Asymmetric Information, Uncertainty, and Selection Bias in Litigation

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Since the pathbreaking work of Baxter, and especially since that of Priest and Klein, legal scholars have realized that they cannot treat a reported appellate case or even a litigated case as a randomly selected dispute. Many disputes are resolved before a lawsuit is filed, many cases are settled prior to litigation, many litigated cases are not appealed, and many appealed cases do not have reported opinions. So long as the processes of filing suit, settlement, appeal, and reporting are not random but vary across characteristics of the dispute, any analysis of litigated or reported cases is subject to "selection bias."

Priest and Klein argue that, given certain restrictive assumptions, each side will win half of the litigated cases under any legal rule. This is the "50% rule." Subsequent literature has focused on exploring in more detail the conditions under which the 50% rule will hold. This literature largely indicates that the 50% rule does not hold in actual settlement negotiations and trial outcomes.

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1 Associate Professor of Business Economics, The University of Chicago Graduate School of Business.
3 George L. Priest and Benjamin Klein, The Selection of Disputes for Litigation, 13 J Legal Stud 1, 4-5 (1984).
4 George L. Priest, Measuring Legal Change, 3 J L Econ & Organization 193, 197.
There are two basic models in the law and economics literature on dispute settlement. I refer to them as the “optimism model” and the “asymmetric information model.” Almost the entire literature on selection bias is based on the optimism model. The goal of this paper is to demonstrate the unique effects that the asymmetric information model has on selection bias. The distinction between the optimism and asymmetric information models may be much more important for understanding the way in which litigated cases are unrepresentative than is the debate which has dominated the literature over the exact conditions under which the 50% rule holds.

Selection bias has dramatic implications for empirical legal research. In only rare and special circumstances is detailed data available on disputes that are settled prior to trial, and even more rarely on disputes that are settled before a lawsuit is even filed. Legal scholars therefore must typically rely on the inferences they can make from the small subset of disputes that are litigated to judgment. However, to analyze whether a change in a legal rule benefits plaintiffs or defendants, one cannot simply compare the outcomes of litigated cases under the two regimes. For example, a rule change that benefits plaintiffs could conceivably benefit defendants in litigated cases if good cases settle more frequently under the new rule than they did under the old.

Understanding the process by which disputes settle or fail to settle will help legal scholars unravel the biases created by the selection effect. They may then “adjust” the data on litigated cases taking the selection bias for the settlement process into account, and thus learn more from the existing data.


4 The one exception is a recent paper by Keith N. Hylton, Asymmetric Information and the Selection of Disputes for Litigation, 22 J Legal Stud 187 (1993). I refer to this paper in section 5.

5 There are some notable situations where information on disputes that are not litigated to judgment is available. One such data set is analyzed in Henry S. Farber and Michelle J. White, Medical Malpractice: An Empirical Examination of the Litigation Process, 22 Rand J Econ 199, 203-04 (1991); See also James Hughes and Edward Snyder, Litigation Under the English and American Rules: Theory and Evidence (1993) (unpublished manuscript).

6 The econometrics literature on selection bias demonstrates how knowledge about the selection process can help one to develop unbiased estimators of underlying relations. See, for example, James J. Heckman, Sample Selection Bias as a Specification Error, 47 Econometrica 153 (1979).
Selection bias in litigation is becoming an even more important issue with the growth of alternative dispute resolution. Comparisons between different dispute resolution devices suffer from two types of selection bias. First, the two regimes may lead to different patterns of settlement, so that the higher awards may be due to better cases being tried rather than settled. Second, the distribution of disputes that are resolved under different regimes may itself not be a randomly-selected subset of all cases. For example, if disputes can only go to arbitration if both parties agree to arbitration, the mere fact that the parties agree to arbitration may reflect important underlying characteristics of the dispute. A more complete understanding of the settlement process, and the selection biases it generates, will provide guidance in the interpretation of the imperfect data that are available.

A second motivation for this paper is to develop testable effects of selection bias across the two models of pretrial settlement. One can then take data from the limited situations where there is good information about pretrial dispute resolution and compare the implications of the two models to separate the type of suits that should settle from those that should be litigated. This can provide important evidence about which of the two competing models fits the actual settlement process.7

One of the most basic questions in legal scholarship, and one of the defining questions of the law and economics movement, is whether or not the common law tends toward efficiency.8 The underlying force that may cause the common law to evolve toward efficiency is the assumption that disputes in areas where existing doctrine is inefficient are more likely to be litigated. This assumption does not have a great deal of theoretical or empirical justification. A more complete understanding of the process of settlement can provide insight into the types of situations where the selection of suits for litigation may conform to those suits that will or will not induce an evolution to efficiency.

Judicial decision-making also may be affected by selection bias. A judge only observes disputes that are litigated, so a judge may adopt a rule or standard that is "optimal,"9 for the types of

7 For an example of a paper attempting to do some of this analysis, see Hughes and Snyder, Litigation Under the English and American Rules (cited in note 5).
9 "Optimal" here does not necessarily mean economically efficient. It merely refers to
cases that are litigated, but that is not the same rule the judge
would adopt if fully-informed about the set of disputes that are
affected by the rule.

An example may clarify this argument. It is conceivable that
almost all legitimate medical malpractice suits settle prior to
litigation. Prior to trial each side has a complete record of the
patient's medical history. They have each consulted experts and
perhaps taken depositions. If there is a legitimate claim, it is
unlikely that there will be large differences in opinion or infor-
mation about the outcome at trial. However, it may well be the
case that people who have suffered terribly after medical treat-
ment believe that their doctor has committed malpractice even
when almost any informed, unbiased observer would think other-
wise. These cases may be the ones that do not settle. If so, judges
will find themselves presiding over cases where there is much
lower incidence of liability than in the general population of
disputes. Judges may thus create standards that make it quite
difficult for plaintiffs to prevail. Because the standards judges set
in cases that are litigated form the basis for pretrial settlement
of all disputes, the stricter standard will make it more difficult
for a legitimate claim to succeed if it goes to trial, thus reducing
the settlement the plaintiff can extract from the defendant in
pretrial negotiations. This may be sub-optimal in the sense that a
judge who is fully informed about the selection bias would choose
a less strict standard.

The main contribution of this paper is to show that if law-
suits do not settle because the litigants have different informa-
tion about the outcome at trial, then the selection bias in opera-
tion may be qualitatively very different from the selection bias
observed in the optimism model of litigation. I develop a model in
which the plaintiff (herein, the “victim”) has private information
about damages and the defendant (herein, the “injurer”) has
private information about the likelihood of liability. I show that
in this setting, selection bias results in a distribution of litigated
cases having a lower likelihood of success but higher awards
conditional on success relative to the underlying distribution of
disputes. I explore the empirical implications of the model and
briefly discuss the effects that increased judicial uncertainty on
settlement has on the two different models.
I. SETTLEMENT AND LITIGATION WHEN BOTH SIDES HAVE THE SAME BELIEFS

Most civil litigation is a negative-sum game. The outcome is a transfer, perhaps equal to zero, from the defendant to the plaintiff. This outcome appears to be zero-sum, but since litigation involves significant costs in legal fees, expert fees, and time, it becomes more efficient to settle than to litigate. However, although a large fraction of disputes settle without litigation, litigation does happen. There are numerous possible explanations for why inefficient litigation may occur despite the cost savings from settlement. Most can be classified as either differences of opinion between litigants or differences of information between litigants.¹⁰

I begin with a simple numerical example. A tort victim claims damages of $100,000. Both parties agree that damages are indeed $100,000 if the injurer is held liable. Each side would incur $10,000 in costs to litigate the claim. Assume further that each side believes that the probability that the victim will prevail in litigation is 0.8.¹¹ Thus, the expected recovery net of costs to the victim is $70,000 [i.e. (0.8*100,000) - 10,000] and the expected payment by the injurer is $90,000 [i.e. (0.8*100,000) + 10,000]. The defendant is willing to settle for anything less than $90,000 and the plaintiff is willing to settle for anything greater than $70,000. In the terminology of bargaining theory, there is a $20,000 agreement zone, from $70,000 to $90,000.

Will the parties reach agreement or litigate? One cannot say with certainty, but it seems likely that they will avoid litigation. The defendant may adopt a variety of bargaining postures to induce the plaintiff to accept an offer close to $70,000, while the plaintiff may do likewise to induce the defendant to agree to settlement near $90,000. Nonetheless, since each party is not fully informed about what the other is willing to accept, posturing probably has limited value and they are likely to reach agreement.¹²

¹⁰ There are some explanations that do not fit easily into either category. Lawyers, for example, may have an incentive to advise clients to reject settlement offers or make low settlement offers if the lawyer can expect to earn more by litigating.

¹¹ We further assume that each side knows that the other has the same beliefs about the outcome of litigation.

¹² A large class of models look at the outcome of complete information bargaining while assuming an explicit sequence of allowable offers and counteroffers. In general, agreement is reached with little or no inefficiency. See, for example, Ariel Rubinstein, Perfect Equilibrium in a Bargaining Model, 50 Econometrica 97 (1982).
The two basic models of litigation and settlement assume that each party is completely informed about its rival’s willingness to settle. The failure to reach agreement arises because the parties have different beliefs about the outcome of litigation.

Before comparing the implications of the optimism and information models for the selection of litigated suits, it is worth mentioning a third reason why a lawsuit may not settle. In some situations litigation may not be a negative-sum game. If the plaintiff places great value on a judicial finding against the defendant or if the defendant has a reputation to maintain that requires that it not admit any wrongdoing, settlement may be inefficient despite the legal costs associated with litigation. This may be most important in criminal settings where the defendant may place a very high value on avoiding any time in jail. Repeat players such as insurance companies may wish to develop reputations for litigating certain types of cases in order to increase their bargaining power in future cases, or to deter frivolous suits. A significant fraction of the cases that are litigated may be of this type. For the purposes of this paper, I will ignore these effects and assume that we are in civil litigation settings where both parties care only about the monetary aspects of the trial. In addition, I assume the parties are risk-neutral.¹³

II. THE OPTIMISM MODEL

In the optimism model of pre-trial settlement, parties settle disputes unless each side is sufficiently optimistic about its prospects in litigation that the difference in expected outcomes exceeds the total costs of litigation. Gould,¹⁴ Landes,¹⁵ and Posner¹⁶ developed the optimism model of settlement and litigation in the early 1970s and it remains the basic model used in most of the law and economics literature. In this model, each party has a private belief of what it expects to get in litigation. Recall our example from the preceding section where both sides agree that damages are $100,000 and each side has litigation costs of $10,000. However, now assume that the victim expects to

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¹³ Risk aversion would complicate the models and increase the likelihood of settlement, but would not affect the qualitative nature of the results.


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win with probability 0.9 and the injurer expects the victim to prevail with probability 0.5. In this case the victim will settle for no less than $80,000\textsuperscript{17} and the injurer will offer no more than $60,000.\textsuperscript{18} There is no longer any scope for agreement. Litigation will result since the maximum that the injurer is willing to offer is less than the minimum the victim is willing to accept.

More generally, parties litigate rather than settle in the optimism model when they are sufficiently optimistic about the outcome of litigation. They will not settle if the difference between the net amount the victim expects to receive and the total amount the injurer expects to pay is greater than the total costs of litigation.\textsuperscript{19} That, in essence, is the basic optimism model of settlement and litigation.

The central assumption of this model is that the process of pretrial bargaining does not affect the beliefs of the parties about the outcome of litigation. In the example above, the victim expects to receive $90,000 in litigation and the injurer expects to pay $50,000. If the injurer offers only $50,000 to settle the case, the victim might reasonably think that the injurer knows something about the outcome of litigation that the victim does not. The victim may then lower her belief about the expected outcome on the basis of the injurer's low offer. This updating of expectations is ruled out in the optimism model. Not only is a party unable to affect its rival's beliefs through the offers it makes in pretrial bargaining, but a party cannot directly reveal information that will influence its rival's opinion about the outcome of litigation.\textsuperscript{20} It is because of this inability to affect anyone else's belief that the model is called a difference in opinion model, as opposed to a difference in information model.

This model of differences in opinion rests on fairly weak theoretical foundations. It is indeed possible that individuals' opinions may differ. However, we usually attribute the underly-

\textsuperscript{17} The victim expects to receive \((0.9\times100,000)\) less $10,000 in costs, which equals $80,000.

\textsuperscript{18} The injurer expects to pay \((0.5\times100,000)\) plus $10,000 in costs, which equals $60,000.

\textsuperscript{19} If each was more pessimistic than its counterpart, the agreement zone would be even larger than if they had the same opinion about the outcome of litigation.

\textsuperscript{20} It may be possible to reveal some of this type of information. The model merely requires that there be significant residual differences in opinion that cannot be eliminated through disclosure. It may help to imagine that the model starts after all the possible disclosure has occurred. For a discussion of the revelation of verifiable information, see Douglas Baird, Robert Gertner, and Randal Picker, *Game Theory and the Law* ch 3 (forthcoming, Harvard, 1994).
ing cause of these differences to differences of information that others find unconvincing or incomprehensible. Broad experiences shape the way that a person sees the world, yet it may be very difficult to convey these experiences in a manner that convinces others to view the world in a similar fashion. Differences of opinion thus survive.

However, the optimism model is even stricter than this discussion might indicate. The model requires that knowledge of one's rival's opinion has no effect on one's own opinion. This is a very strong condition. It may be difficult for someone who has a unique belief to convey the underlying basis of that belief. We may want to attribute that belief to a mere difference of opinion. However, if it is possible for one's rival to convey that his opinion is honestly held, it may shift one's own beliefs somewhat. The optimism model does not allow even this.

To make this concept concrete, assume that the parties agree on the facts, but differ about whether a jury will award punitive damages. The victim believes that there is a 50% chance of punitive damages being awarded while the injurer believes there is only a 25% chance. These different beliefs may derive from the background experiences of each party's lawyer, as well as the lawyers' unique analyses of the law, beliefs about how juries decide punitive damage awards, and other, perhaps even more amorphous, knowledge. These models assume that even if the victim convinces the injurer that she honestly believes there is a 50% chance of punitive damages, the injurer will not increase his belief from 25% one iota.  

The alternative model that I analyze in section 5 explicitly models the differences in belief as based on differences in information. Learning another party's belief, therefore, reveals valuable information and encourages one to update outmoded beliefs. This somewhat subtle difference can create dramatic differences in the process of negotiation and settlement. I will also show that it creates large differences in the characteristics of suits that are litigated.

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21 Consider the following analogous game. You and a friend observe a jar filled with pennies. You are each asked to write down an estimate of the number of pennies in the jar. You each then get to see the other's prediction and to revise your initial guess. Changing your prediction indicates that there is a difference in information and the strategic bargaining issues discussed in the asymmetric information model become important.
III. SELECTION BIAS IN THE OPTIMISM MODEL

In the optimism model, cases are litigated if the difference between the victim's and the injurer's beliefs about the expected outcome exceeds total litigation costs; otherwise, the case settles. The question of selection then boils down to, "how do cases where the victim is sufficiently optimistic relative to the injurer differ from randomly selected disputes?" The divergent implications of different models in the literature derive from the way different forces lead to a different answer to this basic question.

The Priest and Klein model posits that there is generally agreement about damages and the differences in opinion are exclusively about the probability of liability. The stakes in the case are symmetric so the model also assumes away any reputation effects or other reasons why the parties may have differential stakes in the outcome. In addition, each party has information about the facts of the case. The information is modeled as a signal that is equal to the underlying facts plus an error term, where the error term for each party is independently distributed. Finally, Priest and Klein assume that this error term has a bell-shaped distribution.

These assumptions lead to the implication that cases where the probability of liability is close to 50% are more likely to be litigated than cases where the probability of a particular side prevailing is high. Assume that the true facts are far away from the standard, so that the injurer is very likely to be found liable. Given the assumption of the bell-shaped distribution of the error term, it is very unlikely that the difference in the beliefs about the success of litigation will be large. However, if the true facts are near the standard, it is much more likely that the parties' beliefs about the outcome will be large.

It is far from intuitively obvious that the Priest-Klein assumption about error terms is correct. Take the example where damages are $100,000 and each side's litigation costs are $10,000. In this situation, there will be litigation if the victim's belief of the probability of a finding of liability exceeds the

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22 Priest and Klein, The Selection of Disputes for Litigation at 9 (cited in note 2).
23 Priest and Klein refer to the beliefs about the expected outcomes as being based on information. Id. But given the lack of updating in negotiations, it is more accurate to describe the differences in beliefs as being based on opinion, not information, in the terminology I adopt.
injurer's by more than 20%. Priest and Klein assume that it is more likely that the beliefs will differ by at least this much for cases where the true probability of a finding of liability is close to 50%. But why should we think that it is more likely that two parties will have sufficiently different beliefs when the case is close? Assume that each side forms an opinion about the probability that the victim will prevail, and that the opinion is unbiased, so that it is centered around the true probability. Furthermore, assume that the error in each party's opinion has a bell shape. Under these assumptions, there is no selection effect like the one in the Priest and Klein model. Ignoring problems associated with the requirement that probabilities be positive and less than one, it may be just as likely that the difference in beliefs will exceed 20% if the probability of success in litigation is far away from 50%. The Priest and Klein result depends on bell-shaped error terms around the true fact pattern rather than around the probability of prevailing. I see no clear reason to prefer one assumption to the other.

Much of the subsequent theoretical literature on the selection effect has focused on the necessary conditions for the 50% rule. Priest and Klein are fully aware and explicit that the 50% result depends on very strong assumptions that they do not claim generally hold. For example, in addition to clarifying the strong assumptions on the error terms necessary to generate the 50% result, Wittman studies the selection bias implications of the decision of whether to file (or not drop) a lawsuit. He shows that if changes in legal standards affect the incentives to bring (or not drop) a lawsuit in the first place, the 50% result can be weakened.

IV. SELECTION BIAS WITH DIFFERENCES OF OPINION AND STRATEGIC BARGAINING

The optimism model can be modified to allow for strategic bargaining. In this version of the model, differences in beliefs are still based on differences in opinion, so bargaining does not cause either party to update beliefs about the outcome of litigation.

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26 See, in particular, George Priest's reply to Donald Wittman, George L. Priest, Reexamining the Selection Hypothesis: Learning from Wittman's Mistakes, 14 J Legal Stud 215 (1985).
However, by allowing strategic bargaining, it no longer immediately follows that if the victim's expected gains are less than the injurer's expected losses there will always be settlement.

Several scholars have analyzed the bargaining process without explicitly considering the information revelation aspects of bargaining. Mnookin and Kornhauser's classic paper describes how, in the case of divorce, a simple application of the optimism model may not be able to explain the pattern of settlement and litigation.\(^{27}\) They point out that different valuation of monetary and non-monetary outcomes such as child custody make settlement more difficult, and that differences in risk aversion, personal feelings, and strategic behavior may play a role.\(^{28}\) Although these issues are important in many settings, I will continue to focus on settings where the parties care only about monetary outcomes. I will discuss risk aversion below.

Cooter, Marks, and Mnookin explore the strategic behavior issues in detail in a subsequent paper.\(^{29}\) They attempt to distinguish between models based on optimism and models based on strategic behavior. This dichotomy seems flawed to me. I will argue that the more appropriate distinction is between differences of opinion and differences in information. Consider an environment where there are differences in both opinion and strategic bargaining, so that the injurer may offer the victim less than his total expected costs at trial and the victim may demand more than his net expected recovery. There are two possible scenarios. First, each party could know the other's opinion. In this situation, posturing in bargaining has limited value and the case is analogous to the complete information scenario discussed in Section 2 above. The other possibility is that the opinions are private information. In this case, strategic bargaining may play a role as the parties pretend that their beliefs are stronger than they actually are.

These effects are undoubtedly important, but it is unclear how they lead to fundamental differences in selection bias from the pure optimism model beyond adding noise into the process. There may be some situations where the agreement range is positive but strategic posturing prevents the parties from set-

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\(^{28}\) Id at 966-72. This point is closely related to my discussion of the difficulties associated with payoffs that depend on more than monetary outcomes, text at note 10.

toning. Basically, however, we expect settlements to grow more likely as the agreement range increases.

Consider the following example. Each party has an opinion of the outcome of litigation and beliefs about its rival’s opinion. Suppose that each party believes that the expected outcome of litigation is between $50,000 and $100,000. Assume further that each value between $50,000 and $100,000 is deemed equally likely, so that each side’s opinion is uniformly distributed between $50,000 and $100,000. Denote the injurer’s opinion of the expected award as $X_i$ and the victim’s opinion as $X_v$. Again we assume that each side must bear litigation costs of $10,000. Measuring everything in thousands of dollars, in the pure difference of opinion model the parties will litigate if $X_v > X_i + 20$.

Now consider a very simple model that allows for strategic bargaining. Assume that the victim gets to make a take-it-or-leave-it offer to the injurer. If the injurer rejects the offer, he cannot make a counteroffer. The parties proceed immediately to litigation. Although this is a very stylized and unrealistic model of bargaining, I argue below that it captures the basic effects of strategic bargaining in this setting.

Call the victim’s demand in pretrial bargaining $D$. The injurer will accept the offer if the settlement payment, $D$, is less than the expected costs of litigation, $X_i + 10$. The probability that $D < X_i + 10$ is simply $(110 - D)/50$. The probability that the offer will be rejected is $(D - 60)/50$. The expected return to the victim who has opinion $X_v$ from making an offer of $D$ is the probability it will be accepted $[(110 - D)/50]$ multiplied by the offer ($D$) plus the probability the offer will be rejected $[(D - 60)/50]$ multiplied by the expected outcome of litigation less litigation costs ($X_v - 10$), giving an expected return of $[(110 - D)D + (D - 60)(X_v - 10)]/50$. The optimal choice of $D$ can be found by solving for the value of $D$ which makes the derivative of this expression with respect to $D$ equal to zero. Differentiating with respect to $D$ gives $(110 - 2D + X_v - 10)$, so the optimal choice of $D$, which we denote $D^*$, is given by $D^* = (100 + X_v)/2$. The suit will be settled if $X_i + 10 \geq D^*$ or if

$$X_i + 10 > (100 + X_v)/2,$$

which can be rewritten

$$X_i > (80 + X_v)/2.$$

The parties will litigate if

$$X_v > 2X_i - 80.$$

Although this condition differs from the one for the pure optimism model ($X_v > X_i + 20$), they are qualitatively similar. The
parties litigate more often when they are optimistic about the outcome of litigation.

This result does not depend on the nature of the bargaining game. The more optimistic the victim is, the larger the amount she will demand to settle and the more likely it is that she will reject a given offer from the injurer. The more optimistic the injurer is, the smaller the amount he will offer the victim and the more likely it is that he will reject a given demand by the victim. All of these forces lead to less settlement among more optimistic parties.

V. ASYMMETRIC INFORMATION MODEL OF LITIGATION AND PRETRIAL BARGAINING

I will now develop a simple model of pretrial bargaining based on different beliefs of the parties about the outcome of litigation, where the differences are based on differences in information rather than on differences in opinion. That there are differences in information implies that parties will draw inferences about rivals’ information that cause them to update their beliefs about the outcome of litigation. This is consistent with much of the casual evidence about how pretrial negotiation works. The victim may avoid making an early reasonable demand for fear that the injurer will infer that if the victim is willing to make such an offer, the victim’s case must not be very strong. This may cause the injurer to reject the offer. I wish to explore the implications for selection bias of this type of strategic bargaining.

An important element of my analysis is specifying the exact form of information differences between parties. It seems likely that a victim may be better informed than the injurer about the actual damages she incurred, while the injurer may be better informed than the victim about the care he took or other information that will affect the likelihood of liability. Therefore, I will assume that the victim has private information about damages and the injurer has private information about liability. This as-

assumption about the form of information asymmetry is crucial for determining the effects of pretrial bargaining on the selection of suits that are litigated.

In order to keep the analysis simple, I will assume that damages are either high or low, where high damages are $200,000 and low damages are $100,000. I will also assume that the probability of liability is either high or low, where high probability of liability is 0.75 and low probability of liability is 0.25. The victim knows whether damages are high or low while the injurer thinks either is equally likely. Similarly, the injurer knows whether the likelihood of liability is high or low while the victim thinks either is equally likely. I continue to assume that each side must bear litigation costs of $10,000 if they fail to reach an agreement.

I further assume that the private information is nonverifiable, which means that there is no credible way for either party to communicate its private information directly. The victim cannot just say, "damages are $200,000," and expect the injurer to believe her. In addition, I assume that there is no way for the victim to produce documents or other evidence that can convince the injurer of damages. I also assume the analogous restrictions for the injurer's ability to reveal his information to the victim. This assumption is standard in the literature, although its application to litigation bargaining is somewhat suspect.3

The problem with this assumption is that if the information can affect the outcome of a trial, there must be some way to introduce it as evidence. It should thus also be possible to reveal the information to a rival prior to litigation. However, the sanctions associated with perjury may make it possible to reveal information at trial that cannot be credibly revealed prior to trial. Alternatively, parties may wish to avoid revealing the information directly because discovering it early can give rivals a strategic advantage.32

Again, in order to keep the analysis simple, I assume a very simple bargaining game. The victim makes a take-it-or-leave-it demand of the injurer. If the injurer rejects the offer, litigation results. I argue below that the implications for selection bias will be robust enough to survive more complex and realistic assumptions about the way in which bargaining proceeds.

31 See Baird, Gertner, and Picker, Game Theory and the Law at 99-122 (cited in note 20), for a discussion of bargaining where information is verifiable.

32 See id at 106-22 for further discussion of why verifiable information may not be revealed.
Solving this game for the optimal demand by the victim is considerably more complicated than in the previous model where there was no private information. Now the injurer may infer something about the victim's private information on damages from the victim's demand. For example, if the victim demands only a little bit of money to settle, the injurer might infer that damages are lower than he initially thought and that he will prevail in litigation. The injurer might therefore reject the low offer. Similarly, if the demand by the victim is high, the injurer might infer high damages and try to avoid costly litigation. But if the victim knows what the injurer will infer from the demand, the low-damage victim will also demand a great deal of money. Making inferences consistent with optimal actions makes this scenario even more complicated. We require that the inferences that the injurer makes are correct and that the victim makes the optimal demand given the inferences that will be made, both when damages are high and when damages are low.33

There are two possibilities: either both types of victims are expected to make the same offer or they are expected to make different offers. The former is called a pooling equilibrium and the latter is called a separating equilibrium. First, we will see if there can be a pooling equilibrium. Again there are two possibilities: either the demand is sufficiently low that both types of injurers will accept, or the offer is such that only the high probability of liability injurer will accept. Since the high probability of liability injurer expects to do worse in litigation than a low probability of liability injurer, the high-probability injurer is willing to pay more to settle the dispute. If only one type of injurer accepts, it probably will be the high-probability injurer.

If both types of injurers accept the offer, it must be the case that the low-probability injurer will accept. Since we are checking for a pooling equilibrium, we assume that after the offer is made the injurer still believes that both low-damage and high-damage victims are equally likely. The expected cost, again with all numbers in thousands of dollars, if the low-probability injurer rejects and litigates is the probability of liability equal to 0.25 multiplied by expected damages of 150, which is 37.5 plus the litigation cost.

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33 This is a description of some of the conditions for a perfect Bayesian equilibrium. More precisely, a perfect Bayesian equilibrium is a strategy and beliefs for each player at each point in the game. Each player's actions must be optimal at all points in the game, given its beliefs and the strategies of the other player. Furthermore, the beliefs must be updated according to the equilibrium strategies and Bayes' rule. For a more formal discussion see Robert Gibbons, Game Theory for Applied Economists 143 (Princeton, 1992).
costs of 10 for a total of 47.5. Therefore, for this to be an equilibrium, the demand must be less than or equal to 47.5.

We now check to see if both types of victims are willing to make a demand of 47.5. Since the high-damage victim does better in litigation than the low-damage victim, it follows that if the high-damage victim is willing to settle for 47.5, so is the low-damage victim. The return to the high-damage victim in litigation is 0.5(200) - 10 = 90. Since this is greater than 47.5, we cannot have a pooling equilibrium where both types of injurers accept the same offer.

We now check for a pooling equilibrium which attracts only the high-probability injurer. He will accept if the demand is less than or equal to 0.75(150) + 10 = 122.5. We need to determine whether the high-damage victim is willing to settle for 122.5 from the high-probability injurer. If she litigates, she will receive 0.75(200) - 10 = 140, which is greater than 122.5, so there can be no pooling offer which just the high-probability injurer accepts.

We now look for a separating equilibrium where the high-damage and low-damage victims make different demands. In any such equilibrium, the injurer can infer damages by the victim's demand because he expects a different offer from each type of victim. A high-probability injurer is willing to accept any demand less than or equal to .75(100) + 10 = 85 from a low-damage victim and any demand less than or equal to .75(200) + 10 = 160 from a high-damage victim. A low-probability injurer is willing to accept any demand less than or equal to .25(100) + 10 = 35 from a low-damage victim and any demand less than or equal to .25(200) + 10 = 60 from a high-damage victim.

If a low-damage victim is known by the injurer to have low damages, she will wish to make a demand of 85, which only the high-probability injurer will accept. The victim's expected return from a demand of 85 is 0.5(85) + 0.5[0.25(100) - 10] = 50 which is greater than the 35 she gets if she makes an offer which both types of injurer will accept. The equilibrium in this example is for the low-damage victim to demand 85 and the high-damage victim to make no demand, or make a demand so high neither type of injurer will accept. There can be no separating equilibrium where the high-damage victim makes an offer which is accepted because the low-damage victim would want to mimic that high offer and "pretend" to have high damages.

Consider what this model has shown. Settlement occurs only when the victim has low damages and the injurer has a high probability of being found liable. Litigated cases differ from the
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underlying distribution of disputes in that they are less likely to be successful than a randomly chosen dispute and damages are likely to be higher than in a randomly chosen dispute. In the example, the average damages over all disputes is 150 while the average damages in litigated case is 167.\(^{34}\) The average probability of liability over all disputes is 0.50 while the average probability of liability in litigated cases is 0.42.\(^{35}\)

This is the model's important insight. In an environment where a victim has private information about damages and an injurer has private information about the likelihood of liability, low-damage victims and high probability of liability injurers are more likely to settle. Although this result was derived in a very special example, it is robust enough to withstand more complicated specifications of the bargaining game and more complicated distribution assumptions. In any private information bargaining model, parties with more favorable information about what will happen if they do not settle, are less likely to settle.\(^{36}\) In the model, high damages are favorable information for the victim, so they are less likely to settle. Low-probability of liability is favorable information for the injurer, making them less likely to settle. This is really all one needs to generate the selection effects that the model describes.

The main difference between my model and the one in the recent, independent paper by Hylton is the information structure.\(^{37}\) He assumes that one side has superior information about liability, so his model is of one-sided asymmetric information with common knowledge of the level of damages. In much the same spirit as my argument, he shows that litigation will be biased toward the innocent privately-informed defendant.\(^{38}\)

VI. EMPIRICAL IMPLICATIONS

This description of selection effects provides a sharp contrast to the 50% result of Priest and Klein. However, one needs to be careful in predicting its empirical implications. One may be

\(^{34}\) If we assume that two-thirds of litigated cases are high-damage victims and one-third are low-damage victims, the expected damages are \(2/3(200) + 1/3(100) = 167\).

\(^{35}\) If we assume that two-thirds of litigated cases are low probability of liability, the expected probability of liability of litigated cases is \(2/3(0.25) + 1/3(0.75) = 0.42\).

\(^{36}\) This idea is very intuitive and applies in other bargaining settings as well. For example, a firm with a large inventory (a form of private information) is more likely to reject a union’s offer and trigger a strike than a firm with a low inventory.


\(^{38}\) Id at 199.
tempted to say that classes of disputes fitting my informational assumptions should see a lower probability of success and higher awards conditional on success, relative to other classes of disputes. But this does not follow because, in contrast to the 50% result, my results are relative to the underlying distribution of disputes. Assume that there are two classes of disputes, A and B. The average Class A suit has an 80% chance of being successful while the average Class B suit only has a 20% chance of being successful. Furthermore, assume that the information structure in Class A disputes conforms to my model while there is no private information in Class B disputes. My model implies that the success rate in litigated Class A suits will be less than 80%. It does not imply that the success rate in litigated Class A suits will be less than the success rate in litigated Class B suits. This makes the model difficult to test without information about the underlying merits of disputes in the class.

The one assumption to which the result is sensitive is the form of private information. In many settings the assumption that the plaintiff has better information about damages and the defendant has better information about liability may be entirely inappropriate. The selection bias may be quite different in such a setting. Although this may limit the scope of my model, it also provides an opportunity for testing it. To the extent that one can make convincing a priori assumptions about how information asymmetries vary across different disputes or types of disputes, one may be able to generate testable predictions about settlement and litigation.

VII. UNCERTAINTY AND SETTLEMENT

In the preceding sections I have highlighted the different implications of the asymmetric information model and the optimism models for selection bias in litigation. In this section, I will briefly explore the different implications of the models for another important issue in pre-trial settlement: the role of uncertainty. Many have argued that the likelihood of settlement decreases as the amount of uncertainty about the litigation increases.\(^3\) There are numerous implications that one can draw from this assertion. Since difficult cases are litigated, litigation costs are an overestimate for average cases. The common law may evolve more quick-

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\(^3\) See, for example, Priest, 3 J L Econ & Organization 193, 207 (cited in note 3).
ly if the process of pre-trial settlement leaves the courts with mainly the difficult and therefore precedent-setting cases to decide. The preceding sections give us a useful framework for thinking about whether or not more uncertain cases are indeed more likely to be litigated.

There are a number of different ways to think of increases in uncertainty in litigation. One interpretation is that nothing changes other than the addition of noise to the process of making legal decisions. This should increase settlement if parties are risk averse. Although the models discussed in this paper do not include risk aversion, it is straightforward to add risk aversion without changing the qualitative results. Since trials are risky, litigants can benefit from avoiding a trial, preferring to settle for the expected judgment even if litigation is costless. Holding all else constant, additional uncertainty makes litigation more unattractive and increases the likelihood of settlement.

Thus, if increased uncertainty leads to more litigation it must be that everything else is not constant. In the optimism model, increased uncertainty can increase litigation if it increases differences of opinion about trial outcomes. Consider this effect in the Priest-Klein setting where there is a known standard and each party has a signal about where the facts lie relative to the standard. If increased uncertainty adds noise to the signal, it follows immediately that litigation will increase. However, people tend to discuss increased judicial uncertainty in terms of adding noise to the standard, rather than in terms of adding noise to the independent signal parties get about how the facts relate to the standard. There is no reason to think increases in judicial uncertainty should increase the noise in a signal about the fact pattern.

In the Priest and Klein model, making the standard uncertain while keeping the error term of the signal constant has little or no effect on settlement rates. It is not clear how added uncertainty about a judicial standard would increase differences in opinion about the outcome of litigation. Perhaps this could occur if litigants generate different opinions about a court’s standard. This additional noise will lead to optimism about the standard in addition to optimism about the facts of the underlying dispute. Either type of optimism could lead to failed pretrial negotiations.

Now briefly consider increased uncertainty in the asymmetric information model. It seems very unlikely that the parties will obtain private information that improves one side’s predictions of the effect of the increased uncertainty. Instead, adding noise to
the process is likely to mitigate the effects of private information. Suppose, for example, that with some probability the judge just flips a coin to decide the case. This means the private information will only be valuable when the judge does not flip a coin. This reduces the effects of the private information and may increase the likelihood of settlement.

This section is designed simply to suggest that the relation between judicial uncertainty and settlement is far from obvious on a theoretical level. It certainly does not follow immediately from either the optimism model or the asymmetric information model that increases in uncertainty lead to increases in litigation.

Perhaps a different explanation lies in the different incentives of lawyers and their clients to litigate. When there is a great deal of uncertainty it may be easier for lawyers who wish to litigate to do so, even if it is against their clients' interests. Clients will be less able to monitor whether their lawyers are making correct decisions if there is a great deal of uncertainty.

CONCLUSION

In this paper I contrast the different implications of models of litigation and pretrial bargaining for selection bias. I demonstrate that there are significant differences between models based on differences in opinion, such as the optimism model, and models based on differences in information. If plaintiffs have better information about damages and defendants have better information about liability, litigated cases will be less likely to succeed, but will have higher damages conditional on liability than the average case in the population. In contrast, the optimism model has no such implication. By characterizing the form of private information across different types of disputes, the two models could be tested to determine their relative predictive values.