ or lower $\alpha$). These will form the basis of the “hard bargaining” and “cost” effects we describe below.

The defendant’s problem is to design a sequence of offers $\{\tilde{S}_1, \tilde{S}_2\}$ to maximize his payoff given his beliefs (updated in Period 2) about the plaintiff’s damage level. Each type of plaintiff’s lawyer plays payoff-maximizing acceptance strategies, bearing in mind their influence on the defendant’s offers, via Bayes’ rule. The PBE is solved by backwards induction. We provide an intuitive account of the proof here; formal details are in Fudenberg and Tirole (1983, 1991) and the Appendix.

In one-shot litigation, the defendant chooses his strategy on the basis of which offer

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12Modeling the contingent fee as a simple share parameter, $\alpha$, ignores a variety of alternative contingent arrangements, some of which may be preferable to the lawyer and client [see Halpern and Turnbull (1983); Hay (1995); Rubinfeld and Scotchmer, (1995)]. However, as noted earlier, our aim is not to investigate the optimal contingent fee arrangement but, instead, to see how the lawyer’s response to having a financial interest in the case can affect settlement timing and payoffs.

13See Shavell (1982) for an analysis of the effects of different cost allocation rules on settlement behavior. Donohue (1990) and Smith (1992) consider the interaction between cost rules and contingent fees, in models with no explicit pretrial bargaining.
gives him the highest payoff. Offering \( S_2 \) guarantees settlement, saves the defendant trial costs \((h)\), and allows him to extract future costs in the settlement offer \((c/\alpha)\). However, it means paying unnecessarily high damages if the plaintiff is low damage. Thus, there is a critical value of \( \pi \) that makes the defendant indifferent between \( S_2 \) and \( S_2 \). Calling this \( \lambda_2 \), we have \( \lambda_2 S_2 + (1 - \lambda_2) \delta (\bar{x} + h) = \bar{x}_2 \), so

\[
\lambda_2 = \frac{h + \frac{c}{\alpha}}{\bar{x} - x + h + \frac{c}{\alpha}}.
\]  

(3)

Now consider the beginning of the two-period litigation. We can again calculate a critical expression, \( \lambda_1 \), such that when \( \pi < \lambda_1 \), the defendant offers \( S_1 \) and settles the case: there is too little prospect of facing a low-damage plaintiff to justify a low offer (and the associated costs of its rejection). When \( \pi > \lambda_1 \), the defendant offers \( S_1 \). The high-damage lawyer rejects this, anticipating a high-damage offer in Period 2 or a high-damage trial award. The low-damage lawyer faces a predicament. If she accepts \( S_1 \) for sure, the defendant will assume that any rejection of this offer is from a high-damage lawyer \((\Rightarrow \mu = 0)\) and will, therefore, offer \( S_2 \). As the low-damage lawyer would prefer this to \( S_1 \), her original acceptance cannot constitute part of an equilibrium. If, instead, the low-damage lawyer rejects \( S_1 \) with probability one, the defendant has no new information with which to update his beliefs \((\Rightarrow \mu = \pi)\). He, therefore, offers \( S_2 \), and the low-damage lawyer regrets rejecting \( S_1 \) (it has no chance of generating \( S_2 \)). Hence, the low-damage lawyer’s equilibrium strategy must be to mix in Period 1 such that the defendant is made indifferent between offering \( S_2 \) and \( S_2 \) in the next period, i.e., the lawyer must induce \( \mu = \lambda_2 \) and change the mixing probability \( \alpha \), we have from \( \mu = \lambda_2 \) and Bayes’ rule\(^{14}\)

\[
\alpha = 1 - (1 - \pi) \frac{h + \frac{c}{\alpha}}{\pi(\bar{x} - x)}.
\]  

(4)

Finally, it can be shown that the critical first period expression, \( \lambda_1 \), again weighs up the costs and benefits to the defendant of a low initial offer: it is given by

\[
\lambda_1 = \frac{h + \frac{c}{\alpha}}{\alpha \left[ \delta (\bar{x} - x) + h + \frac{c}{\alpha} \right]}.
\]  

(5)

The outcome is depicted in Figure 2.

In summary, we have demonstrated the following:

\(^{14}\)In fact, \( \alpha \in [0, \alpha] \) can support this equilibrium. We focus on \( \alpha = \alpha \) because it is what Rasmusen (1989, p. 240) describes as the Pareto optimal focal point: it maximizes the first period settlement probability.
PROPOSITION 1: In the PBE, when \( \pi < \lambda_1 \), \( \bar{S}_1 \) is offered and accepted. When \( \pi > \lambda_1 \), \( S_1 \) is offered and the probability of instant settlement is \( \pi \lambda_1 \). The defendant offers \( S_2 \) in Period 2, generating a subsequent settlement probability of \( \pi(1 - \lambda_1) \) and leaving a trial probability of \( 1 - \pi \).

From Figure 2 we can define \( \hat{\pi} \) such that \( \lambda_1(\hat{\pi}) = \hat{\pi} \). Thus, we could equivalently state that the defendant offers \( \bar{S}_1 \) when \( \pi < \hat{\pi} \) and \( S_1 \) when \( \pi > \hat{\pi} \).\(^{15}\)

Lawyer’s Costs and Credibility

We now examine the effects of the lawyer’s costs on the PBE. Specifically, we compare the results when all lawyers have \( c = 0 \) with those when all lawyers have \( c = C > 0 \); for simplicity, the two situations are assumed not to coexist. The lawyers’ “type” is common knowledge.\(^{16}\) Using obvious notation to distinguish settlement offers, mixing probabilities and values of \( \lambda \) when \( c = 0 \) and when \( c = C \), we have

15 We can easily solve for \( \hat{\pi} \). Define \( \gamma = (h + c/\alpha)(1 + \delta)(\tilde{x} - \lambda) + (h + c/\alpha) \). Then \( \hat{\pi} = \gamma(b(\tilde{x} - \lambda)^2 + \gamma)^{-1} \in (0, 1) \).

16 As noted in the Introduction, we can interpret the situation when \( c = C \) as involving a conflict of interest between plaintiff and lawyer. When \( c = 0 \), the lawyer faces exactly the same bargaining incentives as her client would if he were conducting the litigation. Accordingly, no conflict is present and the lawyer receives and accepts exactly the same settlement offers as the plaintiff would. When \( c = C \), however, the lawyer faces costs of bargaining that her client would not. It is now possible that her negotiating position will differ from that which her (non-cost-bearing) client would choose.
PROPOSITION 2: Holding a constant, \( S_0^t > S_1^t; \bar{S}_0^t > \bar{S}_1^t; \bar{a}^0 > \bar{a}^C; \lambda_2^C > \lambda_1^0; t = 1, 2 \).

PROOF: This follows directly from setting \( c = 0 \) and \( c = C > 0 \) in (1)–(5) and comparing the outcomes.

To understand this result, begin with \( S_t \). When \( c = 0 \), there are no marginal costs of continuing to bargain. In one sense, this strengthens the plaintiff’s lawyer’s bargaining position and, for any given damage level, forces a higher settlement offer from the defendant [see (1) and (2)]. In turn, this lowers \( \lambda_2 \) [i.e., \( \lambda_2^C > \lambda_2^0 \)] because the defendant has no costs to extract in his settlement offer, so his relative cost of a low-damage offer in Period 2 falls. The value of \( a \) shows how a lawyer representing a low-damage plaintiff reacts to this. Because her intention is to induce a settlement offer based on \( \bar{x} \), bearing no costs means that she must “work hard” to convince the defendant that he faces a high-damage plaintiff in Period 2. She does this by accepting an offer that a high-damage plaintiff’s lawyer would certainly reject (i.e., \( \bar{S}_t \)) with higher probability because this makes the rejections she plays more credible signals that she indeed represents a high-damage plaintiff: hence, \( \bar{a}^0 > \bar{a}^C \). Finally, the tendency for “zero cost” lawyers to accept low-damage first period offers more frequently increases the set of parameters for which such offers are forthcoming: hence, \( \lambda_2^0 > \lambda_1^0 \).

Thus, bearing costs has two effects on a contingent fee lawyer’s behavior. First, she accepts lower offers given the level of damages (the cost effect). However, second, when representing a low-damage plaintiff she is able to bargain hard because costly actions convey more credible signals than costless ones. Because the cost-bearing lawyer risks more by rejecting an offer, the rejection is a more credible signal that she represents a high-damage plaintiff, even though she does not (the hard bargaining effect).

Having established that cost-bearing and contingent fees can produce this effect in a dynamic setting, we now wish to see how this influences the timing and size of settlement. Before moving on we can, as before, define \( \bar{p}^0 \) and \( \bar{p}^C \) as the critical values of \( p \) that determine whether the defendant offers \( S_1 \) or \( S_1^C \) at the start of bargaining. It follows from Proposition 2 that \( \bar{p}^C > \bar{p}^0 \).

III. Price Competition Among Lawyers

Propositions 1 and 2 give us the information required to compute the probability of settlement and the plaintiff’s payoffs, depending on his lawyer’s costs. However, we must first ensure that the value of \( \alpha \) is consistent across the two types of lawyer. One way to do this is to assume that, before they discover the plaintiff’s damage level, lawyers compete for the case on the basis of price, with each bidding a value of \( \alpha \) at which they will take the case.\(^{17}\) If each has a reservation utility of \( V \), then price competition will continue until the value of \( \alpha \) equates lawyers’ ex ante payoffs from the case with the reservation level. We proceed in this way, calculating the endogenous values of \( \alpha \).

If lawyers are sufficiently well informed, they can solve for the equilibrium of the case, depending on the type of plaintiff they represent, by backwards induction. They will,

\(^{17}\)In fact, proving the existence of these \( p \) values is made more complicated by the endogenous values of \( \alpha \) computed in the next section. We can solve for \( \bar{p}^\alpha \) directly by substituting \( c = 0 \) into \( \bar{p} \) in n. 15. However, when \( c = C \), \( \alpha \) can become a function of \( \bar{p} \) and the value(s) of \( \bar{p}^C \) become the real root(s) of a cubic, which are hard to solve for analytically. We can still confirm the existence of a unique \( \bar{p}^C \), but we leave the rather mechanical analysis for the Appendix.

\(^{18}\)Both Danzon (1983) and Swanson (1991) note that a particular advantage of contingent fees, over input-based payment contracts, is their suitability for such price competition.
whether a high- or a low-damage offer can be expected in Period 1, conditional on the type of plaintiff they represent. Given this, there will be competitive values of \( c \) for \( c \in [0, C] \), and based on whether the lawyer expects a high-damage offer or a low-damage offer in Period 1. Using the superscript “\( c \)” to emphasize that values vary with \( c \in [0, C] \), we call these \( \bar{\alpha}^c \) and \( \alpha^c \), respectively. It is straightforward to confirm (see the Appendix) that these are given by

\[
\bar{\alpha}^c = \frac{V + (1 + \delta + \delta^2)c}{\delta^2\bar{x}} \quad \text{and} \quad \alpha^c = \frac{V + (1 + \delta + \delta^2)c}{\delta^2(1 - \pi)\bar{x} + \pi\bar{x}}.
\]

Notice that these PBE fees compare the costs of taking the case, from the lawyer’s perspective, with the benefits in terms of the (expected) damages to be shared between lawyer and client. Ranking the values of \( \alpha \) (again using obvious notation), we have

\[
\alpha^C > \alpha^0 \equiv \bar{\alpha}^C > \bar{\alpha}^0. \tag{6}
\]

As we would expect, the plaintiff’s lawyer needs a higher percentage fee to cover her opportunity costs (1) the lower is the settlement offer she anticipates, and (2) the longer she expects to have to continue bargaining (i.e., when she expects \( \bar{S}_1 \) rather than \( S_1 \)).

### IV. Settlement Timing and the Plaintiff’s Payoffs

We now compare settlement timing and the plaintiff’s payoffs under \( c \in [0, C] \). The plaintiff’s payoff \( U^c \) is a function of \( c \), \( S_1 \) and \( a_t \). Using an overbar (underbar) to signify whether the plaintiff is high- (low-) damage, and the subscript “\( c \)” as before, we have \( U^c(\cdot, S_1^c, \bar{a}_t^c) \) and \( U^c(\cdot, S_1^c, \bar{a}_t^c) \). Therefore,

\[
U^c(\cdot, S_1^c, \bar{a}_t^c) = \begin{cases} (1 - \bar{\alpha}^c)\bar{a}_t^cS_1^c \quad & \text{when } \pi < \pi^c \vspace{1mm} \\ (1 - \bar{\alpha}^c)\bar{a}_t^cS_1^c + (1 - \bar{\alpha}^c)\delta S_2^c \quad & \text{when } \pi > \pi^c \end{cases} \tag{7}
\]

\[
U^c(\cdot, S_1^c, \bar{a}_t^c) = \begin{cases} (1 - \alpha^c)\bar{a}_t^cS_1^c \quad & \text{when } \pi < \pi^c \vspace{1mm} \\ (1 - \alpha^c)\bar{a}_t^c\bar{x} \quad & \text{when } \pi > \pi^c \end{cases} \tag{8}
\]

From (8), the high-damage plaintiff always receives a payoff based on \( \bar{x} \); he either receives a high-damage settlement offer when \( \pi < \pi^c \) or his lawyer refuses all low-damage ones and waits for a high-damage trial award when \( \pi > \pi^c \). As a result, he may only benefit indirectly from hard bargaining, through its effect on \( \alpha \). In contrast, the low-damage plaintiff either receives a high-damage offer immediately \( (\pi < \pi^c) \) or her lawyer “haggles” in response to a low-damage one \( (\pi > \pi^c) \).

Combining Propositions 1 and 2 with (6), (7) and (8) yields the results in Table 1. This distinguishes three regions for the initial value of \( \pi \). When \( \pi \in (0, \pi^0) \cup (\pi^c, 1) \), both types of plaintiff receive higher payoffs when \( c = 0 \). There are two reasons for this. First, in both regions, the cost effect operates but there is no hard bargaining effect to offset it (potentially) for low-damage plaintiffs. In particular, when \( \pi < \pi^0 \) the first offer is based on \( \bar{x} \), whether \( c = 0 \) or \( C \) while, when \( \pi > \pi^c \), the first offer is based on \( \bar{a}_t \) whether \( c = 0 \) or \( C \). However, when \( c = C \), the defendant’s settlement offer is lower by the...
amount of the lawyers’ future costs, which can be extracted through the offer [see (1) and (2)]. Thus, holding damages fixed, offers are lower under $c = C$. This creates a second effect: because offers are lower when $c = C$, the competitive contingent fee percentages are higher [see (6)], meaning that both types of plaintiff pay a larger fraction of the (smaller) sum recovered.

Interestingly, in this joint region, there is no prospect of positive bargaining costs increasing the speed of settlement: settlement is either instant for certain (when $p^* = 0$), or instant with a higher probability under $c = 0$ (when $p^* = C$) (see Figure 3). In the former case, this is because an offer based on $x$ is received in all cases. In the latter, it is because the cost-bearing lawyer’s hard bargaining fails, but involves accepting $x^C$ with a lower probability. Thus, contrary to policy debate, when $p^* \in (0, p^0) \cup (p^C, 1)$, a conflict of interest caused by bargaining costs under contingent fees can emerge, but not as a result of the lawyer achieving speedy settlement.

Now consider intermediate values of $p^*$, i.e., $p^* \in (p^0, p^C)$. Here, the cost-bearing lawyer’s hard bargaining succeeds in inducing a high-damage settlement offer from the defendant, while the lawyer bearing no costs induces a low-damage offer. Thus, it is now

![Fig. 3. Period 1 settlement probabilities.](image-url)
possible for a low-damage plaintiff to gain from hard bargaining: this happens when the higher level of damages received compensates the reductions in settlement demands due to the extraction of legal costs (i.e., the hard bargaining effect dominates the cost effect). Both types of plaintiff can also benefit to the extent that the high-damage offer allows the lawyer to bid a lower contingent fee percentage under \( c \): as (6) shows, \( \pi^c \geq \pi^0 \). Finally, there is a higher probability of speedy settlement as a result of the conflict of interest because high-damage offers are accepted for certain.

**Discussion**

These results indicate the presence of opposing factors when considering whether a self-interested lawyer will settle a contingent-fee case sooner when facing litigation costs than when these are not present, and whether her client suffers in such circumstances. The ambiguity in settlement timing is because bargaining harder involves rejecting more low-damage offers as well as inducing more (acceptable) high-damage ones. Whether the plaintiff is better off when his lawyer faces costs will vary from case to case, although it is worth noting that only a low-damage plaintiff can benefit from the direct effects of hard bargaining. The principal influences on this preference are the relative magnitudes of the cost and hard bargaining effects, which work in opposite directions on the size of the settlement offers, and the degree of uncertainty surrounding whether the plaintiff is high or low damage (i.e., the value of \( p \)). The cost and hard bargaining effects tend to have reinforcing effects through their influence on the contingent-fee percentage.

Notice that, as the plaintiff’s preferences fluctuate, so too does the situation that maximizes the ex ante joint welfare of the plaintiff and his lawyer (given by the sum of their payoffs). This is because, with the lawyer held to reservation utility, this joint payoff varies directly with the plaintiff’s. Of course, when \( \pi \neq (\pi^0, \pi^c) \), this joint welfare is harmed by the presence of bargaining costs and contingent fees.

**Influence of Case Characteristics**

Finally, we analyze how the characteristics of the case in question \( (\pi, C, h, \bar{\pi}, \bar{\pi}, V) \) affect the likely success of hard bargaining.\(^{20}\) Two issues are considered: when is hard bargaining more likely to induce a high-damage initial offer? (i.e., when does \( \pi^c \) increase?) and when is this more likely to benefit the plaintiff?\(^{21}\)

The circumstances in which hard bargaining is likely to succeed can be read from the bottom line of Table 2 (derivations are in the Appendix); only a mean preserving

\(^{20}\)We assume that a change in parameter values does not shift the negotiation from the Pareto optimal equilibrium, that with \( a_1 = a_2 \).

\(^{21}\)By “more likely” we mean that a larger set of parameters is consistent with the event.
spread of damages has an ambiguous effect on $\pi^C$. Elsewhere, higher costs for either side ($C$ and $h$), a higher arithmetic mean of damages (holding spread constant), and a lower opportunity cost for the plaintiff’s lawyer all increase the set of parameters conducive to a high-damage offer under hard bargaining. The role played by $C$ here has already been explained. Higher average damages make the defendant keener to offer $S^C$ because they lower $\tilde{\alpha}^C$ and allow more future costs to be extracted in the settlement offer [see (1) and (2)]. This is also the reason why an increase in the lawyer’s opportunity cost on the case weakens her hard bargaining position. Finally, it is not surprising that a defendant facing higher costs is keen to settle in Period 1. As Table 2 shows, the first three of these effects are due to hard bargaining (they do not occur when $\epsilon = 0$); the fourth occurs regardless of the lawyer’s bargaining stance.\footnote{Technically, the difference is due to whether or not $c/a$ appears in $l^C$, which it does not when $\epsilon = 0$. Conversely, $h$ features in $h^C$ and $l^C$.}

It is difficult, without an explicit expression for $\hat{\pi}^C$, to derive unambiguous comparative static results for the effects of case characteristics on the plaintiff’s payoffs. However, Table 1 shows that a necessary condition for either plaintiff to benefit from hard bargaining is $\pi \in (\hat{\pi}^0, \hat{\pi}^C)$. Therefore, changes that widen this region are necessary—not sufficient—to make hard bargaining more likely to benefit plaintiffs. Table 2 shows that this is unambiguously the case for three of the factors that make hard bargaining more likely to succeed: higher $C$ and average damages and lower $V$. However, as we have seen, raising the defendant’s costs weakens him, regardless of the lawyer’s strategy and, therefore, has an ambiguous effect on the necessary condition for plaintiffs to benefit from hard bargaining.

V. Conclusions

One reason, given by some policy makers and supported by previous literature, for concern over the effects of contingent fees for lawyers is that they provide incentives for lawyers to settle cases earlier, and for less, than clients would wish. In particular, this concern has focused on the lawyer’s desire to prevent accumulated bargaining costs from consuming her share of the available damages. This paper has shown that such a view is too simplistic: in a dynamic setting, bargaining costs produce strategic influences that work in opposite directions, thereby complicating the role of costs and contingent fees.

Certainly, holding the level of damages constant, a cost-bearing contingent fee lawyer’s self-interest will lead her to receive and accept lower settlement amounts than her client would wish [the cost effect identified by inter alia Miller (1987)]. In a competitive market for lawyers, this may further damage the plaintiff by increasing the contingent fee percentage required by the lawyer to cover opportunity costs on the case. However, when lawyers have private information and the opportunity to influence future periods of bargaining, these bargaining costs can play a strategic role. Thus, when the lawyer bears costs, her rejections of a settlement offer are more credible signals that she represents a severely damaged client than when she bears no costs (the hard bargaining effect). Accordingly, bearing costs allows the lawyer to bargain harder and may induce a higher settlement offer. Which of these two factors dominates has been shown to depend on the characteristics of the case: the size of the lawyer’s costs themselves, the spread and level of damages involved, their initial probability of occurring, and level of the defendant’s costs. The central policy lesson, however, is that
contingent fees need not be dismissed for giving lawyers self-interested incentives: in some circumstances, this may be exactly what their clients need.

There are many ways in which the paper could be extended to improve our knowledge of how contingent fees affect litigation behavior. The model ignores several features that are relevant to the question at hand. For instance, plaintiffs are often risk averse, and lawyers can often influence court decisions. Because there is reason to believe that contingent fees have risk sharing and signaling properties, it would be appropriate to incorporate risk and court error into the model; by allowing lawyers to signal to the court, this may enhance the effects of hard bargaining under costs and contingent fees. In turn, this would make a consideration of the effects of contingent fees under other cost allocation rules—like the English one—more interesting. A further issue concerns the comparative effect of contingent fees on litigation relative to other fee contracts: even if contingent fees operate imperfectly, do they dominate other arrangements?

It would also be interesting to study the optimal contract between lawyer and client in a dynamic pretrial bargaining environment. This raises the interesting issue of renegotiation of the fee contract upon receipt of a settlement offer. For example, if the defendant’s side has private information, there may be offers that become acceptable to the plaintiff and his lawyer (as this information emerges), but that the lawyer would reject under the original contract.

Finally, we might consider the role of contingent fees in richer dynamic bargaining contexts, particularly ones with endogenous delay and two-sided information asymmetries. Although our model indicates that the results here are likely to be complicated, it also suggests that the strategic incentives within a given bargaining environment are important to understanding how fee arrangements affect settlement timing and settlement amounts.

Appendix: Contingent Fees and Litigation Settlement

Proof of Proposition 1

Let \( \tilde{S}_1 \) be the minimum Period 1 offer that a low-damage plaintiff’s lawyer would accept when \( S_2 = \tilde{S}_2 \). Therefore, \( \tilde{S}_1 \) satisfies

\[
\alpha \tilde{S}_1 - c = \alpha \delta \left( \frac{x - \epsilon}{\alpha} \right) - c - \delta c
\]

so that \( \tilde{S}_1 = \tilde{S}_1 \). Also, define \( \Delta = \tilde{x} - x \). Finally, define the defendant’s payoff as a function of the Period 1 settlement offer and the low-damage plaintiff’s lawyer’s response \( U^D(S_1, q_1) \). Therefore,

\[
U^D(\tilde{S}_1, 1) = -(\tilde{S}_1 + h)
\]

\[
U^D(S_1, q) = -(\pi a \tilde{S}_1 + (1 - \pi a) \tilde{S}_2) - h - \delta (1 - \pi a) h.
\]

The proof proceeds by examining the parties’ strategies in two situations: \( \pi < \lambda_2 \) and \( \pi > \lambda_2 \).

1. \( \pi < \lambda_2 \): Clearly, the defendant can offer \( \tilde{S}_1 \) and settle the case. Consider \( S_1 \in [\tilde{S}_1, \tilde{S}_1] \). If this is rejected, he computes the posterior probability that he faces a low-damage plaintiff, \( \mu \), from Bayes’ rule:
Because his high-damage opponent plays $\tilde{a}_1 = 0 \ V S < \tilde{S}_1$, we must have $\mu \leq \pi$. Thus (by definition of $\lambda_2$), if $\pi < \lambda_2$, the defendant will offer $\tilde{S}_2$ in Period 2. Anticipating this, the low-damage plaintiff’s lawyer will not accept $S_1 < \tilde{S}_1$, so the defendant must offer $\tilde{S}_1$, which both types of plaintiff accept. This yields the defendant the payoff $U^D(\tilde{S}_1, 1)$.

(2) $\pi > \lambda_2$: Again, the defendant can offer $\tilde{S}_1$ and settle the case. Consider $S_1 \in [\tilde{S}_1, \tilde{S}_2)$, which means that the high-damage plaintiff’s lawyer plays $\tilde{a}_1 = 0$. The low-damage plaintiff’s lawyer cannot play $a_1 > a$, as this would induce $\mu < \lambda_2$ and $\tilde{S}_2$, which she would certainly prefer. Suppose she plays $a_1 < a$, which induces $\mu > \lambda_2$, so that $S_2$ is offered. Accordingly, if $S_1 \in (\tilde{S}_1, \tilde{S}_2)$ she would play $a_1 = 1$, a contradiction. For $S_1 = \tilde{S}_1$, any $a_1 \in [0, 1]$ will suffice. As explained in the text, we focus on Rasmusen’s Pareto optimal focal point $a_1 = a$. If mixing, she must be indifferent between accepting and rejecting $S_1$. This must mean that her opponent is also mixing between $\tilde{S}_1$ and $\tilde{S}_2$. Letting $q$ denote the defendant’s probability of playing $\tilde{S}_2$, we have

$$\alpha S_1 - \epsilon = q \alpha \tilde{S}_2 + (1 - q) \alpha \delta \tilde{S}_2 - \epsilon - \delta \epsilon$$

$$\Rightarrow q = \frac{S_1 - \delta \tilde{S}_2 + \frac{c}{\alpha}}{\delta (\tilde{S}_2 - \tilde{S}_1)}.$$

To determine $S_1$ and $S_2$, we note that the defendant’s expected payoff from $S_1 \in [\tilde{S}_1, \tilde{S}_2)$ is given by $-\pi q S_1 + (1 - \pi q) \delta S_2 - h - (1 - \pi q) \delta h$, using the fact that he is indifferent in the second period between $\tilde{S}_1$ and $\tilde{S}_2$. This is clearly minimized by $\tilde{S}_1$, so that (from the equation for $q$) he plays $\tilde{S}_2$ in Period 2.

Thus, the Pareto optimal PBE depends on the parameter values. The defendant can offer $\tilde{S}_1$ and the plaintiff’s lawyer play $\tilde{a}_1 = \tilde{a}_1 = 1$, generating the defendant an expected payoff of $U^D(\tilde{S}_1, 1)$. Alternatively, the defendant can offer $\tilde{S}_1$ and the plaintiff’s lawyer play $\tilde{a}_1 = a$, $a_2 = 1$; $\tilde{a}_1 = \tilde{a}_2 = 0$, giving the defendant an expected payoff of $U^D(\tilde{S}_1, \tilde{g})$. The equilibrium outcome will depend on which yields the defendant the highest expected payoff. Settlement will definitely occur in Period 1 if $U^D(\tilde{S}_1, 1) > U^D(\tilde{S}_1, \tilde{g})$. Substituting in for the relevant settlement amounts and rearranging tells us that this implies

$$(1 - \pi a) \left( h + \frac{c}{\alpha} \right) > \pi a \delta \Delta$$

$$\Rightarrow \frac{h + \frac{c}{\alpha}}{\alpha (\delta \Delta + h + \frac{c}{\alpha})} = \lambda_1 > \pi.$$

Similarly, if $\pi > \lambda_1$, the defendant offers $\tilde{S}_1$, and the case may not settle in Period 1.■
Consider first the values of \( \alpha \) when the lawyer expects to face a high-damage settlement offer. Her expected payoff is the same regardless of whether she expects to represent a high-damage or a low-damage plaintiff. Denoting the payoff from these as \( U^h(\alpha, S_1^h) \) and \( L^h(\alpha, S_1^h) \), respectively, for \( \epsilon \in [0, C] \), we have

\[
U^h(\alpha, S_1^h) = \frac{U^h(\alpha, S_1^L) - \bar{\alpha} \delta^2 x - \delta \bar{\alpha} - \delta^2 \epsilon}{\bar{\alpha}^2} - \epsilon.
\]

Setting this equal to \( V \) and rearranging returns the value of \( \bar{\alpha}^\prime, \epsilon \in [0, C] \) in Section III.

Next suppose the lawyer expects to receive a low-damage settlement offer in Period 1. Here, her expected payoff depends on whether she expects to represent a high-damage or a low-damage plaintiff. When representing a high-damage plaintiff, the offer is rejected, the case goes to trial, and the lawyer receives

\[
U^l(\epsilon, S_1^h) = \alpha^\prime \delta^2 x - \epsilon - \delta \epsilon - \delta^2 \epsilon.
\]

When she represents a low-damage plaintiff, either the first or second period offer is accepted. The lawyer’s expected payoff is

\[
U^l(\epsilon, S_1^L) = \alpha^\prime \left[ aS_1^L + (1 - a)S_1^L \right] - \epsilon - (1 - a)\delta \epsilon
\]

where \( S_1^L = \delta^2 x - \delta^2 \epsilon / \alpha^\prime - \delta \epsilon / \alpha^\prime \) and \( S_1^L = \delta^2 x - \delta^2 \epsilon / \alpha^\prime \). The lawyer will choose \( \alpha^\prime \) to solve

\[
\pi U^l(\epsilon, S_1^L) + (1 - \pi) U^l(\epsilon, S_1^L) = V.
\]

Substituting for the payoffs and for \( a = 1 - (1 - \pi) (h + \epsilon / \alpha^\prime) / \pi \Delta \) and rearranging gives the expression for \( \alpha^\prime, \epsilon \in [0, C] \) in the text.

**Uniqueness of \( \hat{\Pi}^0 \) and \( \hat{\Pi}^C \) (from Section III)**

In Proposition 1, we were able to calculate a unique value of \( \pi \) (i.e., \( \hat{\Pi} \)) at which the defendant switched between offering \( S_1^h \) and \( S_1^L \). This was easily done because \( \alpha \) was assumed to be exogenous. Now that \( \alpha \) has been made endogenous, we need to check whether such a unique value of \( \pi \) remains under \( \epsilon \in [0, C] \). The problem is that, with two pairs of equilibrium values for \( \alpha \)—depending on \( \epsilon \), i.e., \( [\alpha^0, \alpha^0] \) and \( [\alpha^C, \alpha^C] \)—there are two pairs of \( \lambda_1 \) functions: with obvious notation \( \{\lambda^0_1(\alpha^0), \lambda^0_1(\alpha^0)\} \) and \( \{\lambda^C_1(\alpha^C), \lambda^C_1(\alpha^C)\} \). Given that \( \hat{\Pi} \) is the root of \( \lambda_1(\pi) = \pi \), the multiple \( \lambda_1 \) functions might imply multiple “switching probabilities.” In fact, we can show that this is not the case.

To begin, the case of \( \hat{\Pi}^0 \) is straightforward. With \( \epsilon = 0 \), \( \alpha \) does not enter into \( \lambda_1 \), and we have

\[
\lambda^0_1(\alpha^0) = \lambda^0_1(\alpha^0) = \frac{h}{a^0(\delta \Delta + h)}.
\]

It is easy to check that this has a unique root, with the value implied by n. 15 in the text.

To establish the existence and uniqueness of \( \hat{\Pi}^C \), we first note that the endogenous percentages now enter \( \lambda^C_1 \), thereby yielding two possible \( \lambda^C_1 \) functions:
where we have recognized the dependence of \( a \) on \( \alpha \) as well. We now do two things: first, we examine the boundaries within which \( \hat{\pi} \) must lie; then, we establish the existence and uniqueness of \( \hat{\pi} \) within these. These are done, respectively, in the following two lemmas.

**Lemma 1:** (1) \( \lambda_1^C(\alpha^C) \) and \( \lambda_1^C(\bar{\alpha}^C) \) both slope down in \( \pi \) and have unique fixed points. (2) \( \lambda_1^C(\bar{\alpha}^C) > \lambda_1^C(\alpha^C) \).

**Proof:** (1) It is easy to confirm that \( \partial \lambda_1^C(\alpha^C) / \partial \pi < 0 \). (2) This is easily checked by rearrangement.

We shall refer to the fixed point of \( \lambda_1^C(\alpha^C) \) as \( \hat{\pi}_1^C \), and to that of \( \lambda_1^C(\bar{\alpha}^C) \) as \( \hat{\pi}_2^C \). Clearly, \( \hat{\pi}_2^C > \hat{\pi}_1^C \), as depicted in Figure A1.

Figure A1 tells us that, when \( \pi < \hat{\pi}_2^C \), the defendant will offer \( \hat{S}_1^C \) based on \( \bar{\alpha}^C \), \( \bar{S}_1^C(\bar{\alpha}^C) \), and when \( \pi > \hat{\pi}_1^C \), the defendant will offer \( \hat{S}_1^C \) based on \( \alpha^C \), \( S_1^C(\alpha^C) \). However, \(^2\) When \( \pi < \hat{\pi}_1^C \), the defendant will make a high-damage offer regardless of the value of \( \alpha \). As a result, the value

\[ \lambda_1^C(\alpha^C) = \frac{h + \frac{C}{\alpha^C}}{\alpha^C(\Delta + h + \frac{C}{\alpha^C})} \quad \text{and} \quad \lambda_1^C(\bar{\alpha}^C) = \frac{h + \frac{C}{\bar{\alpha}^C}}{\alpha^C(\Delta + h + \frac{C}{\bar{\alpha}^C})} \]

FIG. A1. The possibility of multiple equilibria.
this leaves us unclear as to what the defendant will do when $\pi \in (\bar{\pi}_1^C, \bar{\pi}_2^C)$. As depicted in Figure A1, in this region, the defendant would like to offer $S_t^tC(\bar{\alpha}^C)$ and $S_t^C(\bar{\alpha}^C)$. Which will be offered will be decided by which yields the defendant the highest payoff. We wish to show that there is at most one value of $\pi$, at which the defendant switches between these offers on the interval $(\bar{\pi}_1^C, \bar{\pi}_2^C)$. Lemma 2 states a result here.

**Lemma 2:** For $\pi \in (\bar{\pi}_1^C, \bar{\pi}_2^C)$, there is at most one value of $\pi$ for which the defendant switches from preferring $S_t^tC(\bar{\alpha}^C)$ to preferring $S_t^C(\bar{\alpha}^C)$.

**Proof:** Define the function $\psi(\pi) = U_D(S_t^tC(\bar{\alpha}^C), a^C) - U_D(S_t^C(\bar{\alpha}^C), 1)$, i.e., the difference between the defendant’s payoffs from the two competing offers in $(\bar{\pi}_1^C, \bar{\pi}_2^C)$. We wish to show that $\psi(\pi)$ has a unique root on $(0, 1)$.

We have

$$U_D(S_t^C(\bar{\alpha}^C), 1) = -\left(\frac{\delta^2 \bar{\alpha} - \frac{\delta^2 C}{\bar{\alpha}} - \frac{\delta C}{\bar{\alpha}} + \bar{h}}{\frac{\delta^2 C}{\bar{\alpha}} + \frac{\delta C}{\bar{\alpha}}}ight)$$

$$U_D(S_t^tC(\bar{\alpha}^C), a^C) = -(\pi a^C C[S_t^tC(\bar{\alpha}^C) + \bar{h}] + (1 - \pi a^C C)[S_t^C(\bar{\alpha}^C) + \bar{h} + \delta h])$$

Substituting for $a^C C$ and $S_t^C(\bar{\alpha}^C)$, $t = 1, 2$, allows us then to substitute into $\psi(\pi)$. Rearranging the resulting expression returns

$$\psi(\pi) = \pi a^C C \delta^2 \Delta + \frac{\delta^2 C}{\bar{\alpha}} + \pi a^C C \frac{\delta C}{\bar{\alpha}} - [1 - \pi a^C C] \delta h - \frac{\delta^2 C}{\bar{\alpha}} - \frac{\delta C}{\bar{\alpha}}$$

$$= \pi \delta a^C C(\cdot) \left(\delta \Delta + h + \frac{C}{\bar{\alpha}}\right) + \frac{\delta^2 C}{\bar{\alpha}} - \delta h - \frac{\delta^2 C}{\bar{\alpha}} - \frac{\delta C}{\bar{\alpha}}. \quad (A1)$$

We shall focus on this expression.

Notice first that $\psi(0) = -\delta h - \delta C/\bar{\alpha}^C < 0$, because $\alpha^C = \bar{\alpha}^C$ when $\pi = 0$. Next, consider $\psi(1) = \delta^2 \Delta + (1 + \delta) C [1/\bar{\alpha}^C - 1/\bar{\alpha}^C] > 0$ since $\bar{\alpha}^C > \bar{\alpha}^C$ when $\pi = 1$. Therefore, $\psi(\pi)$ increases on $[0, 1]$. If we can show that this happens monotonically, we will have established that $\psi(\pi)$ has a unique root on this interval.

Differentiating Equation (A1) with respect to $\pi$ yields

$$\frac{\partial \psi(\pi)}{\partial \pi} = \left(\delta \bar{\alpha}^C + \pi \delta \frac{\partial a^C}{\partial \pi}\right) \theta - \frac{C}{(\bar{\alpha}^C)^2} \frac{\partial a^C}{\partial \pi}$$

where $\theta = \delta \Delta + h + C/\bar{\alpha}^C$ (also recall that $\bar{\alpha}^C$ is not a function of $\pi$). We have suppressed the functional notation on $\bar{a}^C$ for convenience. Because $\bar{a}^C = 1 - (1 - \pi)(h + C/\bar{\alpha}^C)/\pi \Delta$, we have

$$\frac{\partial a^C}{\partial \pi} = \frac{h + C}{(\pi \Delta)^2} + \frac{(1 - \pi) C}{\pi \Delta (\bar{\alpha}^C)^2} \frac{\partial \alpha^C}{\partial \pi}$$

of $\alpha$ will be $\bar{\alpha}^C$ and the settlement offer will build this into the analysis. Similar reasoning confirms the offers made when $\pi > \bar{\pi}_2^C$.

$^2$From the preceding argument, if this falls outside $(\bar{\pi}_1^C, \bar{\pi}_2^C) \supset (0, 1)$, then $\bar{\pi}_1^C = \bar{\pi}_2^C$ or $\bar{\pi}_1^C = \bar{\pi}_2^C$. 

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Substituting this into Equation (A2) and rearranging gives
\[
\frac{\delta \psi(\pi)}{\delta \pi} = \left( \frac{\delta C}{\pi \Delta} + \frac{\delta \left( h + \frac{C}{\alpha} \right)}{\pi \Delta} \right) \theta + \left[ \pi \delta \left( h + \frac{C}{\alpha} \right) \left( \frac{1 - \pi}{\pi \Delta} - \frac{C}{\alpha^2} \right) \delta \right] \frac{C}{(\alpha^2)^2} \frac{\partial \alpha^C}{\partial \pi}.
\]

Next, we substitute for \( \alpha^C/\delta \pi = \alpha^C \Delta / (\pi - \pi \Delta) \) and rearrange to give
\[
\frac{\delta \psi(\pi)}{\delta \pi} = \left( \frac{\delta C}{\pi \Delta} + \frac{\delta \left( h + \frac{C}{\alpha} \right)}{\pi \Delta} \right) \theta + \frac{(1 - \pi) \left( h + \frac{C}{\alpha} \right) \delta C}{\alpha^C(\pi - \pi \Delta)} - \frac{(\alpha^C + \delta) \pi \Delta \delta \frac{C}{\alpha^C}}{\alpha^C(\pi - \pi \Delta)}
\]
\[
= \frac{(1 - \pi) \left( h + \frac{C}{\alpha} \right) \delta C}{\alpha^C(\pi - \pi \Delta)} + \Delta \alpha^C \theta \left( 1 - \frac{(\alpha^C + \delta) \pi \Delta \delta \frac{C}{\alpha^C}}{\alpha^C(\pi - \pi \Delta)} + \frac{\delta \alpha^C}{\alpha^C(\pi - \pi \Delta)} \right).
\]
The first term here is positive, as is \( \delta \alpha^C \theta \); the bracket is harder to sign. Define this bracket as
\[
Z = 1 - \left( \frac{\alpha^C + \delta) \pi \Delta C}{\alpha^C(\pi - \pi \Delta)} + \frac{\delta \alpha^C h}{\alpha^C(\pi - \pi \Delta)} \right) \theta \left( \frac{\delta \alpha^C}{\alpha^C(\pi - \pi \Delta)} + \frac{\delta \alpha^C}{\alpha^C(\pi - \pi \Delta)} \right).
\]
Using \( \alpha^C = M/\delta^2 (\pi - \pi \Delta) \), \( M = (1 + \delta + \delta^2) C + V \), we can rewrite this as
\[
Z = \frac{Ma^C h}{\delta} + \frac{Ma^C h}{\delta^2} + \frac{a^C(\pi - \pi \Delta) + (\alpha^C + \delta) \pi \Delta C}{\delta^2} + \frac{M\theta \left( h + \frac{C}{\alpha^C} \right)}{\delta^2 \pi \Delta}
\]
\[
= \left( 1 - \frac{\pi}{\delta} \right) Ca^C \Delta + \frac{Va^C \Delta}{\delta} + \frac{Ma^C h}{\delta^2} + \alpha^C(\pi - \pi \Delta) C + \frac{M\theta \left( h + \frac{C}{\alpha^C} \right)}{\delta^2 \pi \Delta}.
\]
Only the final bracket here is hard to sign at first glance: the remaining terms are positive. In fact, we can show that the bracket is positive, thereby showing \( Z > 0 \) and completing the proof. We have
Lemmas 1 and 2 have established the existence of a unique value of \( \pi \) at which the defendant will switch from offering \( S_1^C(a^C) \) to offering \( S_2^C(a^C) \): this is \( \pi^C \) from Section III.

Proposition 2 shows that \( \lambda_1^0 < \lambda_1^C(\bar{a}^C) < \lambda_2^C(\bar{a}^C) \), which implies that \( \pi^0 < \pi_1^C < \pi_2^C \). Noting that \( \pi^C \) is only of interest when \( \pi^C \in (\pi_1^C, \pi_2^C) \) confirms that \( \pi^C > \pi^0 \), as claimed in Section III.

**Comparative Statics for Table 2**

Our derivation of the results in Table 2 focuses on those for \( \pi^C \) (\( \pi^0 \) is well defined, as we have seen and its derivatives are easily determined). Thus, we focus on \( \psi(\pi) \), from Equation (A1), to which we apply the implicit function theorem (IFT). It is useful to begin by recalling the expressions for \( \alpha^C, \bar{\alpha}^C \) and \( \bar{a}^C(\bar{a}^C) \), all of which appear in \( \psi(\pi) \). We have

\[
\alpha^C = \frac{M}{\delta^2(\bar{x} - \pi \Delta)}, \quad \bar{\alpha}^C = \frac{M}{\delta^2 \bar{x}}, \quad \bar{a}^C(\alpha^C) = 1 - \frac{(1 - \pi) \left( h + \frac{C}{\alpha^C} \right)}{\pi \Delta}.
\]
The Effects of Plaintiff Costs (C)

From the IFT,

$$\frac{d\vec{\pi}^C}{dC} = -\frac{\partial\phi}{\partial\vec{\pi}}.$$

We know from Lemma 2 that $\partial\phi/\partial\pi > 0$. Therefore, we focus on $\partial\phi/\partial C$. We begin by noting that

$$\frac{\partial}{\partial C} \left( \frac{C}{\alpha^C} \right) = \frac{V}{\alpha^CM} \geq \frac{V}{\alpha^C} = \frac{\partial}{\partial C} \left( \frac{C}{\alpha^C} \right).$$

(A3)

Using this, and Equation A1, we have

$$\frac{\partial\phi}{\partial C} = \pi \frac{\partial a^C}{\partial h} \left( \delta \Delta + h + \frac{C}{\alpha^C} \right) - \delta (1 - \pi a^C) < 0 \quad \therefore \quad \frac{\partial a^C}{\partial h} < 0 \Rightarrow \frac{d\vec{a}^C}{dh} > 0.$$

The Effects of Defendant Costs (h)

Given Lemma 2, this is determined by $\partial\phi/\partial h$. From Equation A1:

$$\frac{\partial\phi}{\partial h} = \pi \frac{\partial a^C}{\partial h} \left( \delta \Delta + h + \frac{C}{\alpha^C} \right) - \delta (1 - \pi a^C) < 0 \quad \therefore \quad \frac{\partial a^C}{\partial h} < 0 \Rightarrow \frac{d\vec{a}^C}{dh} > 0.$$

The Effects of Lawyer Opportunity Costs (V)

We are interested in $\partial\phi/\partial V$. Start by noting

$$\frac{\partial}{\partial V} \left( \frac{C}{\alpha^C} \right) = -\frac{C}{M\alpha^C} \leq -\frac{C}{\tilde{\alpha}^C} = \frac{\partial}{\partial V} \left( \frac{C}{\alpha^C} \right).$$

(A4)

Therefore, using this and Equation (A1)

$$\frac{\partial\phi}{\partial V} = \pi \frac{\partial a^C}{\partial V} \left( \delta \Delta + h + \frac{C}{\alpha^C} \right) - \frac{\partial a^C}{\partial V} \left( \delta C \right) - \frac{\delta^2 C}{M\alpha^C} + \frac{\delta^2 C}{M\tilde{\alpha}^C} + \frac{\delta C}{M\tilde{\alpha}^C}.$$

Given

$$\frac{\partial a^C}{\partial V} = \frac{(1 - \pi)}{\pi \Delta} \left( - \frac{C}{(\alpha^C)^2} \frac{\partial a^C}{\partial V} \right) > 0,$$
plus Equation (A4) and the fact that $\pi_{\alpha^C} < 1$, we have
\[
\frac{\partial \psi}{\partial V} > 0 \Rightarrow \frac{d\pi_{\alpha^C}}{dV} < 0.
\]

The Effects of Higher Mean and Spread of Damages

The mean level of damages is given by
\[
x_m = \frac{\bar{x} + x}{2}.
\]

To model an increase in the mean, with no change in spread, and a mean-preserving increase in spread, we must, therefore, recognize that $\bar{x}$ and $x$ will need to move simultaneously. For example, we can consider the effects of $dx$, bearing in mind the subsequent effects of $dx/d\bar{x}$. In particular, for an increase in mean (no change in spread), we have $dx/\bar{x} = 1$, and for a mean-preserving increase in spread we have $dx/\bar{x} = -1$.

Bearing this in mind, we begin by noticing that, in general,
\[
\frac{\partial (C/\alpha^C)}{\partial \bar{x}} = \frac{\delta^2 C}{M}, \quad \frac{\partial (C/\alpha^C)}{\partial x} = \frac{\delta^2 C}{M} \left[ 1 - \pi(1 - \frac{dx}{d\bar{x}}) \right], \quad \text{(A5)}
\]
\[
\frac{\partial a^C}{\partial \bar{x}} = \frac{(1 - \pi)}{(\pi \Delta)^2} \left[ \pi \Delta \frac{\partial (C/\alpha^C)}{\partial \bar{x}} - \left( h + \frac{C}{\alpha^C} \right) \pi(1 - \frac{dx}{d\bar{x}}) \right], \quad \text{(A6)}
\]
\[
\frac{\partial \psi}{\partial \bar{x}} = \pi \delta \frac{\partial a^C}{\partial \bar{x}} (\delta \Delta + h + \frac{C}{\alpha^C}) + \pi \delta a^C \left[ \delta \left( 1 - \frac{dx}{d\bar{x}} \right) + \frac{\partial (C/\alpha^C)}{\partial \bar{x}} \right] + \delta^2 \frac{\partial (C/\alpha^C)}{\partial \bar{x}} \left( \delta^2 + \delta \right) \frac{\partial (C/\alpha^C)}{\partial \bar{x}} \quad \text{(A7)}
\]

To examine the effects of an increase in mean (spread constant), we substitute Equations (A5) and (A6) into (A7) and substitute for $d\Delta/d\bar{x} = 1$. This leaves Equation (A7) as
\[
\frac{\partial \psi}{\partial \bar{x}} = \pi \delta \frac{\partial a^C}{\partial \bar{x}} (\delta \Delta + h + \frac{C}{\alpha^C}) + \frac{\delta^3 C}{M} (\pi a^C - 1).
\]

This is negative, because
\[
\frac{\partial a^C}{\partial \bar{x}} \bigg|_{d\Delta/d\bar{x}=1} < 0.
\]
Therefore,\[ \frac{d\dot{x}^C}{dx^m} \bigg|_{\Delta_{\text{fixed}}} > 0. \]

We examine a mean-preserving increase in spread by substituting Equations (A5) and (A6) into (A7), and setting \( dx/d\bar{x} = -1 \). It is easy to confirm that the resulting version of Equation (A7) cannot be signed, implying that \( d\dot{x}^C/d\Delta_{\text{fixed}} \equiv 0 \).

References


