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**Trial and Settlement:
A Study of High-Low Agreements**

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Abstract

This paper presents the first systematic theoretical and empirical study of high-low agreements in civil litigation. A high-low agreement is a private contract that, if signed by litigants before the conclusion of a trial, constrains the future damages payment to lie between a minimum and a maximum amount. Whereas the existing literature describes litigation as a choice between trial and settlement, our examination of high-low agreements—a relatively new phenomenon in civil litigation—introduces partial or incomplete settlements. In our theoretical model, trial is both costly and risky. When litigants have divergent subjective beliefs and are mutually optimistic about their trial prospects, cases may fail to settle. In these cases, high-low agreements can be in the litigants' mutual interest because they limit the risk of outlier damages awards while still allowing for an optimal degree of speculation. Using unique insurance claims data from a national insurance company, we describe the features of these agreements and empirically investigate the factors that may influence whether litigants discuss or enter into high-low agreements. Our empirical findings are consistent with the predictions of the theoretical model. We also explore extensions and alternative explanations for high-low agreements, including their use to mitigate excessive, offsetting trial expenditures.

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1. Introduction

In the summer of 2004, a semi-trailer truck cruising at 65 miles per hour on U.S. Highway 60 rear-ended a Ford pickup truck that was stopped in a line of traffic. The pickup truck was in flames as witnesses pulled the driver, Delbert Sanders, from the wreckage. The driver of the semi, who had been searching for his dropped cell phone at the time of the accident, was unharmed. Although the semi driver and his insurer admitted liability for the accident, the parties disagreed over the severity of Sanders' alleged back injury. Settlement negotiations before trial reached an impasse—the defendants' offer of \$500,000 to Sanders was far below the \$1.3 million that he demanded. Both sides were caught by surprise when the jury returned a \$5.25 million verdict. Sanders did not walk away with \$5.25 million, however. Instead, the defendants paid only \$1.5 million, all that was owed under a so-called "high-low agreement" signed by the parties before the jury rendered its verdict.¹

A high-low agreement is a contract "in which a defendant agrees to pay the plaintiff a minimum recovery in return for the plaintiff's agreement to accept a maximum amount regardless of the outcome of trial."² High-low agreements allow both sides to hedge their bets and, perhaps as a result, these agreements appear to have become increasingly popular over the last 30 years.³ Although some lawyers and judges have expressed reservations about their use,⁴ high-low agreements have found significant support among many litigants and legal practitioners, including judges. In the words of Judge Bowes of the Superior Court of Pennsylvania, "[a]s a tool commonly utilized in litigation, a high/low agreement guarantees a

¹ Their agreement specified a low of \$300,000 and a high of \$1.5 million. See Emerick (2007).

² *Black's Law Dictionary*, 8th ed. (2004). Another form of high-low agreement involves giving the factfinder a choice between two awards. Obviously, with this form of high-low agreement, the factfinder is aware of the settlement contract. In many cases, however, factfinders do not know of these agreements.

³ McDonough (2005). In Cook County, Illinois, Judge Richard Elrod estimates that high-low agreements are discussed in 20 to 30 percent of the claims on his docket, and that 10 percent of the claims are ultimately resolved with high-low agreements in place. The exact origins of high-low agreements are unknown. A mid-1970s article by a New York State Supreme Court Justice described the concept, its advantages, and some of the conditions under which parties might enter into a high-low agreement (Finz, 1976). These agreements, the justice argued, reduce the parties' risk while allowing them to avoid appeal delay.

⁴ For example, according to one plaintiffs' attorney, a high-low agreement "reduces the whole concept of a judicial proceeding to a wager..." and "make(s) a mockery of the system" (Riner, 1989). While largely enforceable in courts of law, high-low agreements have received greater scrutiny in situations involving multiple defendants and minors. See Hoenig (2006) and Faley and Alonso (1998). See also McDonough (2005).

plaintiff a minimal recovery while concomitantly circumscribing a defendant's potential exposure. Court, counsel, and litigants favor them.”⁵

This paper presents the first systematic study of high-low agreements in civil litigation.⁶ We begin with a theoretical model in which litigants have the option to enter into contracts prior to a risky and costly trial. The litigants may have different subjective beliefs about the likely outcome of the trial, and they may or may not be risk averse. Naturally, we find that when the costs of litigation are not too large and both parties are sufficiently confident about succeeding at trial (i.e., they are sufficiently “mutually optimistic”), litigants will fail to agree on an out-of-court settlement. But utility-maximizing litigants will not necessarily pursue a “naked” trial under those conditions. A high-low agreement, in which the litigants place both a ceiling and a floor on the award that the plaintiff may receive, can emerge as the optimal contract when at least one litigant is sufficiently risk averse and the risk at trial is large relative to the anticipated litigation costs. In essence, a high-low agreement reduces the disutility the litigants suffer from risk while still allowing them to speculate optimally on the trial outcome.

With this prediction from the model in hand, we turn to data from a large, national insurer to explore the actual use of high-low agreements. The insurer employs many lawyers, both in-house and by contract, and operates in nearly every state. The data include all claims that were open at any point between January 1, 2004, and March 31, 2009. Crucially, the insurance company granted us access to its detailed litigation notes, which has allowed us to identify those cases where high-low agreements were discussed, negotiated, and reached. The vast majority of claims were resolved administratively by claims adjusters without any legal action. Close to 2,600 claims resulted in lawsuits that ended in trial or arbitration. More than 5 percent of these litigated claims involved high-low discussions, and almost 4 percent had high-low agreements in place at the time of resolution by verdict or decision. Moreover,

⁵ *Thompson v. T.J. Whipple Const. Co.*, 985 A.2d 221, 229 (Pa. Super. 2009).

⁶ The first known academic mention of high-low agreements was in 1968. See Coulson (1968). There is no detailed treatment of high-low agreements in either the legal or economics literatures, although there are articles that briefly discuss them. See, e.g., Gross and Syverud (1996, pp. 61–62). It is interesting to note that interest rate collars in financial loan agreements bear some similarity to high-low agreements in civil litigation. Under a collar agreement, the borrower's interest rate is permitted to “float” between a ceiling and a floor. See Briys, Crouhy, and Schobel (1991).

hundreds of claims that ultimately fully settled before adjudication also involved high-low discussions and agreements.

We demonstrate that the behavior of the litigants in our data is consistent with the basic predictions of our partial settlement model. We find that those claims that are expected to be low cost and highly volatile are more likely, relative to baseline probabilities, to involve high-low discussions and/or result in a high-low agreement at some point during the litigation. Specifically, cases with below-median expected litigation costs and above-median expected volatility are, by one estimate, ten times as likely to involve high-low discussions as below-median expected cost, below-median expected volatility claims. Importantly, we do not assert that litigants or lawyers consciously (or unconsciously) seek high-lows for the reasons we identify—only that the patterns in the data are *consistent* with their doing so.

Our paper contributes to the large theoretical and empirical literature on the resolution of litigation.⁷ The vast majority of civil cases in the United States settle out of court. Among cases that are filed in state courts, fewer than four percent actually go to trial. In the federal courts, the figure is approximately two percent.⁸ Choosing to sign a contract agreeing to “opt out” of formal litigation generally makes significant economic sense: the pursuit of litigation is expensive, time-consuming, and risky. Given the obvious advantages of settlement, much of the existing economics scholarship on litigation has focused on the specific factors that motivate most parties to settle and some parties to proceed to trial despite the benefits to avoiding the cost and uncertainties of adjudication.

Starting with the work of Landes (1971), Posner (1973), and Gould (1973), commentators have suggested that settlement negotiations may fail when litigants have different subjective beliefs about the likely outcome at trial.⁹ Others have argued that cases

⁷ Surveys of the settlement literature include Spier (2007), Daughety (2000), Cooter and Rubinfeld (1989), and Hay and Spier (1998).

⁸ See Ostrom, Kauder, and La Fountain (2001, p. 29) and *Judicial Business of the United States Courts* (2001, p. 154 table C-4).

⁹ Scholars have employed this so-called “mutual optimism” framework to explore the selection of cases for trial (Priest and Klein, 1984), fee-shifting (Shavell, 1982), conflicts between lawyers and clients (Miller, 1987), and bifurcation of trials (Landes, 1993). It has also served as a foundation for empirical work on settlement (see Waldfogel, 1998). Experimental and anecdotal evidence indicates that litigants and their lawyers tend to exhibit self-serving biases (Loewenstein et al., 1993). As a group, plaintiffs may overestimate expected judgments at trial while defendants may underestimate them. Indeed, these self-serving biases may provide an

fail to settle because litigants are asymmetrically informed about particular parameters of the litigation. The plaintiff, for example, is more likely to have first-hand knowledge of the extent of damages she has suffered while the defendant is more likely to have first-hand knowledge about his degree of involvement in (or even liability for) the accident. Litigants will also often know the credibility and willingness to cooperate of their witnesses, and perhaps even the quality of their lawyers, better than their opponents.

Early models of bargaining with private information include P'ng (1983) and Bebchuk (1984), in which the uninformed litigant makes a take-it-or-leave-it offer to the informed party before a costly trial,¹⁰ and Reinganum and Wilde (1986), who assume that the informed litigant can make the take-it-or-leave-it offer.¹¹ In this literature, settlement is typically modeled as a simple transfer payment from the defendant to the plaintiff in exchange for a commitment by the plaintiff not to pursue the case further.¹² By contrast, we allow the parties to commit to future transfer payments that are conditional on the outcome at trial. We show that high-low agreements can serve the litigants' joint interests by limiting the parties' risk exposure at trial—thereby reducing the risk premiums they bear—while still allowing them to benefit from their mutual optimism through speculation.¹³

advantage in bargaining and can arise in evolutionary settings (Bar-Gill, 2006). See Yildiz (2003, 2004) for recent theoretical work on learning and delay without common priors.

¹⁰ Nalebuff (1987) extends Bebchuk's analysis to allow the plaintiff to drop the case before trial. Spier (1992) presents a dynamic version of Bebchuk (1984) and establishes that there is a strong deadline effect. Farmer and Pecorino (1994) consider a model where the litigants are risk averse and privately informed about their own degrees of risk aversion, and show that settlement offers are accepted by the more risk averse litigants (since their costs of litigation are effectively higher). See also Heyes et al. (2004).

¹¹ There are additional reasons for settlement failures. Parties may have long-run interests in affecting the outcome of current litigation; the item in dispute may be indivisible (e.g., a child); and bargaining externalities may render settlement infeasible. See Spier (2007) and Daughety and Reinganum (2005).

¹² A notable exception, albeit an abstract one, is a literature that applies the mechanism-design techniques of Myerson (1979) and Myerson and Satterthwaite (1983) to the problem of settlement and litigation. In this literature, privately-informed litigants announce their "types" and the mechanism maps their announcements into settlements (both the level and the probability) and transfer payments at trial (Spier, 1994). See also Neeman and Klement (2005). Linking the transfers to the awards at trial can encourage truth-telling, relax incentive compatibility constraints and achieve higher levels of social efficiency. Also related is the applied literature on Rule 68 of the Federal Rules of Civil Procedure, which shifts legal fees based on settlement offers rejected before trial. See Miller (1986), Spier (1994), and Farmer and Pecorino (2000).

¹³ Donohue (1991) explored the idea that if parties are not content with the existing fee-shifting rule in their jurisdiction, then they can always privately contract for an alternative rule. He noted, however, that there was a dearth of evidence of these contracts in practice. By contrast, we find ample real-world evidence of high-low agreements.

Empirical work on settlement has explored Priest and Klein's (1984) selection hypothesis that, conditioned on a case proceeding to trial, the two parties should be equally likely to prevail. Waldfogel (1995), Kessler, Meites, and Miller (1996), Eisenberg and Farber (1997), and Siegelman and Waldfogel (1999), among others, have shown empirically that divergence from fifty percent can depend on a number of factors including case characteristics. In our data, the insurer prevails in a majority of the claims that proceed to trial. Others have studied the empirical drivers of the decisions whether and when to settle out of court, such as the damages at stake, the parties' appetite for risk, and the reputation effects of both the parties and their lawyers.¹⁴ See, for example, Danzon and Lillard (1983), Farber and White (1991), Kessler et al. (1996), Fournier and Zuehlke (1996), Fenn and Rickman (1999), Viscusi (1988) and the survey by Kessler and Rubinfeld (2004).¹⁵ Our data allow us to extend this literature by examining the incidence of high-low agreements in litigation and the characteristics of the disputes associated with them.

The rest of the paper is organized as follows: Section 2 presents a settlement model that allows the litigants to modify future trial outcomes by private contract. We show that, under reasonable conditions, high-low agreements can be optimal from the perspective of both parties, giving them higher payoffs than could be achieved by settling out of court for a fixed amount or going to trial without a contract in place. We then characterize the conditions under which parties would enter into a high-low agreement and identify likely features of those agreements. In Section 3, we describe our insurance data, and in Section 4 we outline our empirical approach and use the data to examine whether, in a large number of insurance disputes, the high-low discussion and agreement patterns we observe are consistent with our model's predictions. Section 5 of the paper explores an alternative explanation for high-low agreements, namely that they can be cost-reduction mechanisms that work to avoid the

¹⁴ While the early literature (see, e.g., Viscusi, 1991; Galanter and Cahill, 1994) found settlement rates of 99 percent, recent scholarship, cautioning against interpreting all non-trials as settlement, concludes that the settlement rate is actually closer to two-thirds (Eisenberg and Lanvers, 2008; Clermont and Schwab, 2008; Hadfield, 2004).

¹⁵ See also Sieg (2000) and Watanabe (2005) for important structural econometric models of the settlement process. Other branches of the literature explore the effects of tort reforms. Yoon (2001) explores the effect of an Alabama cap on jury awards. Snyder and Hughes (1990) and Hughes and Snyder (1995) study the effect of a temporary implementation of a "loser pays" rule for the allocation of legal fees in Florida.

“mutually assured destruction” that occurs when litigation expenditures are largely offsetting in their effects on the expected trial outcome. Section 6 extends the model to consider costs of negotiating and/or drafting high-low agreements. Section 7 concludes.

2. The Model

Two litigants, a plaintiff and a defendant, engage in settlement negotiations prior to a risky civil trial. If the parties fail to settle, the case proceeds to trial, where the court will enter a judgment for either high damages, x_H , or low damages, x_L , where $x_H > x_L$. The plaintiff and defendant assess the probability that the court will award high damages before they negotiate over settlement. The plaintiff believes that this probability is $\pi_p \in [0,1]$ while the defendant believes it is $\pi_d \in [0,1]$. These beliefs are subjective and may diverge from one another. The plaintiff’s and defendant’s preferences are represented by CARA (constant absolute risk aversion) expected utility functions $u_p(x) = -\exp(-a_p x)$ and $u_d(x) = -\exp(-a_d x)$, where a_p and a_d are the coefficients of absolute risk aversion.¹⁶ The litigation costs of the plaintiff and defendant are c_p and c_d , respectively. These damages, beliefs, preferences, and costs are all assumed to be common knowledge between the parties.

The contracts signed by the litigants before trial may take one of two forms. An *ordinary settlement contract* is a simple transfer payment, s , from the defendant to the plaintiff. By agreeing to this contract, the litigants can completely avoid both the risk and the direct costs of trial.¹⁷ Alternatively, the litigants may agree to proceed to trial with an *award modification contract* that specifies two payments, s_H and s_L . Under this arrangement, the litigants still bear the litigation costs c_p and c_d but can define the bounds of the judicial award in accordance with their divergent beliefs about the trial outcome.¹⁸ Specifically, when the

¹⁶ This utility function is very commonly used in finance and macroeconomics, and has the property that there are no income or wealth effects. It lends itself to straightforward comparative statics results, as litigation costs will drop out of the calculation of the optimal award-modification contract.

¹⁷ Note that if the parties have the same subjective assessments of the probability that the plaintiff will win high damages, $\pi_p = \pi_d = \pi$, then the litigants would be jointly better off settling out of court for the expected damages, $s = \pi x_H + (1 - \pi) x_L$. If the parties are both sufficiently optimistic about their own cases, so π_p is significantly higher than π_d , then there may be no ordinary settlement contract, s , that makes both the plaintiff and defendant better off.

¹⁸ Importantly, we assume here that costs of litigation do not depend on whether there is an award modification contract in place. This assumption is relaxed in Section 6.

court awards high damages, the defendant pays s_H under the contract to the plaintiff instead of x_H . Similarly, when the court awards low damages, the defendant pays s_L to the plaintiff instead of x_L .

In order to focus attention on “realistic” award modification contracts, we impose the following restriction on the contract space:

Assumption 1: $x_L \leq s_L \leq s_H \leq x_H$.

Assumption 1 allows for many of the contracts we observe in practice. It permits *ordinary settlement agreements* where $s_L = s_H$, for example. It also allows for *high-low agreements* in which the defendant agrees to a higher award in the low state, $s_L > x_L$, if the plaintiff agrees to a lower award in the high state, $s_H < x_H$. Finally, it is consistent with the parties arriving at *no agreement at all*, where $s_L = x_L$ and $s_H = x_H$.

This assumption rules out contracts in which $s_L > s_H$, however. This comports with what we observe in actual litigation, where opposing litigants are sincere in their efforts to prevail at trial. Allowing $s_L > s_H$ would lead to absurd results because the contract would encourage litigants to sabotage their own cases: i.e., if the plaintiff were to receive more when the court found that his damages were in fact low, the plaintiff would withhold evidence and take other actions to hurt his own case.

Assumption 1 also rules out contracts under which the parties agree to *amplify* the risk at trial: i.e., making the high outcome, s_H , even higher than the actual damages, x_H , and the low outcome lower than the actual damages, $s_L < x_L$.¹⁹

¹⁹ It might seem odd that risk-averse parties would ever write such a contract, but it might be jointly desirable when the plaintiff believes it is *much* more likely that the court will award high damages than does the defendant. Imagine an extreme case ($\pi_p = 1, \pi_d = 0$) in which each party believes with certainty that he will prevail. Suppose that the parties write a contract with $s_L = 0 < x_L$ and $s_H = 2x_H > x_H$. The defendant is better off (because he pays zero in expectation!), and the plaintiff is better off because he gets twice as much as he would in the best-case scenario absent a contract. Note that with these extreme beliefs and absent liquidity constraints, the plaintiff and defendant would agree to $s_L = -\infty$ and $s_H = \infty$. In practice, such contracts might violate anti-gambling statutes or face other procedural barriers. But betting on the outcome of lawsuits is not unheard of. It was an accepted practice in ancient Hindu law and custom. Indeed, Jolly (1883) describes how these wagers were a source of revenue for the judiciary, as the parties paid a tax of ten percent of the wager’s value. See also Donohue (1991) for a discussion of these issues in the context of contracting over the English Rule for allocating legal fees.

Ignoring the constraint imposed by Assumption 1 for a moment, a Pareto optimal award-modification contract would satisfy:

$$\frac{(\pi_p)u'_p(s_H - c_p)}{(1 - \pi_p)u'_p(s_L - c_p)} = \frac{(\pi_d)u'_d(-s_H - c_d)}{(1 - \pi_d)u'_d(-s_L - c_d)}. \quad (1)$$

This equation defines a locus of points, (s_H, s_L) , where the plaintiff's and defendant's indifference curves are tangent.²⁰ Notice also that if $\pi_p = \pi_d$ then the locus of tangency points is on the forty-five degree line, where $s_H = s_L$. This is not surprising. When the plaintiff and defendant have the same beliefs, they have the private incentive to fully insure each other against the risk at trial. The next Lemma characterizes jointly optimal modification contracts (see Appendix A for a proof of the result).

Lemma 1: With CARA expected utility, the set of unconstrained Pareto-optimal award modification contracts satisfy:

$$s_L = s_H - \frac{\theta}{a_p + a_d}, \quad (2)$$

where θ is a constant that reflects the relative subjective beliefs of the litigants,

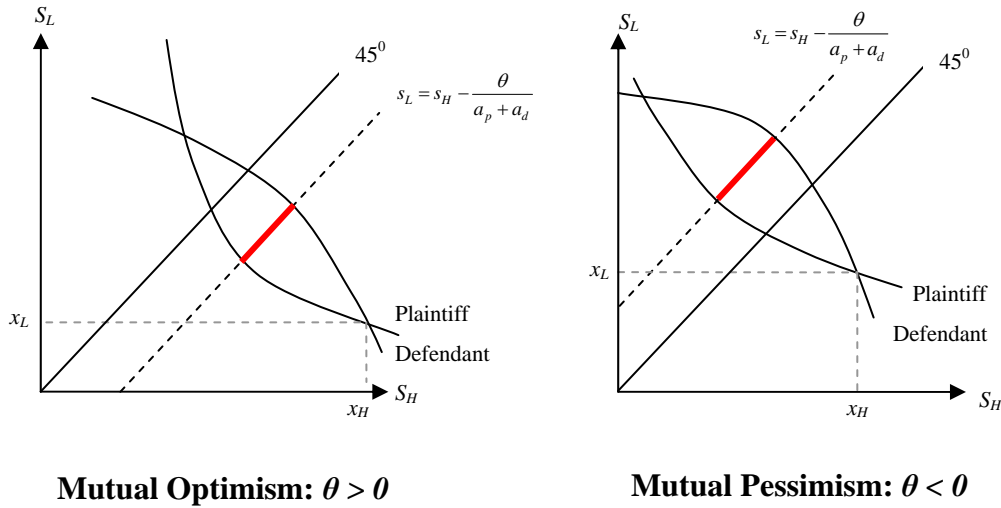
$$\theta = \ln \left[\frac{(1/\pi_d) - 1}{(1/\pi_p) - 1} \right] \quad (3)$$

This result may be understood intuitively. When the plaintiff and defendant are more risk averse, so $a_p = a_d$ is larger, then s_L and s_H will be closer together, reflecting the greater need for insurance by the parties. When $\pi_p = \pi_d$, then $\theta = \ln(1) = 0$, and so $s_L = s_H$. That is, when the litigants have the same beliefs about the probability of the plaintiff winning at trial, both parties would agree to insure each other fully against the risk of trial. When $\pi_p > \pi_d$, so the litigants are “mutually optimistic,” then Lemma 1 tells us that $\theta > 0$ and $s_L < s_H$. In other words, the contract has the plaintiff receiving more when the court determines that the damages are high than when the damages are low.

²⁰ This may be derived by having the plaintiff choose the high and the low of the contract, s_H and s_L , to maximize his expected utility, $\pi_p u_p(s_H - c_p) + (1 - \pi_p) u_p(s_L - c_p)$, subject to the individual rationality constraint that $\pi_d u_d(-s_H - c_d) + (1 - \pi_d) u_d(-s_L - c_d) \geq \pi_d u_d(-x_H - c_d) + (1 - \pi_d) u_d(-x_L - c_d)$. Alternatively, the defendant could choose the contract to maximize his expected utility subject to individual rationality for the plaintiff. If the plaintiff has relatively more bargaining power, the transfers s_H and s_L will tend to be higher, and if the defendant has more bargaining power, the transfers will tend to be lower.

The left-hand side of Figure 1 shows this result graphically. The solid line segment below and to the right of the forty-five degree line represents the set of award modification contracts that Pareto dominate the status quo outcome, (x_H, x_L) . Note that this segment corresponds to a locus of high-low agreements where $x_L < s_L < s_H < x_H$. When θ is very large, however, then the unconstrained Pareto optimal contract the parties would write would have $s_L < x_L < x_H < s_H$.

Figure 1



When the plaintiff and defendant are “mutually pessimistic,” $\pi_p < \pi_d$, then it is easy to verify that $\theta < 0$ and $s_L > s_H$. This is shown on the right-hand side of Figure 1. Under these conditions, the parties would want to ensure a higher transfer when the court finds that damages were in fact low and a lower transfer payment when the court finds that the actual damages were high.²¹ Again, this would violate Assumption 1 and, in practice, could lead the litigants to sabotage their own cases (and so would not be written in equilibrium). In these situations, therefore, the constrained jointly optimal contract would have $s_L = s_H$. Parties would prefer simply to settle.

The next proposition characterizes the litigants’ jointly optimal decision to settle out of court or proceed to trial, either with a high-low contract (that specifies how any damages award would be modified) in place, or without any contract.

²¹ Imagine the extreme case in which $\pi_p = 0$ and $\pi_d = 1$. The plaintiff is very happy to give up money in the high damages state in order to receive a higher payoff in the low damages state. The reverse is true for the defendant. Therefore the plaintiff and defendant would blissfully agree to $s_L = \infty$ and $s_H = -\infty$.

Proposition 1: With CARA expected utility functions and under Assumption 1,

- (i) If $\theta \leq 0$ then the parties settle out of court for a fixed amount.
- (ii) If $\theta \in (0, (a_p + a_d)(x_H - x_L))$ then the litigants proceed to trial with a *high-low contract* specifying $s_L = s_H - \theta / (a_p + a_d)$ when $c_p + c_d \leq \psi(\pi_p, \pi_d, a_p, a_d)$ where:

$$\psi(\pi_p, \pi_d, a_p, a_d) = \ln \left\{ \pi_d^{-1/a_d} \pi_p^{-1/a_p} \left[1 + \left(\frac{1}{\pi_d} - 1 \right)^{\frac{a_p}{a_p + a_d}} \left(\frac{1}{\pi_p} - 1 \right)^{\frac{a_d}{a_p + a_d}} \right] - \left(\frac{1}{a_d} + \frac{1}{a_p} \right) \right\} > 0 \quad (4)$$

and settle out of court for a fixed amount otherwise.

- (iii) If $\theta > (a_p + a_d)(x_H - x_L)$ then the litigants proceed to trial without any *modification of the court's award* when $c_p + c_d \leq \varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d)$ where:

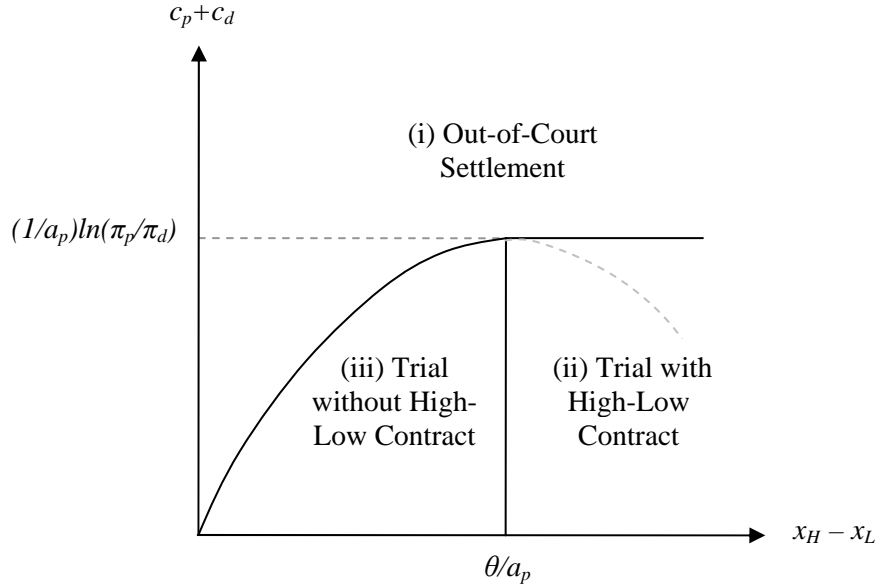
$$\varphi(\cdot) = - \left(\frac{1}{a_p} \right) (1 - \pi_p + \pi_p e^{-a_p(x_H - x_L)}) - \left(\frac{1}{a_d} \right) (1 - \pi_d + \pi_d e^{a_d(x_H - x_L)}) > 0 \quad (5)$$

and settle out of court for a fixed amount otherwise.

In case (i), the litigants are mutually pessimistic ($\theta \leq 0$). Since Assumption 1 prevents litigants from “shorting their own stock” so to speak, there is no joint advantage from going to trial. The litigants therefore settle out of court for a fixed amount. In case (ii), the litigants are somewhat mutually optimistic, i.e., $\theta \in (0, (a_p + a_d)(x_H - x_L))$. In this case, the litigants derive a joint gross benefit, $\psi(\pi_p, \pi_d, a_p, a_d)$, from going to trial with a high-low contract, and will proceed to trial when this benefit is greater than the sum of the litigation costs. In case (iii), the litigants exhibit a strong degree of mutual optimism. In other words, in this case, the litigants jointly prefer the speculation associated with a naked trial to a high-low agreement. They choose to litigate when their joint costs of litigation, $c_p + c_d$, are smaller than their joint benefits from naked speculation, $\varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d)$. The results of the proposition are shown in Figure 2 for the special case of $\theta > 0$ and defendant risk neutrality ($a_d = 0$).²²

²² The intercepts in the figure are calculated by taking the limit as a_d approaches zero in Proposition 1. The concave function represents the joint benefits of a naked trial, $\varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d)$. This expression is maximized when $x_H - x_L = \theta / a_p$, at which point litigants jointly prefer a high-low agreement to a naked trial. Their joint benefit of a naked trial is represented by the horizontal line at $\psi(\pi_p, \pi_d, a_p, 0) = (1/a_d) \ln(\pi_p/\pi_d)$.

Figure 2



Proposition 2: When $x_H - x_L$ rises, the volume of high-low agreements will increase, but the volume of cases that proceed to trial without high-low agreements may either rise or fall. When $c_p + c_d$ rises, the settlement rate rises and the litigation rate falls. The volume of trials with high-low agreements will fall, as will the volume of trials without high-low agreements.

As $x_H - x_L$ increases, trials become more risky for both of the litigants. Importantly, this rise in riskiness increases the private desirability of an optimal high-low contract (as defined in Lemma 1) relative to proceeding to trial without award-modification. Formally, as $x_H - x_L$ increases, more lawsuits fall into case (ii) than into case (iii) in Proposition 1. Because the decision of the litigants to settle out of court does not depend on $x_H - x_L$ in case (ii),²³ we know that the incidence of high-low contracts will rise. While fewer lawsuits fall into case (iii) as $x_H - x_L$ increases, that fact does not necessarily imply that fewer cases will go to trial without award-modification agreements. Because the right-hand side of equation (5) is increasing in $x_H - x_L$, in case (iii), we may have fewer cases settling out of court and more cases going to trial.

²³ Since $\psi(\pi_p, \pi_d, a_p, a_d)$ is independent of x_H and x_L .

3. Data Description

The empirical study of high-low agreements poses several challenges. First, many of the parameters of interest—most notably the parties’ appetites for risk and their beliefs about prevailing at trial—are difficult to observe. Second, parties are either small (making collection of uniform data difficult or impossible) or, if large, highly protective of their litigation-related information.²⁴ Finally, even where a public entity eliminates some of these problems (e.g., a court system that collects data on outcomes), much of settlement behavior occurs—and even the agreements remain—behind closed doors, rarely disclosed to anyone. Therefore, it is unsurprising that little is known about high-low settlement behavior.

The source of our data is a large national auto and general liability insurer, which allows us to at least partially overcome these hurdles.²⁵ First, the insurer is a repeat litigant. We are able to observe a large, complete sample of disputed claims from the occurrence of the underlying event until the final resolution of the dispute (including all arbitrations and pre-suit settlements). Second, the insurer records detailed information not only about the underlying dispute and the opposing party, but about the litigation and, in particular, any high-low negotiations that have transpired or agreements that have been concluded.²⁶

Our data set comprises two parts. The first part is individual claim-level data that the insurer routinely collects in auto and general liability disputes involving its policyholders. In these claims, the plaintiff (claimant) alleges that the policyholder has caused her harm in a manner covered by the policyholder’s insurance policy. As a result, the insurer is effectively the primary defendant in these disputes: the plaintiff seeks to recover first from the insurer, turning only to the insured in those cases in which damages exceed policy limits. As a practical matter, the insurer is typically the only defendant either because the plaintiff seeks

²⁴ Many litigants are what Galanter (1974) describes as “one-shotters,” making the collection of their data near impossible. Some litigants are “repeat players” (Galanter, 1974), of course, but they are reluctant or opposed to making public their litigation outcomes.

²⁵ As a condition of allowing us to use its data, the insurer required anonymity.

²⁶ Much of this information is not otherwise observable—high-low agreements are typically private and parties do not report them (at least consistently) to courts or anyone else. If a high-low agreement is disclosed to a judge or arbitrator, it is primarily to ensure its enforceability should one party seek to challenge the contract after the trial. To our knowledge, disclosure is not a codified requirement in any jurisdiction.

damages that fall within the policyholder's policy limit or because the plaintiff finds it unprofitable to pursue the insured individually for any excess.

We examine all closed claims between January 1, 2004, and March 31, 2009. Table 1 shows summary statistics for claims in dispute (n=48,349) broken down by whether a high-low agreement was in place at the time of a claim's resolution.²⁷ Column 3 (relative to columns 1 and 2) makes clear that claims litigated under high-low agreements are qualitatively different. For instance, claims resolved through arbitration or trial *with a high-low agreement* take more than 10 months longer on average to conclude, result in an average payout that is two and a half times larger, generate lower litigation costs overall (despite the larger payout), and typically have significantly *lower* policy limits than litigated claims where no high-low is in place.²⁸ High-low litigated claims are also less likely to involve a fatality, are more common in the northeast (and less common in the south and west), are more likely to involve an auto policy than a general liability policy, and are more likely to involve individual plaintiffs.

Litigated claims that eventually involve a high-low agreement also appear to start with a lower initial reserve on average. The *reserve* or *incurred loss* is a claim-specific fund the insurer sets aside to cover its obligations under the insurance contract when a claimant files a claim. All insurers, pursuant to state insurance regulations, are required by law to hold minimum reserves per claim to ensure that they have sufficient funds to pay claims and, when necessary, resolve disputes.²⁹ In theory, by setting the reserve, the insurer is balancing legal

²⁷ Table A1 summarizes some of the claim-specific information we have for all litigated claims (n=2,638), for all claims in which a high-low discussion occurred (n=937), and for all claims involving a high-low agreement (n=248). These are partially overlapping groups. Appendix B contains additional details about the contents and construction of the data set and the individual variables we use in the empirical analysis below.

²⁸ One lawyer who represented the insurer as outside counsel explained that high-low discussions are influenced in large part by the alleged harm relative to the policy limit. The insurer—and the lawyer—are wary of a judgment that exceeds the policy limit, which would then place the policyholder at risk for any excess judgment. When this happens, and a settlement below the policy limit had been possible at some point in the litigation, the insurer potentially faces liability for exercising bad faith in refusing to settle the claim. *See State Farm Auto Ins. v. Campbell*, 538 U.S. 408 (2003). As a practical matter, then, an insurer will typically pay any excess judgment when it refuses to accept a settlement demand that is within the policy limit.

²⁹ “All states impose reserve requirements on insurers to provide protection to policyholders, assuring that assets will be available to pay claims.” (McGuire, 1996 p. 38). *See* Salzman (1984) for a discussion of common methods for estimating reserves.

and economic factors: having enough reserves to pay out claims, but not overly restricting funds that could otherwise be used for more profitable purposes (e.g., investment). In practice, our insurer’s claims handlers are directed to “conservatively” determine a claim’s expected value, and handlers are evaluated in part by the accuracy of their determinations. Over the course of a dispute, the insurer adjusts the reserve to account for new information about the underlying claim or the litigation.³⁰

The second part of our data comes from extensive narrative records the insurer maintains (entered both by claim handlers and lawyers) on how each claim in dispute is managed and resolved during the litigation period.³¹ Using a text-mining algorithm, we were able to identify those claims that involved some consideration of a high-low arrangement, at least on the insurer’s side, including not just high-low agreements, but also high-low discussions and even instances in which the insurer considered making a high-low proposal, but ultimately decided against making an offer to enter into a high-low agreement.³² For each of these high-low relevant claims, we recorded the context in which the high-low conversation arose, whether the parties reached an agreement, the number of back and forth proposals, the relevant dates, and the proximity of the discussion to trial or arbitration, if apparent. In the event of an agreement, we recorded the high and low bounds.

The parties reached a high-low agreement in our data in 248 claims, and many hundreds of serious negotiations occurred between the insurer and the claimant over possible high-low agreements. We report summary statistics for 241 claims with high-low *agreements*

³⁰ There is evidence that deviations between the reserves set by insurers and their future losses are not random, and may be a mechanism for smoothing income. See Grace (1990). Several papers have shown that financially secure insurers tend to be more conservative in setting reserves than their financially insecure counterparts (Petroni, 1992; Gaver and Paterson, 2007). Petroni et al. (2000) study revisions in the aggregate loss reserves of a large property and casualty insurer, the Travelers Group, as reported in their 10-K filing with the SEC. These papers do not look at revisions at the level of individual claims, as we do here. Black et al. (2008) look at case-level data for medical malpractice claims, and fail to find a positive relationship between defense costs and reserve accounts, leading these authors to question whether insurers behave sensibly. (They did find a relationship outside of medical malpractice, however.)

³¹ Unfortunately, the insurer does not maintain electronic records of any of its settlement agreements or “partial settlement” arrangements, including whether there was a written or oral high-low agreement in place. We were able to obtain example copies of a number of high-low agreements used by the insurer. Redacted copies of these agreements are available upon request.

³² See Appendix B for a description of the search algorithm, the information we collected, the coding process we employed, and the procedures we used to ensure accuracy.

in Table 2.³³ The average high of the agreement is approximately \$158,000, while the average low is approximately \$44,000. Parties typically reached a high-low agreement in the latter stages of the claim (around the 80th percentile of the total duration of the claim). The parties usually concluded a high-low agreement in anticipation of trial or arbitration, but in significantly more than half of these claims, the parties eventually fully settled the case prior to formal adjudication. In addition, conditioned on going to trial, the insurer won more than half of the trials and arbitrations, either through a directed verdict or a defense verdict after a full adjudication, when a high-low arrangement was in place.

Although our data do not include information on jury, judge, or arbitrator awards, we do know what the insurance company ultimately “paid out” to the plaintiff. In the case of a trial or arbitration award in the shadow of a high-low agreement, we can assume that the “loss paid” to the claimant is roughly, if not exactly, the tribunal’s award. Most outcomes—69 percent—fell between the upper and lower bounds (exclusive of those bounds) of the high-low agreement. Subsequent to a high-low agreement, all payouts will (or should) fall between the high and the low (inclusive), and because we do not observe actual awards, we do not know how often the high or low is the *exact* amount awarded. Still, we know that in 17 percent of the claims, the insurer payout was at the low of the high-low agreement, while the insurer paid the high in slightly less than 14 percent of the claims.³⁴

Parties discussed high-low agreements in 937 claims, and the insurer raised the idea *internally* at least once in more than 300 additional disputed claims, although we found no evidence in these latter cases that any discussion with the plaintiff occurred. We report summary statistics for claims involving high-low *discussions* in Table 3. While there are differences across these three groups of claims—in which a high-low agreement was only

³³ For six of the high-low agreements we identified, we were unable to establish the exact terms (high and/or low) of the agreement. In addition, one of the high-low agreements had miscoded dates. Where this information is required in our analysis, we omitted these seven claims. More than half of the claims with high-low agreements in place were settled out of court.

³⁴ If these figures are representative, and the distribution of possible damages awards had symmetric tails, this pattern would indicate that the insurer was behaving irrationally, paying more than necessary on average by engaging in high-low agreements. But the tails are not symmetric (awards are bounded below by zero), and so it is unclear whether the insurer does better or worse on average in terms of actual damages paid (i.e., not considering gains from avoiding risk).

raised as a possibility by one party, only seriously discussed by both parties, and executed as a formal contract—simple unconditional averages do not reveal any particular patterns. This fact may hint that while claims that are candidates for high-low agreements are noticeably different from the typical claim in dispute, the line that separates the consideration of a high-low agreement from the signing of one may be somewhat arbitrary, perhaps turning on attorney personalities or other chance circumstances.

4. Empirical Strategy and Results

In this section of the paper, we use our detailed litigation and settlement data to examine some of our model’s predictions. Because we do not empirically observe litigants’ beliefs about likely damages awards, and we cannot directly measure their levels of risk aversion, we are unable to test the validity of our model directly. Instead, our empirical strategy relies on basic comparative statics derived from the theoretical analysis. Specifically, we use the model’s conjectures about litigant behavior under varying exogenous conditions to hypothesize the existence of a particular pattern in how litigants approach and resolve claims. If our model’s risk reduction theory can help account for settlement and partial settlement behavior, we argue, we ought to observe that pattern in our data.³⁵

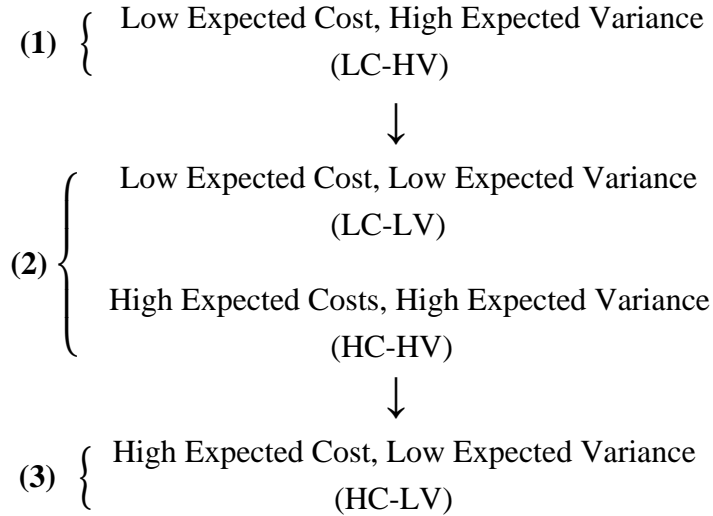
First, when a claim’s *expected* legal costs are high, we should see more settlement and fewer trials, including fewer high-low agreements, all else equal. Proposition 1 states that, when $\theta > 0$, high-lows and trials are preferred to settlement if $c_p + c_d \leq \psi(\pi_p, \pi_d, a_p, a_d)$, and if $c_p + c_d \leq \varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d)$, respectively. Therefore, if the insurer’s costs, c_d , are expected to be high and the correlation between c_d and c_p is not too negative, we should see fewer settlements.³⁶ Second, when case outcomes are sufficiently unpredictable (i.e., variance in the award/payout amount is high because its distribution has a larger spread—e.g.,

³⁵ Importantly, demonstrating a causal relationship—specifically, that parties use high-low agreements to reduce risk-associated losses—requires more than a pattern in the data that is consistent with the model. We also have to rule out any and all *alternative explanations* for that pattern. Although we are not aware of any obvious alternative explanations for what we find, our empirical claim is descriptive in nature.

³⁶ $Corr(c_d, c_p) \geq 0$ is a sufficient condition, and requires that litigation costs of defendants and plaintiffs be weak complements, which seems likely to be true in the vast majority of cases. Ideally, we would include expected c_p in our analysis, but we only have data from a single, repeat defendant.

$x_H - x_L$ is large), we should see an increase in the likelihood of a high-low agreement and a reduction in the likelihood of a naked trial, all else equal.³⁷

By combining these two predictions, we can identify and rank four categories of cases in terms of how “likely” they are to involve high-low discussions or agreements,³⁸ from most-likely at the top (1) to least likely at the bottom (3).³⁹



We empirically verify this pattern using a simple multinomial choice model through which we evaluate the likelihood that parties will settle, fully litigate (through a naked trial or arbitration), or enter into a high-low discussion or an agreement.

The intuition behind this empirical approach is that the parties’ willingness to enter into a high-low agreement while preparing to litigate depends on their beliefs about the likely

³⁷ In a more general model, we are likely to see an attempt to reduce risk generally when damages become more variable, through either settlement or the use of high-low agreements. But, in the context of our model, changes in $x_H - x_L$ do not change the likelihood of settlement, so long as $x_H - x_L > 0$. Instead, $x_H - x_L$ helps to define the line between cases that are optimally resolved (from the perspective of the parties) with a naked trial and those that are optimally resolved under a high-low agreement.

³⁸ We separately study cases in which high-low agreements were proposed and discussed and cases in which high-low agreements were actually concluded. Our assumption is that cases in which the parties “discussed” entering into a high-low share some of the same characteristics as those in which the parties agree to a high-low, and that, like other contracts, the conclusion of a high-low agreement may fail for many real-world reasons unrelated to the utility maximizing choices of the parties.

³⁹ The rank ordering of LC-LV and HC-HV is theoretically ambiguous, depending on the level of risk aversion of one or both parties, and therefore the “rate of exchange” between risk and cost for each party.

outcomes of the their case (both about possible damages and the relative degree of fault), which in turn depend on the formal adjudication of similarly situated cases and the known outcomes from the trial, arbitration, or settlement of other claims. While both parties may be optimistic in their assessment of the case ($\pi_p > \pi_d$), their beliefs will be shaped by their knowledge of how disputes involving similar claims (e.g., type of injury, type of claim, etc.) have fared in the past.⁴⁰ Our approach therefore assumes that litigants know the details of their cases by the time settlement negotiation occurs, and that they form beliefs based on that information about the likely consequences (in particular, litigation costs and outcome variability) of going to trial or submitting to arbitration. We use the outcomes in cases with similar characteristics as proxies for these beliefs.

We believe these assumptions are reasonable, given that the parties are typically represented by legal counsel with experience in litigating insurance cases. But, ultimately, this assumption is empirical in nature.⁴¹ As a practical matter, the insurer may be better informed than the plaintiff given that, institutionally, the insurer and its lawyers are likely to have participated in the resolution of more claims and are therefore more experienced than most if not all plaintiffs' lawyers in the specifics of insurance litigation. Any such differences, however, do not upset our predictions about the role of outcome variance and litigation costs in settlement behavior.

In the empirical work, we model the probability of high-low behavior using only information available to the insurer because we do not observe any private information that individual plaintiffs (or even groups of plaintiffs) possess. This is a limitation, but given our approach we do not believe it is a serious one. First, payout amounts are close to zero sum, meaning that claims with high outcome variance for a defendant are also highly variable for the plaintiff. Second, we assume that plaintiff and defense litigation costs are highly

⁴⁰ Obviously, the attractiveness of a high-low agreement turns on the belief that the other party is committed to formal adjudication (either trial or arbitration). While parties are certainly free to enter into a high-low agreement at any point after a claim is made, it is unlikely that such discussions take place early in the litigation process, certainly not before a law suit has been filed, which is why we focus in much of our analysis only on those claims that were actively disputed.

⁴¹ Our work does allow for a partial test of this assumption in that we investigate whether litigants behave in ways that are consistent (but only consistent) with their being rational and informed about their own case and the outcomes of similar cases.

correlated because they are likely to be complementary (Danzon, 1985)—and known to be complementary by the parties, an idea we deal with explicitly in Section 6. Certainly there will be periods of divergence in expenditure profiles of the parties, especially over short periods of time. The *timing* of litigation costs is likely differ significantly between the insurer (which has large fixed costs in the form of a career legal staff) and an individual represented by a plaintiffs’ attorney because of the very different organizational approaches these litigants take to defending their interests in court. Still, this assumption is likely to be true on average for *total* legal costs per claim, allowing us to use c_d as a rough proxy for c_p .

Before discussing our empirical model, we describe the key inputs to our analysis: our measure of expected litigation costs, our measure of perceived variability of the likely payout, conditional on resolving the case through trial or arbitration, and the outcome variable (whether the case resolved through trial or settlement, and whether it involved a high-low discussion or agreement). The extensive detail provided by the insurance data allows us considerable flexibility in how we define and construct these measures.

4.1. Measuring Expected Litigation Costs

We have multiple measures of litigation expenses (including fees paid to outside counsel, internal transfers to the insurer’s legal department, fees paid to courts, etc.) by month and in total for virtually all of the disputed claims in our sample. However, we cannot use *actual* costs for a claim as a measure of *expected* costs because the litigation costs of any individual claim and the method selected for resolving that claim are jointly determined.⁴² Indeed, litigants often choose to resolve a claim in a particular way (e.g., settlement) precisely to reduce the costs they expect they would otherwise incur, so it seems reasonable to assume that actual costs are systematically lower on average than expected costs.

Therefore, we estimate expected total litigation costs with the results of an OLS regression using only those claims in our sample that were resolved through formal

⁴² For example, assume that claims that settle tend to settle very early. In that case, low litigation costs will be correlated with settlement, and a regression of outcomes on litigation costs will indicate that lawyers take really expensive cases to trial, but choose to settle inexpensive cases. While this could be true, a more likely explanation is that a consequence of settlement is dramatically reduced future costs on both sides.

adjudication (i.e., a trial or arbitration): $C_i = \vec{\beta}X_i + \epsilon_i$, where C_i represents total *actual* litigation costs for claim i , and X_i is a detailed set of *exogenous* characteristics about that case, including fixed details about the plaintiff, the injury or damage sustained, the insurance policy, the location of the suit and of the accident, etc.⁴³ We purposely exclude any characteristic of the case (e.g., duration of the case, type of lawyer) that litigants might select for purposes of lowering their costs (including choices likely to improve settlement prospects), raising the costs of their opponent, etc. (see Gruber and Yelowitz, 1999). Next, we take the coefficients that we estimate from these regressions, $\hat{\beta}$, and, using the values of the exogenous variables, X_i , for every claim in dispute, we generate a “predicted cost” for each claim, \hat{C}_i , were that claim to be resolved through trial or arbitration. We view this as an appropriate measure because our focus is on litigants’ decisions to deviate by contract from a default resolution through adjudication.⁴⁴

Unfortunately, building our expected litigation costs measure from this set of “litigated claims” may introduce sample selection bias into our analysis—by assumption, cases that go all the way to trial or arbitration are likely to be less costly, all else equal, than cases that settle. Fortunately, our empirical strategy relies only on the ordinal rank of cases and case characteristics in terms of their relationship to litigation expenses. In particular, we assume that the exogenous characteristics that make fully litigated cases more expensive also make settled cases more costly.⁴⁵ Given that we rely only on pre-existing exogenous claim

⁴³ More specifically, we include different subsets of the following: state of litigation fixed effects, a pre-suit estimation of liability by the insurer, fixed effects for the year in which the loss was reported, dummies for the number of individuals injured in the “loss event,” a detailed set of indicators for the type of injury and/or loss, a fatality indicator, whether the claim was in the automobile or general liability line of business, fixed effects for the state and region of the accident, the policy limit, the population density where the insured lived and where the claimant lived, the early estimates (in months 2, 3, and 4) by the insurance company of its “incurred losses” or reserve amount on the claim, other demographic information about the area where the insured lived, the type of plaintiff (individual or company), and the year in which the lawsuit was filed.

⁴⁴ We also considered using a “jackknife” approach to estimate $\hat{\beta}$. For each claim i , we would run a regression on all litigated observations *except* for claim i to estimate $\hat{\beta}_{-i}$. We would then use $\hat{\beta}_{-i} \forall i$ to predict \hat{C}_i to ensure that claim i ’s actual costs play no role in our estimate of i ’s expected costs. In attempting this approach, however, we found that our expected cost estimate regression replications occasionally dropped *different* variables as collinear, making jackknifing impossible without reducing the number of exogenous regressors we used to predict litigation costs. We decided against this approach. Our cost regressions involve thousands of observations, so any single claim has very little influence on our estimate of $\hat{\beta}$.

⁴⁵ For example, if litigation is more expensive in a particular state, we assume that settling in that state is at least not *less* expensive than in other states. Likewise, we assume that if litigating a head injury case is more costly than litigating a leg injury case, then *settled* head injury cases will also have higher actual costs.

characteristics to estimate expected costs, and considering that much of the expense of litigating a claim actually occurs before settlement, we view this assumption as reasonable or at least plausible. All the same, we produced a second set of expected cost measures, \hat{C}_l , using all claims “in dispute” to estimate $\bar{\beta}$ regardless of how the parties resolved the claim. This approach is almost certainly less attractive, as we discuss in Section 4.5, but we find it encouraging that both measures lead to similar results with respect to high-lows.

One way to solve the selection problem directly is to identify some exogenous cost shock or shifter—some characteristic that makes certain claims more or less expensive to litigate, regardless of the stage at which the claims are resolved—and employ an instrumental variables framework. We explored a number of candidate instruments, including federal civil and criminal case loads and durations, state civil and criminal per-capita case loads, state-specific cost averages, state-fixed effects, and an indicator for whether the case was being litigated in a state other than where the loss occurred. Unfortunately, our first-stage results were too weak to pursue an IV strategy. Almost all of the variation in predicted litigation expenses appears to be due to claimant-, insured-, or claim-specific differences and not to exogenous cost shocks or shifters such as a change in state law or state-wide patterns.

4.2. Measuring Expected Outcome Variance

In addition to a measure of expected litigation costs, we require some measure of *expected* outcome volatility. A lawyer who is trying to decide whether to settle a case out of court or to push for a high-low agreement must first determine whether the claim is sufficiently “risky” to justify the necessary concessions to the plaintiff. We assume that claims can be unpredictable in at least two ways. First, new information may arrive at any time during the life of the litigation—information that may significantly alter the stakes and likely outcome of any trial or arbitration.⁴⁶ Presumably, certain types of claims are more likely than others to evolve in *predictably unpredictable* ways. Second, certain claims may be very predictable in how they will evolve throughout the litigation process, with no surprises along the way, but may face factfinders (juries, judges, or arbitrators) who nonetheless

⁴⁶ For example, in the context of our model, if $x_H - x_L$ is large, then even small changes in π (the likelihood that the plaintiff prevails in court) could lead to large changes in the expected payout.

produce predictably very unpredictable verdicts. As with expected litigation costs, we assume parties are able to identify both types of unpredictability by examining the exogenous features of a claim at some early point in the litigation.

We explored many different measures of claim volatility, only one of which we focus on here.⁴⁷ As we noted above, insurers are required by law in every state to establish a “reserve amount” or “incurred loss,”⁴⁸ an estimate of the likely value of a claim once the claim has been filed. Reserves are determined internally and are used for recordkeeping and regulatory compliance, meaning there is no obvious strategic reason—at least with respect to any claim’s litigation—for the insurer or its employees to manipulate the valuation process (and conversations with officers of the insurer revealed that its claim handlers are evaluated in part on their ability to “predict correctly”). A claim’s reserve is supposed to capture the current, but conservative, “best guess” of the possible litigation value of the claim,⁴⁹ a measure that can change repeatedly throughout the life of any litigation.⁵⁰ The insurer kindly provided us with its reserve estimate by month for almost every claim in our sample.

We use this information to gauge the first type of volatility described above—the predictable unpredictability of claim value *during litigation* because new information or other changed circumstances suddenly materialize. For volatile claims, the reserve amount (i.e., the expected incurred loss) will change regularly and perhaps dramatically as often as newly relevant information comes to light. Therefore, a straightforward estimate of volatility is the variance of the reserve amount over the course of the claim’s life, conditional on the length of

⁴⁷ For space reasons, we only report results using one of these volatility measures. Our results were similar across measures, and the other measures either turned out to be so similar as to be effectively redundant or seemed to us theoretically less appropriate.

⁴⁸ See McGuire (1996 p.38).

⁴⁹ In phone conversations with insurer’s officers, we inquired whether there was a more precise meaning to the “best guess” description. The answer was that the reserve is the expected value of the claim, viewed conservatively. Therefore, we assume the reserve amount lies somewhere between the 50th and 60th percentile of the insurance company’s estimated distribution of likely damages.

⁵⁰ We also constructed a number of candidate volatility instruments, but they suffered from the same weak instrument problem that our litigation costs candidate instruments did. We explored different measures of tort reform designed to limit “excessive verdicts,” including various types of damages caps and joint-and-several liability reform. We also considered state law offer-of-judgment rules, because a law that has the effect of shifting attorneys fees will essentially *increase* outcome variance, but there was too little within-state variance given that only one or two states made significant reforms during our sample period.

the claim’s life.⁵¹ We rely on this approach in the work below, but many other related measures of volatility are possible using the reserve information, including the total number of changes to the reserve amount, the difference between the first reserve amount and the last reserve amount, and so on. Regrettably, these measures only capture volatility due to a claim’s predictable unpredictability while the litigation is ongoing, not any latent volatility due to judge or jury unpredictability.⁵²

4.3. Defining Claim Resolution Outcomes

For lawyers evaluating these claims, the cost of the “going all the way” or “going the rest of the way” and the expected volatility of the claim are sensible inputs to the decision of whether to settle a claim, or continue forward to a trial, without or without a high-low agreement. Absent any agreement between the parties, disputes are resolved through trials with parties bound by the outcome. Only by settling out of court or by entering into a high-low agreement can the parties reduce the expected volatility of the outcome of their dispute, and in our model, only by fully settling can the litigants save the costs of adjudication.⁵³ But contracts can be reconsidered. If new information were to arrive post-settlement or after a

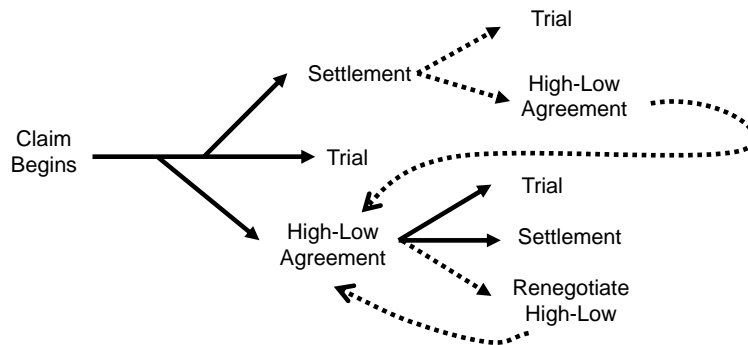
⁵¹ This measure also has a clear link to the value $x_H - x_L$ from our model. Suppose that reserves set aside for a claim at any point in time t is the estimated expected value of the claim if the dispute is resolved by a court. Denote this reserve by R_t . Suppose further that $x_H - x_L$ is certain and known to both parties, and that $\rho = (\rho_1, \rho_2, \dots, \rho_T)$ is the time series representing the evolving probability of high damages. Then, at time t the reserves R_t are a linear function of ρ_t given by $R_t = \rho_t x_H + (1 - \rho_t)x_L = x_L + \rho_t(x_H - x_L)$. Therefore, if V denotes the volatility of ρ , then the volatility of the time series of reserves is given by $V(x_H - x_L)$, and the volatility of the reserves process is a linear function of $x_H - x_L$.

⁵² An alternative approach could make use of the fact that the reserve amount is considered a conservative guess by some—closer to 55% or 60% of the expected loss rather than the mean of the damages probability distribution. Similar to the mean regression method described above for litigation costs, we could use a quantile regression framework where exogenous features about the claim are used to predict the 50th and the 90th percentile of reserve amount in, say, the fifth month of the claim’s life. The ratio of the 90th to the 50th percentile could then be used as a measure of volatility because it will provide a measure of the spread of the reserve amount distribution at a fixed point in time. Note that if the reserve amount is actually the median, instead of the 55th percentile, this approach would no longer be appropriate because the inference drawn about the shape of the probability distribution turns on the *difference* between the reserve amount and the median relative to this same difference in other claims. One advantage of this approach is that types of claims that have a single reserve amount throughout their litigation but which are nevertheless unpredictable before a factfinder may have a greater spread of fifth month reserves, all else equal. Alternatively, the same approach could be used to predict the spread in the final “loss paid” amount, although this method may suffer from sample selection bias.

⁵³ We ignore, without consequence for our work, other possibilities, such as plaintiffs unilaterally dismissing their claims or defendants allowing a default judgment.

high-low agreement has been signed, the parties are under some circumstances free to revisit their agreement if the interest is mutual. Renegotiation does not happen in practice with settlement in our data, although it is theoretically possible. It is also possible, although again we see no evidence of it in this set of claim disputes, for parties to agree to unwind a high-low agreement and pursue a full-blown trial if the parties became more mutually optimistic.

Figure 3



High-low agreements, however, are regularly a first step toward full settlement, which raises the question of how to categorize high-low claims that eventually settle. Should we consider a high-low agreement or discussion that later turns into full settlement a high-low agreement/discussion or simply a full settlement? On one hand, even if the parties renegotiate a high-low and eventually fully settle the claim, the conditions that cause or allow litigants to enter into that agreement at *any* stage of the litigation, and even temporarily, are of interest. After all, renegotiation to settlement could occur as the result of new information indicating much higher costs for continuing to trial under a high-low agreement.⁵⁴ Still, a temporary high-low may occur, for instance, because an artificial time constraint (the length of a settlement conference, for example) makes it impossible to negotiate a full settlement in a single sitting. A high-low agreement may be faster and easier to obtain (although we explore

⁵⁴ There is also a behavioral explanation for a two-stage settlement process, i.e., when parties first enter into a high-low agreement, but then ultimately agree to a full settlement. This evolution may not occur because of new information about litigation costs (consistent with a rational agent's behavior) arrives after the high-low agreement, for example, but because the parties view their options very differently under a high-low, a shift that at least one party may not have anticipated. For example, once agreeing to a high-low arrangement to guarantee a minimum recovery, a plaintiff may come to believe that, given that a huge damages award is no longer possible, full settlement is more attractive than it had seemed previously.

the opposite possibility in Section 6), and may be viewed as hopefully temporary, but nonetheless valuable protection against extreme outcomes at trial. We view both positions as having merit and therefore explore both possibilities in our work below.

4.4. Predicting High-Low Discussions and Agreements

Our empirical strategy seeks to identify factors that explain one of three possible outcomes—1) trial; 2) high-low discussions or agreements; and 3) settlement. Because these categories are unordered, we adopt a multinomial logit (MNL) model, which estimates the probability of a particular outcome relative to a baseline category.⁵⁵ We estimate:

$$p(y_i = j) = \frac{\exp(x'_{ij}\gamma_j)}{\sum_k \exp(x'_{ik}\gamma_k)}, \quad (6)$$

where x_{ij} denotes claim i 's characteristics, which are associated with each of the J alternative outcomes (trial or arbitration, full settlement, or high-low discussion or agreement). We are interested in γ , a $K \times 1$ vector of estimated coefficients that characterize the relationship of expected litigation cost and expected payout variance to whether litigants choose to settle their claim, proceed to trial naked, or enter into a high-low discussion or agreement.

Because going to trial occurs absent some agreement, resolution through adjudication serves as our baseline category. With respect to x_{ij} , we use our calculations of expected litigation costs and expected volatility to generate two indicator variables. Using all disputed claims, we calculate the *median* expected litigation cost and the *median* expected volatility level. We then categorize claims by whether they are “above the median” or “below the

⁵⁵ This modeling decision, although appropriate, generated a host of thorny technical issues when we attempted to employ IV methods to remove selection effects. Estimating a multinomial logit model with endogenous regressors is, to say the least, non-trivial. We employed the control function approach described in Terza, Basu, and Rathouz (2008), although this approach is not fully satisfactory. See Imbens & Wooldridge (2007), at http://www.nber.org/WNE/lect_6_controlfuncs.pdf (“Allowing endogenous explanatory variables (EEVs) in multinomial response models is notoriously difficult, even for continuous endogenous variables. There are two basic reasons. First, multinomial probit (MNP), which mixes well [with] a reduced form normality assumption for $D(y_2|z)$, is still computationally difficult for even a moderate number of choices. Apparently, no one has undertaken a systematic treatment of MNP with EEVs, including how to obtain partial effects. The multinomial logit (MNL), and its extensions, such as nested logit, is much simpler computationally with lots of alternatives. Unfortunately, the normal distribution does not mix well with the extreme value distribution, and so, if we begin with a structural MNL model (or conditional logit), the estimating equations obtained from a [control function] approach are difficult to obtain, and MLE is very difficult, too, even if we assume a normal distribution in the reduced form(s).”)

median” in each category.⁵⁶ By interacting these two variables, we produce the four categories HC-HV, LC-HV, HC-LV, and LC-LV. For the resolution and settlement behavior in our data to be consistent with our model’s predictions, claims that have below-median costs *and* above-median variance in outcomes (LC-HV) should be more likely, relative to other claims, to have involved a high-low discussion or a high-low agreement. This specification is a fairly parsimonious way to examine the risk-reduction theory, but it is also intuitive and generates results that are straightforward in their interpretation.

4.5. Empirical Results

We report the baseline results of our empirical work in Table 4.⁵⁷ Overall, we find evidence, consistent with our model, that high-low discussions are much more likely to occur when expected costs are low and expected volatility is high. HC-LV is the omitted variable, and the analysis in the first panel reports the relative difference in the likelihood that litigants engage in a high-low discussion (versus an adjudication with no such discussion) between a case that has high costs and low variance and the other three combinations. To make this concrete, in the first row, the risk ratios reported indicate that moving from below-median variance to above median variance when expected litigation costs are high dramatically increases the odds of a high-low discussion. Columns (1) through (4) suggest that that the likelihood of such a discussion is four to six times higher (admittedly, on a relatively small base, compared to the numbers of settlements, for example).

In the third row, we learn that there is no statistically significant difference in our data in the likelihood of a high-low discussion between claims with above-median expected costs

⁵⁶ Our framework makes use of generated regressors and, as a consequence, the usual approach to calculating standard errors results in biased estimates (Murphy and Topel, 1985). To remedy this concern, we report standard errors calculated by bootstrapping.

⁵⁷ In this table, we use only litigated cases to calculate expected litigation costs, and we consider claims to involve high-lows if, at a minimum, the parties engaged in an explicit discussion about the possibility of entering into a high-low agreement. This set of claims includes both claims in which a high-low agreement was never signed and claims in which a high-low was signed, but the claim letter settled out of court. As explained in the tables more fully, and in Section 4.1, the differences between columns (1), (2), (3), and (4) are the variables we use to predict expected litigation costs. We use only variables that are fixed at the time the claim is filed. We show the results for four different sets because adding variables results in the loss of observations, including cases with high-low agreements, as the observation counts show.

and claims with below-median costs when outcome volatility is expected to be low, although the point estimate indicates that a discussion is approximately fifty percent more likely. This, too, makes sense in the context of our model because shifting from a naked trial to a high-low agreement does not, in our model, reduce costs. Only fully settling a case has that consequence. Parties, therefore, should be relatively indifferent to the choice between a high-low and a full adjudication if *only* the expected cost of litigation changes, unless high-lows offer some means for lowering litigation costs. The point estimate in the third row of Table 4 hints at that possibility, and we explore the idea explicitly in Section 5 below by modeling high-low agreements as commitment devices to restrain wasteful expenditures.

Finally, in the second row, we assess the difference in the relative likelihood of a high-low discussion relative to trial between HC-LV claims and LC-HV claims—in other words, when there are differences in both expected litigation costs and in expected volatility as measured by reserve variance. Lower expected costs and higher expected volatility raise the odds of a high-low discussion between six and tenfold. The evidence in the first panel suggests that this change in likelihood stems mostly if not entirely from the increase in variance. The differences in the risk ratios in the first row and the second row of the panel are not statistically significant, and the numbers in the third row show—in line with the model—that, as between a naked trial with and without a high-low discussion, costs may be irrelevant. Still, one could hypothesize that the differences in the point estimates between the first and second row signify that a difference in expected litigation costs may magnify the role of the difference in outcome volatility.

With respect to settlement, our model's predictions also perform well, although not as well as the estimates predicting high-low discussions and without the same level of statistical precision. Note that, with settlement as an outcome, the coefficients in all four columns on HC-HV (interpreted as relative risk ratios) ought to be larger than the coefficients on LC-HV, unlike with the high-low panel of results discussed above (where we expect the opposite relationship). We find this to be true in column (1), but not in columns (2) through (4). Nevertheless, the coefficients are very close together and are statistically indistinguishable from each other, and from the value of one. The only estimate that approaches statistical significance in the second panel is the relative risk coefficient on LC-LV. A LC-LV claim is

only 80% as likely (p-value 0.10) as a HC-LV claim to settle (as opposed to going to trial or arbitration without the parties discussing the possibility of a high-low agreement), a result that is fully consistent with our model's predictions.

We examine the relationship of litigation costs and claim volatility to actual high-low *agreements* in Table 5. We began by examining discussions rather than agreements because negotiations about high-low agreements are just as relevant in thinking about settlement behavior, in our view, and are more numerous (n=937), reducing the likelihood of any bias resulting from high-lows being a rare event.⁵⁸ Presumably, however, LC-HV claims should have a similar positive relationship to the parties coming to an actual agreement over high-low terms. In fact, the relationship may be stronger if we identify agreements more accurately than we do claims involving discussions or if discussions occur before parties have had the ability to conduct a full investigation into the specifics of a claim (leading to greater uncertainty about the claim's likely litigation costs and volatility).

Our findings are again consistent with our model's predictions about litigant claim-resolution behavior. With many fewer agreements, our estimates are significantly less precise than they were in Table 4. Nevertheless, in columns (1), (2), and (3), we find statistically significant or marginally significant coefficients on LC-HV, with even larger relative risk ratio magnitudes. In column (4), our point estimate on LC-HV remains large, meaning that on average in our data, LC-HV claims are resolved relatively more often with a high-low agreement in place than any other type of claim. However, excluding observations with no reporting year information, eliminating approximately thirty high-low agreements from our sample, significantly increases the size of our estimated standard errors, making the findings we report in column (4) only suggestive.⁵⁹

⁵⁸ See King and Zeng (2001). High-low discussions are not especially rare events in our sample. More than two percent of *all* of the disputed claims in our data involved high-low discussions. More importantly, even if our estimates were to suffer from rare events bias, theoretical work and Monte Carlo work by King and Zeng show that logits tend to *underestimate* the probability of rare events (i.e., high-low discussions or high-low agreements), a bias that should run *against* the results we find. Moreover, the extent of possible bias when the total number of observations (disputed claims) is almost 50,000, as it is here, is unlikely to explain the large coefficients we find on LC-HV. Alternative approaches to building our sample, such as endogenous stratified sampling, would more likely than not simply increase the magnitude of our estimates.

⁵⁹ In unreported results, we repeat all of the above analysis ignoring whether a claim involved a high-low discussion or even a high-low agreement if that suit eventually settles. Once we omit additional claims that lack

In Table 6, we tentatively explore the idea of conducting the above analysis using *all* claims, as opposed to just those claims that the parties resolved through adjudication, to estimate our expected litigation costs variable. This change has the effect of increasing the precision of our litigation cost predictions (and, consequently, reduces the size of our second-stage bootstrapped standard errors), and the pattern of the relative risk ratio coefficients on HC-HV, LC-HV, and LC-LV in the top two panels (comparing the likelihood of high-low discussions and agreements relative to naked trials and arbitrations) bolster the explanatory power of our model's predictions.

A strategy that uses all disputed claims to predict expected litigation costs, however, suffers from an important selection bias. Because settlement avoids, by design, many of the costs that accrue to fully litigated cases, cases that settle tend to involve lower total costs, all else equal. Therefore, including information from those claims is likely to generate a powerful, but spurious correlation between high expected litigation costs and the decision to fully adjudicate a claim. In the context of our model, such selection is likely bias downward our estimates of the relative risk ratio on HC-HV for settlement (versus adjudication) and to upward bias our LC-HV and LC-LV estimates, which account for the differences we see between the lower panel's results in Table 6 and those in Tables 4 and 5. Another possibility, which we explore in Section 6 below, is that negotiating a high-low agreement may be costly—even more costly than settling. Accordingly, Table 6's results, even if we assume away any selection bias, may well be consistent with our model.

Overall, our empirical results suggest that litigants behave in ways that are consistent with the model we present in Section 2. Specifically, when litigants expect a case to be relatively inexpensive to litigate, but view the outcome to be more unpredictable than the median claim, high-low agreements play a more important role. Although, according to some commentators, high-low agreements are quite common in some areas of civil litigation, they

some of the variables necessary to predict litigation costs, we wind up with relatively few high-low claims to study. The settlement results are almost identical, and the magnitudes and patterns of the high-low estimates remain consistent with our model's predictions. But, because the standard errors we estimate via bootstrapping are too large in these regressions for us to say anything definitive, we view these results as simply corroborative of the evidence we present in Tables 4 and 5. These results are available from the authors upon request. In other work, we investigated alternative specifications for our regressions, using different percentiles cut-offs in the creation of our key independent variables, as well as using continuous measurements of expected litigation costs and reserve variance. Our results in those specifications are broadly similar to the contents of Tables 4 and 5.

are admittedly not pervasive in our data. Nevertheless, a disputed insurance claim is much more likely (even if still fairly unlikely) to involve a high-low discussion or agreement at some point during that dispute when that claim has the two characteristics (LC-HV) our model identifies as important inputs to litigants behaving optimally.

5. High-Low Agreements as a Commitment Device to Limit Rent-Seeking

We now explore a second reason that litigants may choose to modify the outcome of a trial by signing a high-low agreement—to limit rent-seeking activities and to lower the future costs of litigation. In contrast to our earlier model where litigation expenditures were fixed and parties were risk averse, here we model litigation as a simple rent-seeking contest between risk-neutral parties where higher litigation expenditures improve a litigant’s odds of winning at trial.⁶⁰ By reducing the spread between the best- and worst-case scenarios, the high-low contract commits the two parties to expend fewer resources once the agreement is in place, including during adjudication itself.

Specifically, suppose that the probability that the court will award high damages following a trial as $\pi + \beta(e_p^{1/2} - e_d^{1/2})$ and the probability it will award low damages as $1 - \pi - \beta(e_p^{1/2} - e_d^{1/2})$, where π is exogenously given and e_p and e_d are positive and represent the variable litigation expenditures of the plaintiff and defendant, respectively. The probability of the high award is increasing in the plaintiff’s litigation efforts and falling in the defendant’s efforts. The parameter β reflects the sensitivity of the court’s decision to the investing party’s trial expenditures. The fixed litigation expenditures of the plaintiff and defendant remain c_p and c_d , so the total litigation costs of the plaintiff and defendant are, respectively, $e_p + c_p$ and $e_d + c_d$.

Given an award modification contract with $s_H > s_L$, it is easy to show that the equilibrium levels of litigation spending are:

$$e_p = e_d = \frac{\beta^2 (s_H - s_L)^2}{4}. \quad (7)$$

⁶⁰ Our cost model is related to the economics literature on rent-seeking contests and all-pay auctions. See, for example, the early work of Tullock (1980) and Dixit (1987) and the more recent work of Siegel (2009).

Therefore, variable litigation expenditures are monotonically increasing in the high-low spread, $s_H - s_L$, and monotonically increasing in the sensitivity of the trial outcome to the variable litigation expenditures, β . They are also independent of the litigants' beliefs about the probability of the high award, π .⁶¹ The joint payoff of the plaintiff and defendant from going to trial is:

$$(\pi_p - \pi_d)(s_H - s_L) - (\beta^2/2)(s_H - s_L)^2 - c_p - c_d. \quad (8)$$

Differentiating this expression with respect to $s_H - s_L$ establishes that when $\pi_p > \pi_d$, the set of unconstrained Pareto-optimal award modification contracts satisfy:

$$s_L = s_H - \frac{(\pi_p - \pi_d)}{\beta^2}. \quad (9)$$

This award modification contract makes intuitive sense. When $\pi_p > \pi_d$, the plaintiff and defendant are mutually optimistic. They jointly benefit from the speculation value of trial, but they also want to avoid wasteful rent seeking. The contract trades off these two objectives. Note that the spread between the high and low awards, $s_H - s_L$, is smaller when β is larger, meaning that when the probabilities are more sensitive to expenditures, litigants have an even greater incentive to constrain their variable litigation costs through a tighter high-low spread.

Proposition 3: Suppose that the litigants are risk neutral and litigation costs are endogenous.

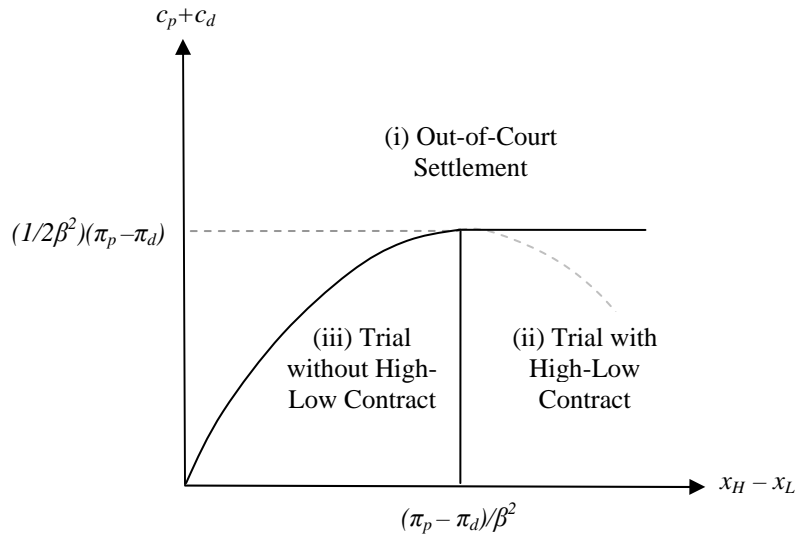
- (i) If $\pi_p - \pi_d \leq 0$ (the litigants are mutually pessimistic) then the parties settle out of court for a fixed amount.
- (ii) If $\pi_p - \pi_d \in (0, \beta^2(x_H - x_L))$ (the litigants are somewhat mutually optimistic) then the litigants proceed to trial with a *high-low contract* specifying $s_L = s_H - (\pi_p - \pi_d)/\beta^2$ when $c_p + c_d \leq s_H - (\pi_p - \pi_d)/2\beta^2$ and settle out of court for a fixed amount otherwise.

⁶¹ If $s_H < s_L$, on the other hand, then $e_p = e_d = 0$.

- (iii) If $\pi_p - \pi_d > \beta^2(x_H - x_L)$ (the litigants are very mutually optimistic) then the litigants proceed to trial without any *modification of the court's award* when $c_p + c_d \leq (\pi_p - \pi_d)(x_H - x_L) - (\beta^2/2)(x_H - x_L)^2$ and settle for a fixed amount otherwise.

The predictions of this rent-seeking model are, at a superficial level, similar to those of our original model: we should observe high-low contracts when the fixed costs of litigation are low and the spread $x_H - x_L$ is large. This is shown in the following figure:

Figure 3



The rent-seeking model has the further empirical prediction, however, that a high-low agreement will cause the parties to reduce their subsequent litigation expenditures. One possible (and potentially observable) consequence, therefore, would be a post-high-low decline (or a slower increase relative to non-high-low claims) in litigation expenditures by both parties. We attempt to test these predictions with our data in two ways. We began with a simple differences strategy, examining whether monthly litigation expenditures for claims with high-low agreements in place were lower after the high-low agreement, all else equal, than they were before the agreement was signed:

$$M_{it} = \alpha_i + \gamma_t + \bar{\theta}X_{it} + \beta post-high-low_{it} + \epsilon_{it}, \quad (10)$$

where M_{it} is either claim i 's monthly total litigation expenditures or claim i 's monthly outside counsel fees,⁶² α_i represents a claim-specific effect, γ_t is a time fixed effect, X_{it} are claim characteristics that vary over time, and $post-high-low_{it}$ is an indicator that takes the value one in all months after a high-low agreement is in place. Next, we sought to control for unobservables, despite our inclusion of a large number of covariates, and to test whether monthly litigation expenditures, even if they did not decline after a high-low agreement, may have grown at a slower rate by comparing the spending patterns in high-low cases to those in cases where a high-low was discussed, even negotiated, but never concluded.⁶³

$$M_{it} = \alpha_i + \gamma_t + \vec{\theta}X_{it} + \beta post-high-low_{it} + \delta high-low_i + \epsilon_{it}. \quad (11)$$

The variable $high-low_i$ is one if claim i ever involved a high-low contract, and zero if it involved only a high-low discussion between the parties. We considered a number of plausible error structures and various alternative specifications, but our work shows no consistent differences between high-low claims and non-high-low claims over time or across groups in monthly litigation expenses.

Importantly, even if we were able to estimate a tight confidence interval around a zero effect, our work would in no way require a rejection of the rent-seeking theory. Litigants may be able to identify in advance claims that will eventually involve a high-low agreement, and therefore reduce or delay spending *in advance* of any actual agreement.⁶⁴ Alternatively, many litigation costs may be fixed or sunk in the short term, especially for a litigant, like a large insurance company, that employs a full-time legal staff and has long-term contracts.

⁶² We examine both total costs and fees paid to outside counsel on the assumption that many of the components of “total litigation costs” may be fixed, at least in the short term. Outside counsel fees, on the other hand, are more likely to reflect any immediate change in litigation expenditures.

⁶³ We assume that claims involving high-low discussions are sufficiently similar to claims with high-lows in place to serve as an appropriate comparison group. To the extent that discussions do not fail randomly, however, our estimates represent a combination of the effects of the high-low agreement and the unobserved differences between these two groups.

⁶⁴ One could even imagine a pre-agreement form of tacit collusion where behavior on both sides mimicked behavior under a high-low agreement. In such a setting, there would be no sharp change in behavior at the time the parties entered into the anticipated contract. Of course, this logic runs against the basic idea that parties may require a high-low agreement as a commitment device to avoid wasteful expenditures.

Furthermore, even though the insurer graciously provided us with month-by-month accounts of litigation expenses, both for in-house and outside counsel, for virtually every disputed claim in our data, monthly accountings may well be less reliable than overall spending totals, as expenditures may be recorded months after commitments to pay for services were made, when the insurer is finally billed, etc.

Still, our results may hint that rent-seeking plays a less important role than our risk-reduction story, and there are a number of strong theoretical arguments in support of that interpretation. First, and perhaps most importantly, private parties have other commitment devices at their disposal to limit their litigation expenditures. In practice, litigants can concede certain issues (such as liability or damages determination), and litigate only the remaining ones.⁶⁵ Moreover, litigants often explicitly write contracts to limit the testimony that will be presented before the tribunal, such as restrictions on the number of expert witnesses or the hours of testimony. In short, there may be no need for parties to use high-low agreements to mitigate excessive rent-seeking activities when it is straightforward to do so directly through contractual limitations on spending.

6. Costs of Drafting High-Low Agreements

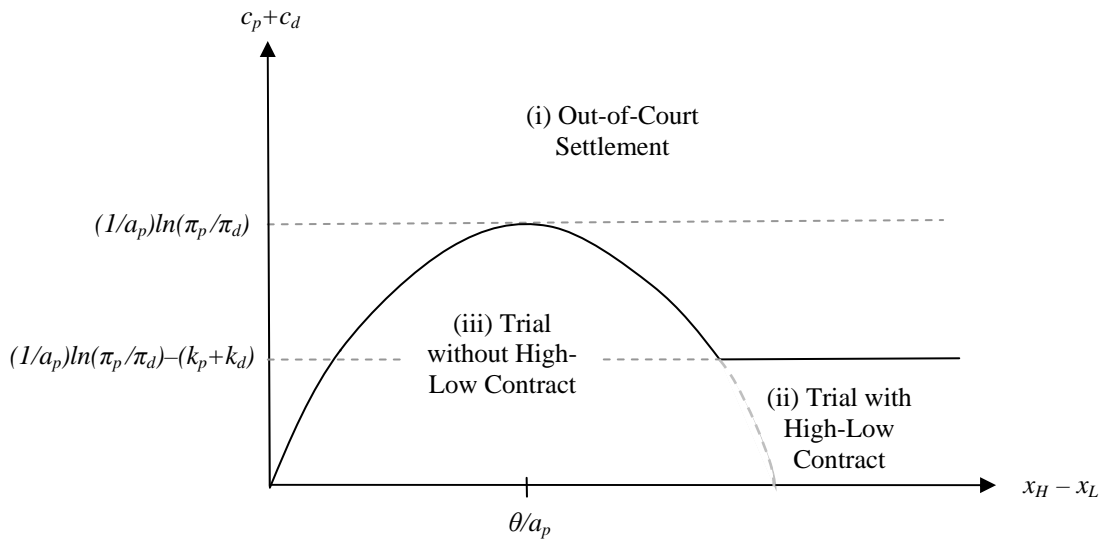
Given the joint benefits that litigants can capture through high-low agreements, it is perhaps surprising that fewer than four percent of litigated cases we study had high-low agreements in place when they went to court. While this may simply reflect the prevalence of litigants with a high level of mutual optimism (i.e., that $\theta > (a_p + a_d)(x_H - x_L)$), it might also reflect additional transactions costs of drafting and negotiating high-low agreements. It is not clear how large these costs are in practice, but they might include the time lawyers spend in drafting and negotiating the contract, the time it takes to explain the arrangement to the plaintiff, and any non-pecuniary costs that the litigants must bear as a result. This section extends our earlier framework to include such costs.

⁶⁵ See Noyes (2006) for a general discussion of the court's acceptance of private contracts that waive statutory rights and rules, such as waivers of notice and hearing and the right to a jury trial, and contracts that modify discovery requirements and limitations.

Suppose that the litigants must incur additional costs, k_p and k_d , when they draft a high-low agreement.⁶⁶ The litigants' joint benefit of a naked trial, $\varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d)$, is exactly as presented in Equation (5) in Section 2. It is not hard to show that this joint benefit is increasing in $x_H - x_L$ when $x_H - x_L < \theta/(a_p + a_d)$ and decreasing otherwise. (Intuitively, the joint benefit of a naked trial is highest when x_H and x_L correspond precisely to the jointly desired high-low bounds.) The concave function in Figure 4 below reflects this joint benefit. As before, when the litigation costs $c_p + c_d$, exceed this joint benefit, the parties prefer to settle out of court to resolving the dispute by a naked trial.

Similarly, the litigants' joint benefit of a high-low agreement is exactly as characterized in Equation (4), $\psi(\pi_p, \pi_d, a_p, a_d)$. Their joint cost of going to trial with a high-low agreement is now higher than before. In addition to paying litigation costs $c_p + c_d$, the parties must also pay the drafting costs $k_p + k_d$. Therefore the parties' net benefit from a high-low agreement is $\psi(\pi_p, \pi_d, a_p, a_d) - (k_p + k_d)$, and the region for which we would observe trials with high-low agreements (case (ii)), is smaller than before. The differences that result from including the costs of drafting and negotiating high-low agreements can be seen by comparing Figure 2 and Figure 4.

Figure 4



⁶⁶ These costs must be paid in addition to the fixed litigation costs associated with trial, c_p and c_d , and therefore make high-low agreements relatively less attractive than before.

This extension may also shed some light on the pattern we observed in some of our empirical work (particularly, Table 6) that cases with lower-than-median costs but higher-than-median volatility may be more likely to settle than cases with lower costs and lower volatility. This result is inconsistent with our original framework where, holding litigation costs constant, higher levels of volatility led to more high-low agreements rather than more out-of-court settlements. When high-low contracts are costly to draft, this need not be the case. For intermediate levels of litigation costs in the figure above, note that an increase in $x_H - x_L$ could indeed lead to more out-of-court settlement.

7. Conclusion

This paper presents the first systematic study of high-low agreements, a contractual device that has grown increasingly popular in civil litigation in the United States over the last several decades. We began by developing a formal model involving at least one risk-averse litigant in which these agreements arise endogenously. When the litigants are mutually optimistic about their prospects at trial and out-of-court settlement is elusive, high-low agreements provide a value-enhancing opportunity. They eliminate the risk of a “strike out” or a “home run,” while still maintaining scope for disagreement. In two extensions to the model, we explored 1) the cost-reducing value of high-low agreements in a model of mutually assured destruction and 2) the role transactions costs may play in the drafting of high-low agreements. Using a proprietary data set from one of the country’s largest insurers, we found that high-low agreements are not uncommon, at least in some areas of litigation. We also presented evidence that high-lows tend to be used in the circumstances identified by our risk-reduction theory: when the litigation environment is sufficiently uncertain (signifying scope for disagreement) and the costs of litigation are not too large.

We hope that our analysis will broaden the scope of discussion about litigation and settlement. The literature on settlement in civil litigation has tended to view only the extreme ends of the dispute resolution spectrum, where on one end cases are settled or dropped and on the other end cases go to full-blown trial. In practice, however, dispute resolution may be better viewed as a continuum. For example, presumably to reduce costs on both sides, parties often agree to arbitrate their dispute, which amounts to an agreement to ignore certain

procedural requirements of formal trial and to rely on arbitrators to resolve the dispute quickly. For similar reasons, parties often agree to waive their jury trial rights, stipulate to certain facts or points of law, etc., while still asking a judge or jury to determine many key issues. These practices show that settlement in litigation is actually a much broader category of agreements than simply “settlement without adjudication.” While the “cost-reducing” benefits of arbitration are well-recognized, most commentators have overlooked the “risk-reducing” benefits of mechanisms such as high-low agreements.

There remains additional theoretical and empirical work to be done in this area. Our paper developed a model of high-low agreements in which litigants have different subjective prior beliefs. From a theoretical perspective, it would be interesting to explore their use in models with asymmetric information. There are also a number of unexplored public policy issues and concerns. For instance, because these private agreements mitigate the risk of trial for litigants, they decrease the attractiveness of full settlement. For this reason, the use of high-lows should increase the demand for (high-low constrained) trials. This potentially imposes external costs and benefits. First, increased demand for litigation could lead to higher overall litigation costs since the court system—including the buildings, the court employers, and the juries—are all heavily subsidized. Second, because there is currently no requirement in most jurisdictions to disclose the existence of a high-low agreement, there may be a misallocation of scarce adjudicatory resources.⁶⁷ These topics, and others, constitute fruitful areas for further research.

⁶⁷ Note that this is a distinct feature of high-low agreements, as opposed to other forms of partial settlement where court involvement is typically necessary (for example, stipulating to a particular fact). Even though not compelled by law, some litigants find it strategically wise to inform judges of the existence of a high-low agreement, in part because having the judge sign off on the agreement in open court may increase the chances it will be enforced at some later point, should one party seek to breach. In arbitration, because of the informality of the proceeding, arbitrators are even more likely to know about the existence of a partial settlement arrangement. Additional distortions in the use of public funds may arise for jurisdictional reasons. For example, imagine a lawsuit alleging \$100,000 in damages, above the \$75,000 amount in controversy requirement for use of the federal courts under diversity jurisdiction. Using a high-low agreement, the parties might agree to limit possible damages to a range of \$40,000 to \$60,000. In effect, then, the amount in controversy is only \$20,000 and yet the private nature of the agreement allows the use of the federal courts. One can go further and imagine an out of court *full* settlement (i.e., agreeing to a \$50,000 payment regardless of the outcome at trial) between two parties who then seek to use a jury to determine “who was right, after all.” We usually assume that the costs of litigation will keep the number of such cases to a minimum, but where substantial sums are still at issue, there is no reason to think that such arrangements could not be fairly common.

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Table 1: Final Resolution of All Claims in Dispute

| | Claims in Dispute Resolved by Trial or Arbitration with No High-Low in Place | Claims in Dispute Resolved by Settlement with No High-Low Agreement in Place | Claims Resolved by Trial or Arbitration with a High- Low in Place |
|------------------------------|---|---|---|
| Total Number of Claims | 2,537 | 43,649 | 101 |
| Claims by Year (when closed) | | | |
| 2004 | 301 | 4,941 | 11 |
| 2005 | 443 | 7,302 | 8 |
| 2006 | 541 | 8,704 | 18 |
| 2007 | 542 | 9,845 | 32 |
| 2008 | 586 | 11,225 | 29 |
| 2009 | 124 | 1,632 | 3 |
| Type of Claim | | | |
| Auto Liability | 905 | 23,922 | 80 |
| General Liability | 1,632 | 19,727 | 21 |
| Accident Characteristic | | | |
| Region Where Claim Arose | | | |
| Northeast | 40.20% | 32.61% | 63.37% |
| South | 26.61% | 29.98% | 17.82% |
| Midwest | 8.79% | 11.83% | 10.89% |
| West | 23.81% | 25.25% | 6.93% |
| Pacific | 0.55% | 0.27% | 0.99% |
| Claimant Characteristics | | | |
| Claimant Type | | | |
| Firm/Business | 10.5% | 6.7% | 1.0% |
| Individual | 86.2% | 89.8% | 90.1% |
| Unknown | 3.4% | 3.5% | 8.9% |
| Part of Body | | | |
| Fatality | 2.3% | 2.5% | 0.0% |
| Head | 5.8% | 6.8% | 5.0% |
| Lower Extremities | 13.0% | 11.5% | 12.9% |
| Multiple Injuries | 3.3% | 1.8% | 0.0% |
| Neck | 13.2% | 14.8% | 8.9% |
| Spinal | 4.1% | 6.5% | 11.9% |
| Trunk | 23.7% | 29.8% | 41.6% |
| Upper Extremities | 7.9% | 9.4% | 13.9% |
| Personal Injury | 4.9% | 4.3% | 1.0% |
| Unreported | 21.8% | 12.6% | 5.0% |
| Average Claim Characteristic | | | |
| Duration of Claim (months) | 28.03 (19.08) | 26.28 (15.71) | 39.04 (13.64) |
| Initial Reserve | \$7,114 (13,701) | \$7,352 (16,170) | \$4,469 (4,486) |
| Loss Paid | \$30,322 (125,825) | \$42,411 (110,808) | \$74,075 (108,891) |
| Total Litigation Costs | \$13,996 (34,873) | \$7,847 (20,699) | \$10,748 (10,749) |
| Policy Limit (per person) | \$996,787 (883,433) | \$795,862 (893,086) | \$409,885 (505,977) |
| Policy Limit (per event) | \$1,418,445 (2,429,681) | \$1,056,617 (1,246,849) | \$582,027 (618,504) |

Notes: All figures are computed from machine data or litigation notes provided by the insurer. All financial figures are reported in 2008 dollars. The three categories are designed to capture the "final resolution" of all claims in dispute, including whether the claim resolved through arbitration or trial with a high-low agreement in place. Any high-low agreement is, by definition, no longer in force if the parties decide to renegotiate and fully settle. Standard deviations are reported in parentheses.

Table 2: Details of High-Low Agreements

| | High-Low Agreement Reached |
|---|---------------------------------------|
| Total number High-Low Agreements (complete) | 241 |
| Average Duration from Report Date | |
| High-Low Agreement Reached (months) | 31.96 (14.9) |
| Claim Closed (months) | 39.59 (15.9) |
| High-Low Agreement Details | |
| Average High Amount | \$157,702 (219,654) |
| Average Low Amount | \$43,641 (107,455) |
| How High -Low Claims Resolved | |
| Arbitration | 34.4% |
| Suit - Full Trial: Defendant Wins | 5.4% |
| Suit - Full Trial: Plaintiff Wins | 7.9% |
| Suit - Directed Verdict for Defendant | 0.8% |
| Suit - Settled Before Trial | 44.0% |
| Suit - Settled Before End of Trial | 3.3% |
| Suit - Withdrawn | 2.5% |
| Unknown | 1.7% |
| Outcome When Claim Adjudicated Under High-Low Agreement | |
| Outcome Below the Low | 17.3% |
| Outcome Between the High and Low | 68.5% |
| Outcome Above the High | 14.3% |

Notes: All figures are computed from machine data or litigation notes provided by the insurer. All financial figures are reported in 2008 dollars. The data contain a total of 248 high-low agreements, but seven were eliminated from the calculations in Table 2 because 1) the high or low of the agreement could not be determined or 2) the timing of the agreement could not be determined. Standard deviations are in parentheses.

Table 3: Intensity of High-Low Discussion

| | Level of High-Low Discussion | | |
|------------------------------|------------------------------|------------------------------|----------------------------|
| | High-Low Raised by One Party | Parties Amenable to High-Low | High-Low Agreement Reached |
| Total Number of Claims | 345 | 344 | 248 |
| Claims by Year (when closed) | | | |
| 2004 | 59 | 52 | 27 |
| 2005 | 66 | 56 | 29 |
| 2006 | 70 | 57 | 54 |
| 2007 | 59 | 79 | 68 |
| 2008 | 82 | 87 | 61 |
| 2009 | 9 | 13 | 9 |
| Type of Claim | | | |
| Auto Liability | 224 | 201 | 167 |
| General Liability | 121 | 143 | 81 |
| Accident Characteristic | | | |
| Region Where Claim Arose | | | |
| Northeast | 70.43% | 65.12% | 68.55% |
| South | 12.75% | 13.66% | 16.13% |
| Midwest | 5.80% | 8.43% | 6.05% |
| West | 10.72% | 12.50% | 8.87% |
| Pacific | 0.29% | 0.29% | 0.40% |
| Claimant Characteristics | | | |
| Claimant Type | | | |
| Firm/Business | 1.5% | 0.9% | 2.4% |
| Individual | 91.0% | 93.9% | 91.1% |
| Unknown | 7.5% | 5.2% | 6.5% |
| Part of Body | | | |
| Fatality | 1.7% | 2.3% | 0.4% |
| Head | 8.1% | 9.3% | 7.7% |
| Lower Extremities | 12.8% | 14.8% | 15.3% |
| Multiple Injuries | 0.6% | 2.0% | 0.4% |
| Neck | 9.6% | 9.6% | 8.9% |
| Spinal | 8.1% | 12.5% | 11.7% |
| Trunk | 44.6% | 32.0% | 38.3% |
| Upper Extremities | 12.8% | 12.8% | 12.5% |
| Personal Injury | 0.3% | 1.5% | 1.6% |
| Unreported | 1.5% | 3.2% | 3.2% |
| Average Claim Characteristic | | | |
| Duration of Claim (months) | 35.36 (20.77) | 37.68 (17.69) | 39.37 (15.77) |
| Initial Reserve | \$7,307 (14,351) | \$7,785 (12,475) | \$5,673 (8,841) |
| Loss Paid | \$78,472 (147,138) | \$112,377 (216,173) | \$83,005 (128,910) |
| Total Litigation Costs | \$13,420 (37,407) | \$16,123 (32,183) | \$12,585 (20,672) |
| Policy Limit (per person) | \$606,609 (618,820) | \$723,243 (907,452) | \$538,767 (613,084) |
| Policy Limit (per event) | \$860,351 (788,358) | \$951,524 (816,792) | \$790,515 (789,372) |

Notes: All figures are computed from machine data or litigation notes provided by the insurer. All financial figures are reported in 2008 dollars. "High-Low Raised by One Party" indicates that either the insurer or the other party raised the possibility of a high-low agreement in a settlement discussion, but the other side was uninterested according to the litigation notes. "Parties Amenable to High-Low" indicates that the parties attempted to negotiate a high-low agreement at some point in the litigation. Standard deviations are reported in parentheses.

**Table 4: Likelihood of High-Low Discussion and Full-Settlement
Relative to Trial or Arbitration
(Litigation Costs Predicted Using Litigated Cases)**

| | (1) | (2) | (3) | (4) |
|--|---------------------------|---------------------------|---------------------------|---------------------------|
| <u>High-Low Discussion</u> | | | | |
| HC-HV | 4.740 (0.82) [0.00] | 4.484 (0.71) [0.00] | 5.279 (1.07) [0.00] | 6.078 (1.33) [0.00] |
| LC-HV | 5.864 (1.32) [0.00] | 6.235 (1.25) [0.00] | 8.085 (2.00) [0.01] | 9.861 (2.67) [0.01] |
| LC-LV | 1.290 (0.32) [0.39] | 1.338 (0.30) [0.29] | 1.755 (0.48) [0.15] | 1.555 (0.46) [0.25] |
| <u>Settlement</u> | | | | |
| HC-HV | 1.101 (0.07) [0.19] | 1.130 (0.08) [0.12] | 1.043 (0.08) [0.59] | 1.063 (0.08) [0.46] |
| LC-HV | 1.010 (0.11) [0.93] | 1.173 (0.13) [0.22] | 1.180 (0.17) [0.30] | 1.206 (0.19) [0.30] |
| LC-LV | 0.757 (0.07) [0.01] | 0.861 (0.09) [0.15] | 0.818 (0.10) [0.09] | 0.808 (0.10) [0.10] |
| Calculating Expected Litigation Costs | | | | |
| Set #1 (see notes) | ✓ | ✓ | ✓ | ✓ |
| Set #2 (see notes) | | ✓ | ✓ | ✓ |
| Set #3 (see notes) | | | ✓ | ✓ |
| Set #4 (see notes) | | | | ✓ |
| Num of Obs. | 45,382 | 44,005 | 36,118 | 32,321 |

Notes: Estimates are reported as relative risk ratios. The outcome variable is measured at the time of first choice into a settlement or a high-low discussion, if any: (1) high-low discussions, (2) settlement, or (3) trial/arbitration (excluded category). The independent variables are indicators for the interaction between an indicator for whether the claim had above-median expected variance and an indicator for whether the claim had above-median expected litigation costs. Therefore, HC-HV is one for claims with high expected litigation costs and high expected variance and zero otherwise, etc. Bootstrapped standard errors are listed below estimates in parentheses. P-values are listed in brackets. We explain the method for calculating expected litigation expenditures in Section 4 of the text. Here, we show estimates using four different estimates of expected litigation costs. Set #1 includes state of litigation fixed effects, accident region fixed effects, fixed effects for the insurance company's estimate of percentage of liability, year effects for when accident was reported, fixed effects for the number of persons injured in the event, fixed effects for type of injury or damage, a fatality flag indicator, and an indicator for whether the line of business was automobile liability or general liability. Set #2 includes accident fixed effects, the insurance policy claim limit, the population density of the insured's geographic area, and the insurance company's estimates of "incurred loss" in months 3, 4, and 5 after the filing of a claim. Set #3 includes demographic variables about the area where the insured lives, the type of plaintiff (corporate or individual), and the population density of the plaintiff's geographic area. Set #4 includes an indicator for the year in which the suit was filed.

**Table 5: Likelihood of High-Low Agreement and Full-Settlement
Relative to Trial or Arbitration
(Litigation Costs Predicted Using Litigated Cases)**

| | (1) | (2) | (3) | (4) |
|--|----------------------------|----------------------------|-----------------------------|-----------------------------|
| <u>High-Low Agreement</u> | | | | |
| HC-HV | 7.289 (3.02) [0.06] | 6.193 (2.11) [0.03] | 10.231 (4.96) [0.09] | 6.237 (9.75) [0.60] |
| LC-HV | 12.404 (5.33) [0.06] | 12.359 (4.44) [0.03] | 20.447 (10.41) [0.09] | 14.492 (22.36) [0.56] |
| LC-LV | 1.667 (0.87) [0.46] | 1.519 (0.67) [0.46] | 2.645 (1.68) [0.35] | 1.230 (2.00) [0.91] |
| <u>Settlement</u> | | | | |
| HC-HV | 1.080 (0.07) [0.27] | 1.112 (0.07) [0.15] | 1.028 (0.08) [0.72] | 1.044 (0.08) [0.59] |
| LC-HV | 0.997 (0.10) [0.98] | 1.151 (0.13) [0.27] | 1.164 (0.16) [0.34] | 1.197 (0.19) [0.31] |
| LC-LV | 0.761 (0.07) [0.01] | 0.865 (0.09) [0.16] | 0.820 (0.10) [0.09] | 0.808 (0.10) [0.10] |
| Calculating Expected Litigation Costs | | | | |
| Set #1 (see notes) | ✓ | ✓ | ✓ | ✓ |
| Set #2 (see notes) | | ✓ | ✓ | ✓ |
| Set #3 (see notes) | | | ✓ | ✓ |
| Set #4 (see notes) | | | | ✓ |
| Num of Obs. | 45,378 | 44,001 | 36,117 | 32,321 |

Notes: Estimates are reported as relative risk ratios. The outcome variable is measured at the time of first choice into a settlement or a high-low discussion, if any: (1) high-low discussions, (2) settlement, or (3) trial/arbitration (excluded category). The independent variables are indicators for the interaction between an indicator for whether the claim had above-median expected variance and an indicator for whether the claim had above-median expected litigation costs. Therefore, HC-HV is one for claims with high expected litigation costs and high expected variance and zero otherwise, etc. Bootstrapped standard errors are listed below estimates in parentheses. P-values are listed in brackets. We explain the method for calculating expected litigation expenditures in Section 4 of the text. Here, we show estimates using four different estimates of expected litigation costs. Set #1 includes state of litigation fixed effects, accident region fixed effects, fixed effects for the insurance company's estimate of percentage of liability, year effects for when accident was reported, fixed effects for the number of persons injured in the event, fixed effects for type of injury or damage, a fatality flag indicator, and an indicator for whether the line of business was automobile liability or general liability. Set #2 includes accident fixed effects, the insurance policy claim limit, the population density of the insured's geographic area, and the insurance company's estimates of "incurred loss" in months 3, 4, and 5 after the filing of a claim. Set #3 includes demographic variables about the area where the insured lives, the type of plaintiff (corporate or individual), and the population density of the plaintiff's geographic area. Set #4 includes an indicator for the year in which the suit was filed.

Table 6: Likelihood of High-Low Agreements, High-Low Discussions, and Full-Settlement Relative to Trial or Arbitration (Litigation Costs Predicted Using All Disputed Claims)

| | Discussions | | | | Agreements | | | |
|--|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| High-Low Cases | | | | | | | | |
| HC-HV | 5.204 (0.86) [0.00] | 5.454 (0.92) [0.00] | 5.275 (0.95) [0.00] | 7.188 (1.49) [0.00] | 5.527 (2.18) [0.06] | 5.398 (2.13) [0.07] | 8.338 (3.85) [0.09] | 7.010 (3.15) [0.09] |
| LC-HV | 10.123 (1.70) [0.00] | 12.050 (2.16) [0.00] | 11.688 (2.30) [0.00] | 13.303 (2.78) [0.00] | 16.771 (6.09) [0.03] | 17.444 (6.05) [0.02] | 22.288 (9.85) [0.06] | 19.422 (8.20) [0.05] |
| LC-LV | 2.139 (0.39) [0.02] | 2.568 (0.47) [0.01] | 2.334 (0.46) [0.02] | 2.217 (0.56) [0.06] | 1.841 (0.81) [0.32] | 1.866 (0.76) [0.28] | 2.542 (1.32) [0.27] | 1.678 (0.86) [0.45] |
| Settlement | | | | | | | | |
| HC-HV | 1.157 (0.07) [0.06] | 1.193 (0.08) [0.04] | 1.174 (0.09) [0.09] | 1.223 (0.10) [0.05] | 1.135 (0.07) [0.08] | 1.177 (0.08) [0.05] | 1.163 (0.09) [0.11] | 1.213 (0.10) [0.05] |
| LC-HV | 1.602 (0.11) [0.00] | 1.785 (0.14) [0.00] | 1.838 (0.15) [0.00] | 1.736 (0.15) [0.00] | 1.575 (0.11) [0.00] | 1.739 (0.13) [0.00] | 1.790 (0.14) [0.00] | 1.692 (0.15) [0.00] |
| LC-LV | 1.142 (0.09) [0.13] | 1.249 (0.09) [0.02] | 1.283 (0.11) [0.02] | 1.221 (0.11) [0.06] | 1.145 (0.09) [0.13] | 1.253 (0.09) [0.02] | 1.283 (0.11) [0.02] | 1.220 (0.10) [0.06] |
| Calculating Expected Litigation Costs | | | | | | | | |
| Set #1 (see notes) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Set #2 (see notes) | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| Set #3 (see notes) | | | ✓ | ✓ | | | ✓ | ✓ |
| Set #4 (see notes) | | | | ✓ | | | | ✓ |
| Num of Obs. | 45,378 | 44,001 | 36,117 | 32,321 | 45,378 | 44,001 | 36,117 | 32,321 |

Notes: Estimates are reported as relative risk ratios. The outcome variable is measured at the time of first choice into a settlement or a high-low discussion, if any: (1) high-low discussions, (2) settlement, or (3) trial/arbitration (excluded category). The independent variables are indicators for the interaction between an indicator for whether the claim had above-median expected variance and an indicator for whether the claim had above-median expected litigation costs. Therefore, HC-HV is one for claims with high expected litigation costs and high expected variance and zero otherwise, etc. Bootstrapped standard errors are listed below estimates in parentheses. P-values are listed in brackets. We explain the method for calculating expected litigation expenditures in Section 4 of the text. Here, we show estimates using four different estimates of expected litigation costs. Set #1 includes state of litigation fixed effects, accident region fixed effects, fixed effects for the insurance company's estimate of percentage of liability, year effects for when accident was reported, fixed effects for the number of persons injured in the event, fixed effects for type of injury or damage, a fatality flag indicator, and an indicator for whether the line of business was automobile liability or general liability. Set #2 includes accident fixed effects, the insurance policy claim limit, the population density of the insured's geographic area, and the insurance company's estimates of "incurred loss" in months 3, 4, and 5 after the filing of a claim. Set #3 includes demographic variables about the area where the insured lives, the type of plaintiff (corporate or individual), and the population density of the plaintiff's geographic area. Set #4 includes an indicator for the year in which the suit was filed.

Table A1: Litigated and High-Low Related Claims

| | Claims Resolved by Trial or Arbitration | Claims with High- Low Discussions | Claims with High- Low Agreements |
|------------------------------|--|--|---|
| Total Number of Claims | 2,638 | 937 | 248 |
| Claims by Year (when closed) | | | |
| 2004 | 312 | 138 | 27 |
| 2005 | 451 | 151 | 29 |
| 2006 | 559 | 181 | 54 |
| 2007 | 574 | 206 | 68 |
| 2008 | 615 | 230 | 61 |
| 2009 | 127 | 31 | 9 |
| Type of Claim | | | |
| Auto Liability | 985 | 592 | 167 |
| General Liability | 1,653 | 345 | 81 |
| Accident Characteristic | | | |
| Region Where Claim Arose | | | |
| Northeast | 41.09% | 67.98% | 68.55% |
| South | 26.27% | 13.98% | 16.13% |
| Midwest | 8.87% | 6.83% | 6.05% |
| West | 23.16% | 10.89% | 8.87% |
| Pacific | 0.57% | 0.32% | 0.40% |
| Claimant Characteristics | | | |
| Claimant Type | | | |
| Firm/Business | 10.1% | 1.5% | 2.4% |
| Individual | 86.3% | 92.1% | 91.1% |
| Unknown | 3.6% | 6.4% | 6.5% |
| Part of Body | | | |
| Fatality | 2.2% | 1.6% | 0.4% |
| Head | 5.8% | 8.4% | 7.7% |
| Lower Extremities | 13.0% | 14.2% | 15.3% |
| Multiple Injuries | 3.2% | 1.1% | 0.4% |
| Neck | 13.0% | 9.4% | 8.9% |
| Spinal | 4.4% | 10.7% | 11.7% |
| Trunk | 24.3% | 38.3% | 38.3% |
| Upper Extremities | 8.2% | 12.7% | 12.5% |
| Personal Injury | 4.8% | 1.1% | 1.6% |
| Unreported | 21.2% | 2.6% | 3.2% |
| Average Claim Characteristic | | | |
| Duration of Claim (months) | 28.45 (19.02) | 37.27 (18.48) | 39.37 (15.77) |
| Initial Reserve | \$7,010 (13,469) | \$7,049 (12,413) | \$5,673 (8,841) |
| Loss Paid | \$31,997 (125,482) | \$92,119 (172,360) | \$83,005 (128,910) |
| Total Litigation Costs | \$13,872 (34,268) | \$14,191 (31,762) | \$12,585 (20,672) |
| Policy Limit (per person) | \$974,257 (879,168) | \$631,473 (739,790) | \$538,767 (613,084) |
| Policy Limit (per event) | \$1,388,664 (2,393,859) | \$876,832 (801,237) | \$790,515 (789,372) |

Notes: All figures are computed from machine data or litigation notes provided by the insurer. All financial figures are reported in 2008 dollars. "Claims with High-Low Discussions" are claims in which the parties at least raised in settlement negotiations the possibility of a high-low agreement. "Claims with High-Low Agreements" is the subset of "Claims with High-Low Discussions" in which the parties reached an actual agreement. Because some high-low agreements subsequently resolved through settlement, "Claims Resolved through Trial or Arbitration" includes many, but not all, of the high-low discussions and agreements. Standard deviations are reported in parentheses.

Table A2: Full Universe of Insurance Claims

| | All Claims | Admin. Claims | Claims in Dispute | | Litigated Claims | High-Low Discussions |
|------------------------------|--------------------------|--------------------------|----------------------------|----------------------------|----------------------------|------------------------|
| | | | Broad | Narrow | | |
| Total Number of Claims | 385,069 | 336,720 | 48,349 | 34,282 | 2,638 | 937 |
| Claims by Year (when closed) | | | | | | |
| 2004 | 68,445 | 62,527 | 5,918 | 3,699 | 312 | 138 |
| 2005 | 79,699 | 71,481 | 8,218 | 5,730 | 451 | 151 |
| 2006 | 83,805 | 74,227 | 9,578 | 6,727 | 559 | 181 |
| 2007 | 87,446 | 76,742 | 10,704 | 7,684 | 574 | 206 |
| 2008 | 62,670 | 50,545 | 12,125 | 8,959 | 615 | 230 |
| 2009 | 3,004 | 1,198 | 1,806 | 1,483 | 127 | 31 |
| Type of Claim | | | | | | |
| Auto Liability | 224,885 | 199,724 | 25,161 | 18,388 | 985 | 592 |
| General Liability | 160,184 | 136,996 | 23,188 | 15,894 | 1,653 | 345 |
| Accident Characteristic | | | | | | |
| Region Where Claim Arose | | | | | | |
| Northeast | 22.58% | 21.13% | 32.69% | 35.82% | 41.09% | 67.98% |
| South | 39.14% | 40.49% | 29.73% | 27.56% | 26.27% | 13.98% |
| Midwest | 12.62% | 12.77% | 11.58% | 11.37% | 8.87% | 6.83% |
| West | 25.43% | 25.40% | 25.64% | 24.98% | 23.16% | 10.89% |
| Pacific | 0.20% | 0.18% | 0.29% | 0.22% | 0.57% | 0.32% |
| Claimant Characteristics | | | | | | |
| Claimant Type | | | | | | |
| Firm/Business | 2.2% | 1.5% | 6.8% | 6.1% | 10.1% | 1.5% |
| Individual | 76.6% | 75.1% | 87.0% | 89.1% | 86.3% | 92.1% |
| Unknown | 21.2% | 23.4% | 6.2% | 4.8% | 3.6% | 6.4% |
| Part of Body | | | | | | |
| Fatality | 0.7% | 0.5% | 2.5% | 2.0% | 2.2% | 1.6% |
| Head | 8.2% | 8.4% | 6.8% | 6.4% | 5.8% | 8.4% |
| Lower Extremities | 9.5% | 9.2% | 11.4% | 12.5% | 13.0% | 14.2% |
| Multiple Injuries | 2.5% | 2.6% | 2.0% | 1.5% | 3.2% | 1.1% |
| Neck | 22.9% | 24.1% | 14.3% | 13.8% | 13.0% | 9.4% |
| Spinal | 2.1% | 1.6% | 6.2% | 7.2% | 4.4% | 10.7% |
| Trunk | 27.4% | 27.2% | 28.7% | 30.5% | 24.3% | 38.3% |
| Upper Extremities | 8.1% | 8.0% | 9.3% | 10.1% | 8.2% | 12.7% |
| Personal Injury | 0.9% | 0.4% | 4.4% | 3.5% | 4.8% | 1.1% |
| Unreported | 17.6% | 18.0% | 14.5% | 12.4% | 21.2% | 2.6% |
| Average Claim Characteristic | | | | | | |
| Duration of Claim (months) | 9.20 (11.28) | 6.76 (7.84) | 26.19 (15.99) | 28.98 (15.71) | 28.45 (19.02) | 37.27 (18.48) |
| Initial Reserve | \$7,345 (17,804) | -- -- | \$7,345 (17,804) | \$7,163 (13,933) | \$7,010 (13,469) | \$7,049 (12,413) |
| Loss Paid | \$9,948 (46,796) | \$5,442 (23,366) | \$41,325 (111,862) | \$47,026 (114,476) | \$31,997 (125,482) | \$92,119 (172,360) |
| Total Litigation Costs | \$1,039 (8,414) | -- -- | \$8,277 (22,449) | \$10,674 (24,927) | \$13,872 (34,268) | \$14,191 (31,762) |
| Policy Limit (per person) | \$737,428 (2,101,470) | \$726,009 (2,210,010) | \$816,986 (1,071,733) | \$786,141 (848,211) | \$974,257 (879,168) | \$631,473 (739,790) |
| Policy Limit (per event) | \$886,051 (1,170,250) | \$855,077 (1,138,832) | \$1,097,010 (1,346,331) | \$1,078,306 (1,067,606) | \$1,388,664 (2,393,859) | \$876,832 (801,237) |

Notes: All figures are computed from machine data or litigation notes provided by the insurer. All financial figures are reported in 2008 dollars. "Administrative Claims" are claims that involve no legal expenses and in which no complaint has been filed. "Claims in Dispute" involve some minimal legal expenses and/or (narrow/broad) the filing of a legal complaint. Litigated claims are those claims that are eventually adjudicated either in trial or arbitration. Standard deviations are reported in parentheses.

Table A3: Consideration of a High-Low Agreement for All Claims in Dispute

| | Claims in Dispute Resolved by Trial or Arbitration with No High-Low Discussion | Claims in Dispute Resolved by Settlement with No High- Low Discussion | Claims in Dispute Involving a High-Low Discussion |
|------------------------------|--|---|--|
| Total Number of Claims | 2,492 | 42,863 | 937 |
| Claims by Year (when closed) | | | |
| 2004 | 297 | 4,821 | 138 |
| 2005 | 432 | 7,170 | 151 |
| 2006 | 529 | 8,553 | 181 |
| 2007 | 537 | 9,676 | 206 |
| 2008 | 576 | 11,036 | 230 |
| 2009 | 121 | 1,607 | 31 |
| Type of Claim | | | |
| Auto Liability | 882 | 23,435 | 592 |
| General Liability | 1,610 | 19,428 | 345 |
| Accident Characteristic | | | |
| Region Where Claim Arose | | | |
| Northeast | 39.85% | 31.95% | 67.98% |
| South | 26.81% | 30.28% | 13.98% |
| Midwest | 8.83% | 11.93% | 6.83% |
| West | 23.96% | 25.50% | 10.89% |
| Pacific | 0.52% | 0.27% | 0.32% |
| Claimant Characteristics | | | |
| Claimant Type | | | |
| Firm/Business | 10.7% | 6.8% | 1.5% |
| Individual | 86.2% | 89.8% | 92.1% |
| Unknown | 3.1% | 3.4% | 6.4% |
| Part of Body | | | |
| Fatality | 2.2% | 2.6% | 1.6% |
| Head | 5.9% | 6.8% | 8.4% |
| Lower Extremities | 12.8% | 11.4% | 14.2% |
| Multiple Injuries | 3.3% | 1.9% | 1.1% |
| Neck | 13.2% | 14.9% | 9.4% |
| Spinal | 4.0% | 6.4% | 10.7% |
| Trunk | 23.5% | 29.6% | 38.3% |
| Upper Extremities | 7.9% | 9.4% | 12.7% |
| Personal Injury | 5.0% | 4.4% | 1.1% |
| Unreported | 22.2% | 12.8% | 2.6% |
| Average Claim Characteristic | | | |
| Duration of Claim (months) | 27.63 (18.66) | 26.10 (15.61) | 37.27 (18.48) |
| Initial Reserve | \$7,043 (13,603) | \$7,355 (16,228) | \$7,049 (12,413) |
| Loss Paid | \$28,153 (117,658) | \$41,508 (109,358) | \$92,119 (172,360) |
| Total Litigation Costs | \$13,231 (32,865) | \$7,765 (20,578) | \$14,191 (31,762) |
| Policy Limit (per person) | \$1,003,179 (887,140) | \$798,397 (894,999) | \$631,473 (739,790) |
| Policy Limit (per event) | \$1,423,470 (2,447,770) | \$1,059,359 (1,252,906) | \$876,832 (801,237) |

Notes: All figures are computed from machine data or litigation notes provided by the insurer. All financial figures are reported in 2008 dollars. The three categories are designed to capture the "first move" made by the parties. If a high-low agreement was not discussed by the parties, then the claim ultimately resolved either through settlement or through trial or arbitration. Standard deviations are reported in parentheses.

Appendix A: Proof of Lemma 1 and Proposition 1

Proof of Lemma 1: Using Equation (1), the award modification contract would satisfy:

$$\frac{\pi_p a_p e^{-a_p(s_H - c_p)}}{(1 - \pi_p) a_p e^{-a_p(s_L - c_p)}} = \frac{\pi_d a_d e^{-a_d(-s_H - c_d)}}{(1 - \pi_d) a_d e^{-a_d(-s_L - c_d)}}.$$

The litigation costs drop out, giving:

$$\frac{\pi_p e^{-a_p s_H}}{(1 - \pi_p) e^{-a_p s_L}} = \frac{\pi_d e^{a_d s_H}}{(1 - \pi_d) e^{a_d s_L}}.$$

Rearranging this expression,

$$\left[\frac{(1/\pi_d) - 1}{(1/\pi_p) - 1} \right] = e^{(a_p + a_d)(s_H - s_L)}.$$

Taking the natural logarithm of both sides, and using the definition of θ from Lemma 1, this becomes $\theta = (a_p + a_d)(s_H - s_L)$. Rearranging terms gives the result. ■

Proof of Proposition 1: We will first prove the following claim.

Claim: Under Assumption 1, Pareto-optimal award-modification agreements have the following characteristics:

- i. If $\theta \leq 0$ (so the plaintiff is no more optimistic than the defendant) then the parties agree to a *full-insurance contract* $s_L = s_H$.
- ii. If $\theta \in (0, (a_p + a_d)(x_H - x_L)]$ then the litigants agree to $s_L = s_H - \theta/(a_p + a_d)$.
- iii. If $\theta > (a_p + a_d)(x_H - x_L)$ then the parties agree to $s_L = x_L$ and $s_H = x_H$.

The proof of this is straightforward and will only be sketched here. When $\theta \leq 0$ then the litigants are mutually pessimistic. If the contracts were unrestricted, they would agree to $s_L > s_H$. Under Assumption 1, the constraint that $s_L \leq s_H$ is binding so the parties agree to $s_L = s_H$. When $\theta > (a_p + a_d)(x_H - x_L)$, then Equation (2) would imply $s_H - s_L > x_H - x_L$. This speculation violates Assumption 1. Again, the constraint binds and so $s_L = x_L$ and $s_H = x_H$. □

Consider case (i) where $\theta \leq 0$. The litigants would clearly prefer settling out of court in this case, since they would avoid the costs of litigating.

Next consider case (ii) where $\theta \in (0, (a_p + a_d)(x_H - x_L)]$. Suppose there is an ordinary settlement contract, s , that is better for both litigants than their preferred *high-low contract* with $s_L = s_H - \theta/(a_p + a_d)$. For the plaintiff, it must be the case that:

$$-\exp[-a_p s] > -\pi_p \exp[-a_p(s_H - c_p)] - (1 - \pi_p) \exp[-a_p(s_L - c_p)] \quad (\text{A1})$$

Substituting for s_L from Equation (2) in the text and rearranging terms gives a lower bound for s ,

$$s > s_H - c_p - \frac{1}{a_p} \ln \left[\pi_p + (1 - \pi_p) \left[\frac{(1/\pi_d) - 1}{(1/\pi_p) - 1} \right]^{\frac{a_p}{a_p + a_d}} \right]. \quad (\text{A2})$$

For the defendant, we must have:

$$-\exp[a_d s] > -\pi_d \exp[-a_d(-s_H - c_d)] - (1 - \pi_d) \exp[-a_d(-s_L - c_d)]. \quad (\text{A3})$$

Again, substituting for s_L from Equation (2) and rearranging terms gives us an upper bound,

$$s < s_H + c_d + \frac{1}{a_d} \ln \left[\pi_d + (1 - \pi_d) \left[\frac{(1/\pi_d) - 1}{(1/\pi_p) - 1} \right]^{\frac{-a_d}{a_p + a_d}} \right]. \quad (\text{A4})$$

Putting these expressions together, we see that the litigants will sign an ordinary settlement contract with the sum of their litigation costs high as characterized in Equation (4) in the text. To show that $\psi(\pi_p, \pi_d, a_p, a_d)$ is positive, it is sufficient to show that:

$$\pi_d^{-1/a_d} \pi_p^{-1/a_p} \left[1 + \left(\frac{1}{\pi_d} - 1 \right)^{\frac{a_p}{a_p + a_d}} \left(\frac{1}{\pi_p} - 1 \right)^{\frac{a_d}{a_p + a_d}} \right]^{\left(\frac{1}{a_d} + \frac{1}{a_p} \right)} > 1.$$

Rearranging terms, this becomes:

$$1 + \left(\frac{1}{\pi_d} - 1 \right)^{\frac{a_p}{a_p + a_d}} \left(\frac{1}{\pi_p} - 1 \right)^{\frac{a_d}{a_p + a_d}} < \left[\pi_d^{-1/a_d} \pi_p^{-1/a_p} \right]^{\frac{a_p a_d}{a_p + a_d}} = \pi_d^{-a_p/(a_p + a_d)} \pi_p^{-a_d/(a_p + a_d)},$$

or, equivalently,

$$\pi_d^{a_p/(a_p + a_d)} \pi_p^{a_d/(a_p + a_d)} + (1 - \pi_d)^{a_p/(a_p + a_d)} (1 - \pi_p)^{a_d/(a_p + a_d)} < 1.$$

When $\pi_p = \pi_d$, it is easy to show that the left-hand side is equal to one. So if we verify that the left-hand side is decreasing in π_p then we are done. Differentiating with respect to π_p ,

$$\left(\frac{a_d}{a_p + a_d} \right) \pi_d^{a_p/(a_p + a_d)} \pi_p^{-a_p/(a_p + a_d)} - \left(\frac{a_d}{a_p + a_d} \right) (1 - \pi_d)^{a_p/(a_p + a_d)} (1 - \pi_p)^{-a_p/(a_p + a_d)}.$$

This has the same sign as:

$$\left(\frac{\pi_d}{\pi_p} \right)^{a_p/(a_p + a_d)} - \left(\frac{1 - \pi_d}{1 - \pi_p} \right)^{a_p/(a_p + a_d)},$$

and it is easy to show that this is negative when $\pi_p < \pi_d$.

Now suppose that $\theta > (a_p + a_d)(x_H - x_L)$. According to our earlier claim, the parties are sufficiently optimistic about their own prospects at trial that they do not modify the court award. Suppose there is an ordinary settlement contract, s , that is better for both litigants. For the plaintiff, it must be the case that:

$$-\exp[-a_p s] > -\pi_p \exp[-a_p(x_H - c_p)] - (1 - \pi_p) \exp[-a_p(x_L - c_p)] \quad (\text{A5})$$

Rearranging terms, this becomes:

$$s > -c_p - (1/a_p) \ln(\pi_p e^{-a_p x_H} + (1 - \pi_p) e^{-a_p x_L}) \quad (\text{A6})$$

Similarly for the defendant, settling must be better than going to trial, so:

$$-\exp[a_d s] > -\pi_d \exp[a_d(x_H + c_d)] - (1 - \pi_d) \exp[a_d(x_L + c_d)] \quad (\text{A7})$$

Rearranging terms, this becomes:

$$s < c_d + (1/a_d) \ln(\pi_d e^{a_d x_H} + (1 - \pi_d) e^{a_d x_L}) \quad (\text{A8})$$

Combining and rearranging terms, we have:

$$c_p + c_d > -(1/a_p) \ln(1 - \pi_p + \pi_p e^{-a_p(x_H - x_L)}) - (1/a_d) \ln(1 - \pi_d + \pi_d e^{a_d(x_H - x_L)})$$

Renaming the right hand side $\varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d)$, we have Equation (5) from the proposition. Now we will show that $\varphi(x_H, x_L, \pi_p, \pi_d, a_p, a_d) > 0$. First, if $x_H - x_L = 0$ then it is clear that $\varphi(\cdot) = 0$. We can prove that $\varphi(\cdot)$ is increasing in $x_H - x_L$. Differentiating Equation (5) with respect to $x_H - x_L$ gives us:

$$\frac{\pi_p e^{-a_p(x_H - x_L)}}{1 - \pi_p + \pi_p e^{-a_p(x_H - x_L)}} - \frac{\pi_d e^{-a_d(x_H - x_L)}}{1 - \pi_d + \pi_d e^{-a_d(x_H - x_L)}}.$$

This is positive when:

$$\frac{\pi_p e^{-a_p(x_H - x_L)}}{1 - \pi_p + \pi_p e^{-a_p(x_H - x_L)}} > \frac{\pi_d e^{-a_d(x_H - x_L)}}{1 - \pi_d + \pi_d e^{-a_d(x_H - x_L)}},$$

Cross multiplying and rearranging terms, we find that this is true when:

$$\frac{(1 - \pi_d)/\pi_d}{(1 - \pi_p)/\pi_p} > e^{(a_p + a_d)(x_H - x_L)},$$

which is true because we are in case (iii) where $\theta > (a_p + a_d)(x_H - x_L)$.

Appendix B: Additional Data Description

The insurer provided us with detailed data for all claims that were either closed or open at any point between January 1, 2004, and March 31, 2009. The raw claim data included approximately 570,000 total claims. Because we do not know how open claims eventually resolve, we do not use them in our analysis. By also removing claims that were missing extensive information or were outliers in subject matter, geography, or timing, we constructed a “clean” data set of approximately 385,000 claims.

The clean data set consists of two types of claims: claims resolved administratively through a claim handler and “disputed” claims. For our purposes, we define a claim as being “in dispute” if either (1) positive litigation costs are recorded by the insurer’s in-house legal counsel or an outside firm, or (2) a suit date is recorded (which occurs when the insurer receives notice that the plaintiff has filed a complaint, at which point the insurer refers to the claim as being “in suit”). A little more than 12 percent or about 48,500 of the claims were “in dispute” using our definition. Approximately 5 percent of the disputed claims, or about 2,600 claims, were “litigated” (resolved by trial or arbitration). Most non-administrative claims involve *both* a suit date and positive litigation costs, but a small fraction involves only one or the other. In Table A2, we provide summary statistics for the data, and we include alternative “broad” and “narrow” measures of the “disputed” claims category by using the union and intersection of conditions (1) and (2), respectively.

When a claimant notifies the insurer of a claim against one of its policies, the insurer first internally assesses the claim to determine to what extent, if any, the policyholder is responsible for the alleged harm. Based on this determination, the insurer attempts to resolve the claim through one of its claims agents. Most claims are resolved in this way, essentially administratively. If the claims agent is unable to resolve the claim through negotiation, and the claimant subsequently files suit, the insurer continues in its efforts to settle the claim but either assigns its own in-house legal staff or outside legal counsel to manage the claim. Consistent with most litigation, suits against the insurer typically end in settlement, with a small percentage proceeding to trial or arbitration.

For each claim, the insurer records the date of the alleged harm, the date the insurer received notice of the claim, and the close date (i.e., when the claim is resolved, regardless of its disposition). With these dates, it is possible to calculate the duration of each claim. In addition, the insurer gathers detailed information about the alleged harm and its likely “litigation” value. Of particular interest, the insurance company makes an initial assessment of the harm and the extent of its perceived liability, but also subsequently records a second post-evaluation, pre-litigation evaluation of the likely value of the claim. It also records the state (and sometimes city) in which the accident or harm occurred and maintains demographic information about the area in which the insured and claimant (plaintiff) live or lived. For all claims, the insurer also collects the amount ultimately paid out, if anything, to the claimant, as well as any legal fees or other legal expenses incurred. Each record also contains the policy limit for the policyholder (which affects how the insurer handles the claim), information about how long the insured had the policy, and when it became effective.

For approximately 80% of the claims, the insurer recorded whether the plaintiff was an individual or a business. The company also records extremely detailed information about the type of harm allegedly suffered by the plaintiff. Possible harms include property/economic damage, personal injury or death, or, in many instances, both. Property/economic damage and personal injury raise different concerns for the insurer. With property/economic damage, the magnitude of harm is typically quantifiable using market measures, leaving liability as the central issue. By contrast, claims involving personal injury require the insurer to determine both the magnitude of the harm as well as the extent of liability, so the insurer catalogs the part of the body allegedly harmed (e.g., head, neck, spine) as well as the nature of the injury (e.g., contusion, sprain, fracture). If there are multiple injuries, the insurer records them, as well as whether other people were injured during the “loss event” and other indicators of injury (the use of an ambulance, for example).

As the summary statistics in Table A2 suggest, “in dispute” claims are different from administratively handled claims. The fatality rate is more than four times higher in disputed claims than in administrative claims. In addition, a disputed claim takes on average four times longer to resolve and involves payouts eight times greater than an administrative claim. The insurer tracks how the claim resolved, whether by settlement, arbitration, or trial. Table A3 reports the same summary statistics as Table A2, broken down by whether the claim involved a high-low discussion (irrespective of whether the parties reached a high-low agreement or how the claim ultimately resolved), resolved through settlement without a high-low discussion, or resolved by trial or arbitration without a high-low discussion. Consistent with the existing literature on settlement rates (Galanter, 1994), the vast majority of claims (95 percent) resolve without formal adjudication.

The insurer does not store any of its settlement agreements (including even whether there was a written or oral high-low agreement in place) in its standard, uniformly coded and collected electronic records. However, the insurer does keep extensive electronic narrative records on how the claim is handled while it is in dispute. Claim handlers, lawyers, and anyone else involved with a claim enter their notes as claims evolve, although the notes are not entirely complete and can be difficult to decipher.

To extract information about high-low agreements from these notes (which run at least many dozens of pages per “in dispute” claim when aggregated), we worked with the insurer to design an algorithm that extracted chunks of text surrounding references to a “high-low” agreement. The algorithm was designed to identify the many ways different people might have referred to high-low agreements in the notes: e.g., “hi-lo,” “high/low,” and “hi/low.”

A single claim often gave rise to several notes, depending on the frequency of high-low references. All notes included the following:

- Event ID: the underlying event giving rise to one or more claims;
- Claim ID: the specific claim corresponding to a given event;
- Note ID: individual identifier for the specific note;
- Note Type: the category of note, e.g., negotiation, legal, medical, etc.;

- Note Date: the date corresponding to the note;
- Note Count: the total number of notes attached to the claim.

The algorithm also recorded how many times the variation of the term appeared in the claim notes. For privacy reasons, notes were redacted to exclude names, addresses, social security numbers, and other sensitive information.

We read through a large sample of complete case notes and algorithm-extracted chunks of text to better understand the scope of the notes and to design a coding regimen. Research assistants completed the coding and double-checking of the data. For each of these “high-low” relevant claims, we read the available narrative information, and recorded the context in which the high-low agreement arose, whether the parties reached an actual agreement, as well as other potentially useful information, such as the number of back and forth proposals, relevant dates, and the proximity of the discussion to trial or arbitration, if apparent.

When the redactions inhibited our ability to understand the notes, we requested additional information from the insurer. Officials at the insurer either helped us to determine the substance of the notes or forwarded hand-redacted notes. These notes were then recombined with the existing notes for those claims. The same procedure was used for both auto (AL) and general liability (GL) claims. The high-low data was structured such that each row in a spreadsheet contained a new note and all of the information we had about that note. The data were sorted by Event ID to determine whether there were multiple claims for an event, then sorted by claim ID to group each claim together, then sorted by date so that the notes were in chronological order within each claim. We ultimately coded a total of almost 300,000 text entries (many for each claim).

From the claim notes identified and redacted by the text-mining algorithm, we collected the following information on high-low discussions and agreements.

- H/L Discussion Level (measures the extent of high-low discussion). A “0” indicates that a high-low was mentioned by the insurer but there was no discussion between the parties. A “1” indicates that it was mentioned by one party but the other party was not interested. A “2” indicates that a high-low was discussed and seriously considered by both sides, but that no high-low was ever reached. Any type of interest on the other party’s part (such as “let me check with my client”) received a “2” coding. A “3” indicates that a high-low agreement was made. “4” records unknown/unclear.
- Party Name (identifies the party initiating the high-low discussion). A “1” indicates that the insurer raised the possibility of a high-low, a “2” means the plaintiff raised it, a “3” indicates a co-defendant (such as another insurance company also involved in the litigation) raised it, and a “4” means that it was unclear from the notes which party raised the possibility. A “5” indicates that a judge raised the idea.
- Date H/L Raised (the date of the first recorded mention of a high-low).

- H/L Context (the stage of the claim at which the discussion of the high-low occurred). A “0” represents a very early planning/negotiation stage, “1” is for arbitration, “2” is for mediation, and “3” is for trial.
- Date H/L Reached (if applicable, the date when the parties agreed to a high-low).
- High (if applicable, the high of the agreement).
- Low (if applicable, the low of the agreement).
- Claim Resolution (how the claim was eventually resolved). A “1” is for arbitration, a “2” is for mediation, a “3” is for trial, a “4” is for settlement, a “5” is for a dismissal or dropped case, and a “6” is recorded when the notes did not provide sufficient information to determine the resolution.

In the rare event that claims involved multiple parties and multiple distinct high-low agreements, we recorded the information in multiple separate rows as if there were separate agreements. We then later determined the appropriate treatment based on the facts and procedural posture of the case.

We also collected whether a claim involved multiple high-low proposals and, if so, we recorded the terms of each offer or demand, up to three proposals. (In a few instances, the notes did not report the actual terms of the high-low proposal.) These proposals usually, but not necessarily, resulted in the parties reaching a high-low agreement. Finally, we kept track of any information indicating the motivation or thinking of the lawyers or other insurer personnel in engaging in a high-low negotiation or agreement, and also recorded any other information possibly relevant to analyzing the case.

As an internal check, many claims (several hundred) were coded redundantly to ensure accuracy. Subsequent spot-checking also revealed that coding was highly consistent. The research assistants also recorded the certainty of their coding. A claim coded as a “1” was evaluated by another research assistant or by one of us, a “2” indicated that the claim required additional attention, and a “3” meant the RA had high confidence in the coding.