GOVERNANCE AND THE EFFICIENCY
OF ECONOMIC SYSTEMS
GESY

Discussion Paper No. 346

Jackpot Justice: The Value of Inefficient Litigation

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November 2010

Financial support from the Deutsche Forschungsgemeinschaft through SFB/TR 15 is gratefully acknowledged.

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Jackpot Justice: The Value of Inefficient Litigation *

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Abstract

Litigation seems to be a Pareto-inefficient outcome of pretrial bargaining; however, this paper shows that litigation can be the outcome of rational behavior by a litigant and her attorney. If the attorney has more information than his client concerning the characteristics of the lawsuit, the client can use litigation as a way of extracting information. I show that, counterintuitively, litigation will occur only when the plaintiff is pessimistic about her prospects at trial. Even if the plaintiff could obtain a higher payoff from bargaining than from litigation-without-bargaining, bargaining may not occur in equilibrium. The plaintiff is more likely to sue if she is more pessimistic about winning damage in court and if litigation is more risky. Litigation is less likely to occur if the plaintiff receives third party financing for litigation. *Journal of Economic Literature* Classification Numbers: C78, D74, D86, K41.

Keywords: settlement-litigation decision, costs of bargaining, non-bargaining, delegation of dispute resolution, risks of litigation, plaintiff-characteristic dependence, low plaintiff win rates.

*An early version of this paper has been awarded a Young Economist Award (2008) from the European Economic Association. I wish to thank the Netherlands Organisation for Scientific Research for financial support (No. 400-03-296). Part of the research was done while the author was visiting the Department of Economics, University College London. I thank Timothy Swanson for providing data and patient and clear explanation of these data. I am grateful to Jesse Fried, Evgenia Motchenkova, Jens Prüfer and Suzanne Scotchmer for their perceptive and constructive comments. In conducting this research project, I benefited from the knowledge acquired from Jan Boone's lecture on incentives and mechanism design. I also benefited from conversations and suggestions about this research from Philippe Jehiel, Pierre Larouche and Neil Rickman. Special thanks go to Jan Boone, Eric van Damme and Timothy Swanson for their patient supervision on this project. Any mistakes are my own.

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Jackpot Justice: The Value of Inefficient Litigation

1. Introduction

Litigations are wars without bloodshed, yet more expensive and all-consuming than warfares with. The total annual cost of tort litigation across the U.S. in 2006 comes to some \$ 865.37 billion[1] (6.5% of U.S. GDP), which is more than the Pentagon budget, plus Iraq and Afghan conflicts combined; however, less than 15 percent of that amount goes to compensate injured people (See McQuillan *et al.* (2007)). In 2003, the U.K. had a 0.7% ratio of tort cost to GDP,[2] the same size as its costs of war in Iraq and Afghanistan (approx. £ 8 billion). Statistics estimate that tort cases in the U.K. take, on average, five years to resolve and legal expenses exceed the damage paid (see NAO (2001), Swanson (1998)). One might expect knowledge of the expensiveness of litigation to provide incentives for litigants to engage frequently in negotiation as to avoid these expenses, and that only strong cases are pushed towards trial, causing plaintiff win rates (the frequency that the court rule in favor of the plaintiff) at trial to be large. However, empirical evidence[3] shows that bargaining between the litigants occurs only on an infrequent basis – the average personal injury case in the United Kingdom receives fewer than two offers in its 5-year lifetime; while the average trial success rate of the plaintiff rests around 43%. Further inspection of disaggregated data shows that settlement-litigation distributions and trial win rates depend crucially on plaintiff characteristics such as the type of accident and the way litigation is financed. Particularly, the plaintiffs are less likely to go to trial if their trial outcomes are more predictable and if they receive financial support for litigations; the plaintiffs are more likely to win at trial if they face less uncertainty about trial outcomes and if they receive financial support. The theory presented in this chapter is an attempt to rigorously explain these empirically significant observations of [1] partial bargaining[4], [2] low plaintiff trial success rate and [3] party-dependent settlement-litigation behavior.

The chapter deals with the issue of litigation versus settlement by taking as its starting point the asymmetric information between litigants and their attorneys. It examines the plaintiff and her attorney as an uniformed principal and an informed agent who are bargaining with another principal – the tortfeasor's insurer. For simplicity, I assume (as do Bebchuk (1984), Schweizer (1989), Watts (1994) and Watanabe (2007)) that the interests of the insurer and his attorney are perfectly aligned. So I can represent the insurer and his attorney as a single player called the "defendant". Given asymmetric information on various aspects of pretrial bargaining, litigation can be explained as an instrument a plaintiff uses to extract information. Both the litigant and the attorney can be viewed as lacking information about the case's prospects at trial. This chapter examines the case where the attorney has better information. This is a reasonable assumption because attorneys, via repeated

[1] These costs include, among others, administrative costs (\$ 59 billion), claimant's attorney costs (\$ 53 billion), first-party defense costs (\$ 39 billion), deadweight costs (\$ 36 billion), and dynamic costs (\$ 537.37 billion). The dynamic costs include costs of accidental deaths (\$ 7.51 billion), health care expenditures (\$ 124 billion), reduced access to health care (\$ 38.78 billion), and lost sales of new products from less innovation (\$ 367.08 billion). See McQuillan *et al.* (2007).

[2] This ratio was 0.6% in Denmark, 0.7% in France, 0.8% in Japan, 1.0% in Belgium and in Spain, 1.1% in Germany, and 1.7% in Italy. See Tillinghast (2006).

[3] Two sets of data are included in the discussion of this section: Swanson's Taxed Cases Study (TCS) [see Swanson (1988) and Swanson and Mason (1998)] and the Oxford Study by Harris *et al.* (1987).

[4] This term was first used by Swanson and Mason (1998). The term refers to the fact that the probability that the plaintiff bargains with the defendant is neither zero nor one.

and frequent litigation, acquire experience and knowledge about the statutes, precedents, and rules of procedure and evidence which are rarely possessed by occasional plaintiffs. A key matter for us in considering the issue is the role played by information of claim strength (i.e., defendant's liability for damages) in determining patterns of settlement and litigation.

The approach taken in this chapter to litigants' settlement-versus-litigation decision under asymmetric information is based on the work of Myerson (1979). It involves the design of a contract offer by a plaintiff that recognizes that her attorney may have an incentive to misinform her about the perspective of the case in order to delay settlement and increase billable hours while working less. An incentive-compatible contract in which a plaintiff will commit to resort to costly litigation when her case is reported to be weak can, however, be shown to be at least as good as any contract in which the plaintiff will settle all her dispute out of court. That is, since the plaintiff does not know the genuine strength of her case, the plaintiff must set the attorney's reward as a function of some report on the case prospects from the attorney, and the incentive contract must satisfy the constraint that the attorney should have an incentive to report truthfully the information desired by the client. Because of this constraint, the settlement-versus-litigation decision can be optimal only in a constrained sense,[5] and expensive litigation results from the information asymmetry.

The major results in this chapter can be summarized as:

(a) A plaintiff will not pursue litigation when she learns from her attorney that her case is strong and that she is likely to prevail at trial. Bargaining may not occur, even if the plaintiff could obtain a higher payoff from bargaining than from going to trial without bargaining. The intuition is easily conveyed: The attorney's productivity in settlement negotiation increases with the case strength. The plaintiff, therefore, wants to encourage the attorney to admit that the case is strong, whenever it is true, so that the attorney will bargain hard with the defendant to obtain a high damage award in settlement. However, to prevent the attorney from misrepresenting the strength of the case when the case is strong, the plaintiff must somehow 'punish' the attorney for reporting that the case is weak. Such punishment takes the form of pushing cases towards trial without negotiation (hence no payment to the attorney).

(b) The pattern of the plaintiff's settlement-litigation decision depends on the probability distribution of the case strength and therefore on the risks associated with litigation and the plaintiff's ability to monitor the attorney. Litigation occurs more frequently if it is *a priori* less profitable for the plaintiff to pursue. The intuition behind this result is as follows. The plaintiff's prospect at trial increases with the strength of her case. With a stronger case, it is less costly for the attorney to obtain favorable settlement terms from the defendant. Since the plaintiff bears the full costs of pretrial negotiation, out-of-court settlement (resp. litigation) becomes more (resp. less) attractive an option for the plaintiff when negotiation is less costly.

(c) Litigation occurs more frequently if it is *a priori* more risky for the plaintiff to pursue. The intuition behind this result is as follows. When the plaintiff's uncertainty about trial outcome is low, she can better monitor her attorney's performance in settlement bargaining and the principal-agent impediments to settlement is mitigated. Therefore, the plaintiff pursues litiga-

[5]This is a common result in the mechanism design literature.

tion less often when the trial outcomes are more predictable. An implication of this result is that institutional characteristics determining the degree of plaintiff uncertainty about trial outcomes figure large in settlement-litigation strategies.

(d) There is another aspect of the attorney-client relationship regarding the financing of litigation that can affect a plaintiff's incentive regarding settlement: legal aid (for both settlement and litigation) reduces the costs inherent in representative bargaining that impede settlement. Therefore, plaintiffs receiving legal aid go to court less often than those receiving no legal aid.

My model is able to explain key features of the U.K. tort settlement-litigation data – partial bargaining, low plaintiff win rate and heterogeneity between plaintiffs: plaintiffs with less uncertainty about trial outcomes and receiving financial assistance in litigation go to court less often than those with higher uncertain and receiving no financial assistance. The next section provides empirical evidence by using detailed database of 242 cases developed by Swanson(1988) from the U.K. Royal Courts of Justice. The U.K. database contains information on the legal expenses, trial outcomes, and various characteristics of the litigants and their attorneys, allowing direct tests of the model's predictions.

The model is a good representation of many real *civil* dispute situations. The vast majority of tort, prisoner and civil right lawsuits are characterized by the plaintiffs' informational disadvantage *vis-à-vis* the attorneys.[6] This is because attorneys, via repeated and frequent play in the litigation game, accumulate experience and knowledge about the statutes, precedents, and rules of procedure and evidence which are rarely possessed by occasional plaintiffs. Furthermore, In the process of pretrial bargaining, as it relates to the decision to litigate or settle a civil dispute, attorneys exercise predominant control over and take responsibility for the dispute-resolution delegated to them by their clients. Although clients usually participate in the litigation process, attorneys in personal injury cases often enjoy considerable latitude in deciding how to resolve their clients' claims in settlement negotiation. This study therefore provides a theory that explicitly incorporates this empirically significant facet of the dispute resolution process into the game-theoretic analysis of litigation-settlement decision.

The paper is organized as follows. I begin by reviewing the literature and by presenting evidence on the litigation frequency and trial outcomes in UK tort liability litigation in section 2. The evidence suggests a need to expanding existing litigation models to include the delegation of pretrial negotiation. The game theoretic model is constructed in section 3: section 3.1 describes the basic model of pretrial negotiation developed in previous work; the basic ingredients of my model are discussed in section 3.2; the formal solution and properties of the litigant's settlement-litigation decision are developed and illustrated in section 3.3; section 3.4 describes the variations in the plaintiff's settlement-litigation pattern, corresponding to changes in her optimism/pessimism about the trial outcome; section 3.5 discusses the effect of different forms of litigation financing on plaintiff's settlement-litigation decision; section 3.6 presents a result about how bargaining outcome and litigation incidence change with changes in the risks associated with litigation. Section 4 concludes.

[6] Bebchuk (1984), Hylton (1993) and Boon (1995) make similar arguments. Using information on plaintiff and defendant identities in over 65,000 federal civil suits drawn from the Administrative Office of the U.S. Courts data set, Siegelman and Waldfogel (1999) find that plaintiffs in tort, prisoner and civil right cases usually suffer a more serve informational disadvantage than in other types of cases.

2. Motivation

2.1. Theoretical Motivation

Two central puzzles in the U.K. tort litigation data from Swanson's Taxed Cases Study (TCS) are the *high* proportion of cases which require ultimate resolution by a court and the *low* likelihood of trial success of the plaintiffs.[7] These plaintiffs must pay the costs of the entire legal process, usually without getting compensated.[8] Swanson's Taxed Cases Study (TCS)[9] shows that in the tried cases (i.e., cases that went to trial) the plaintiffs incurred on average legal expenses in the neighborhood of £5,300, approximately 68.5% of the damage payments received by the plaintiffs in those cases. However, more than 50% of the plaintiffs received no damage payments after having incurred a substantial amount of legal costs. Similarly in the U.S., plaintiff trial success rate appears to be low. Waldfogel (1995), for instance, empirically documents that the plaintiffs only win approximately 50% of the times at trial by using data from broad variety of cases (including contract, tort, civil right and property disputes).

The decision to litigate or settle a civil dispute, as it relates to the process of pretrial bargaining, has been the subject of extensive investigation in law and economics. Asymmetric information (AI) models, starting with Cooter *et al.* (1982), P'ng (1983), Bebchuk (1984), and advanced by Reinganum and Wilde (1986) and Nalebuff (1987), offer possible explanations of the litigation puzzle. What most of these models have in common is that the game is formulated in extensive form and essentially consists of a sequence of two periods. After the suit has been filed, one litigant, in the first period, making a settlement offer which, in the second period, the other litigant either accepts or rejects. If the last-moving litigant accepts, the case settles out of court at the proposed terms. Otherwise, the case goes to trial. The way these models work is as follows: when one side in a legal dispute has information that the other side does not have, incentives are created for the former to credibly convey information to the latter; delays occur inevitably when the benefits of establishing credibility exceed the costs of waiting; informed parties proceed to trial *only* when they expect to win, causing plaintiff win rates at trial to be high. The central finding of this literature has been that the presence of asymmetric information yields a positive probability of trial.[10]

Central to *all* these models is the informational difference about trial outcomes between the litigants. None of the informational differences, however, has been adequately explained by *any* of these models; that is, it is not yet understood why this system might generate the divergent expectations which must be the source of these differences in perspectives. The incorporation of the attorneys as key participants in the bargaining game provides a crucial link in the analysis of

[7] In the U.S. however, the vast majority of cases that are filed settle out of court and countless others are settled even before a lawsuit is filed. Less than 4 percent of the civil cases that are filed in the U.S. state court proceed to trial. Only 2 percent of the civil cases that are filed in the U.S. federal court proceed to trial. See Ostrom *et al.* (2001) p.29.

[8] In the British legal system the losing litigant of a civil case has to pay the winner's court costs, in addition to her own legal expenses. In the US as well as in many European jurisdictions, each side pays their own legal costs.

[9] In the U.K. the legal expenses are usually allocated to the "losing" party in the dispute. Since the reasonable legal expenses must then be determined, a separate division of the judiciary has evolved to fulfill this function: the Taxing Masters of the High Courts of Justice. In order to make fact-based determinations of claims for expenses, the regulations of the High Court provide that a detailed account of the proceedings must be tendered to the Taxing Master. It was this set of files which were consulted for the construction of the data set in Swanson (1988)'s study. Swanson named these legal cases as "taxed cases".

[10] For an excellent review of this literature, see Waldfogel (1998).

settlement-litigation decision. It explains why a difference in perspective on a lawsuit might exist; and how this difference might plausibly lead to inefficient litigation. To my knowledge, this paper is the first attempt to rigorously analyze the role of the attorneys in causing the informational differences between the litigants that give rise to expensive litigation. Early studies have also investigated the role of lawyers in settlement and litigation. However, in these studies lawyers are not necessarily barriers to settlement; sometimes their participation may facilitate settlement by furnishing information to their clients,[11] or by providing credibility to party communications in pretrial negotiation.[12] In another theory, the lawyer's incentives regarding settlement depend on her fee arrangement with the client; some fee structures are more likely than others to discourage the lawyer from seeking an early settlement.[13]

Furthermore, existing AI theories do not explain the absence of bargaining (i.e., absence of settlement offers in pretrial negotiation) observed in the TCS study,[14] as will be elaborated in the following section.

2.2. Empirical Motivation

The empirical features I focus on are the likelihood that the plaintiff bargains with the defendant, the frequency of litigation and the chance that the plaintiff prevails in court in the event of a trial.[15] Table 1 shows the frequency of bargaining of different types of plaintiffs. In my sample of 242 tort cases from the U.K. Courts of Justice for the year of 1987, the majority of cases are bargained (74%) and settled out of court (66%) for all plaintiff types. However, a significant proportion of claims (26%) are forced to trial without bargaining.

Disaggregate data reveals, however, a more confusing picture that cannot be explained by existing models. Table 1 shows the frequency of bargaining of different types of plaintiffs. The majority of cases are bargained (74%) and settled out of court (66%) for all plaintiff types. The frequency of litigation, however, appears to be highly dependent on the plaintiff's uncertainty about trial outcomes and on the financing of litigation. For players whose disputes are governed by *customary* tort law[16] that is characterized by a relatively high uncertainty of trial outcomes (these are motor accident and medical negligence cases), the frequency is 41%. Union-represented plaintiffs in workplace injury lawsuits, who litigate under *statutory* labor law [17] that is characterized by a relatively low uncertainty of trial outcomes[18], settled all their claims out of court. Furthermore, for those who have inexpensive

[11]See Menkel-Meadow (1984).

[12]See Gilson and Mnookin (1994).

[13]See Miller (1987).

[14]Swanson and Mason (1998) is an exception. But Swanson and Mason did not investigate the role of agency problems in bargaining processes.

[15]My data come from the files of the Taxing Masters in the U.K. Courts of Justice for the year of 1987 selected by Timothy Swanson. See Swanson (1998) for a detailed description.

[16]Customary law is law not documented in the written code. It is not enacted by a legislative authority. It is an established pattern of legal practice where courts enforce customary rules as if they had been enacted by the proper legislative authority.

[17]Statutory law is written law enacted by a legislature.

[18]In England, the labor law which governs workplace injury disputes is largely a creature of Statute, (Acts of the Parliament of the United Kingdom) rather than Common law. Legal outcomes under statutory law are usually more predictable than under customary law. See O'Hara and Ribstein (2000) for a discussion on the difference in predictability between customary law and statutory law.

Table 1. Distribution of Litigations and Settlements by Plaintiff's Type

	All Types	Privately-funded	Legal aid	Union assisted	Union represented
Negotiated cases (%)	74%	68%	83%	71%	100%
Settled cases (%)	66%	59%	76%	63%	100%
Tried cases without prior bargaining (%)	26%	32%	17%	29%	0%
Tried cases with prior bargaining (%)	8%	9%	7%	8%	0%

Source. Author's calculations using data from Taxed Cases Study by Swanson (1988).
Notes: Privately funded plaintiffs pay all their own legal expenses. Legal aid plaintiffs receive financial aid from the government that partially covers their legal expenses. Union assisted plaintiffs receive financial assistance from trade unions that partially covers their legal expenses. For union represented plaintiffs, their trade unions retain attorneys on their behalf and cover all legal costs associated with litigation and settlement.

Table 2. Distribution of Plaintiff Trial Success Rates by Plaintiff Types

	All Types	Privately-funded	Legal aid	Union assisted
Prior Bargaining	95%	92%	100%	100%
No prior bargaining	26%	17%	43%	50%
All	43%	33%	60%	61%

Source. Author's calculations using data from Taxed Cases Study by Swanson (1988).
Notes: The prior bargaining pool contains litigated cases that have undergone negotiation but have failed to settle. The no prior bargaining pool contains cases that are forced to trial without negotiation. Privately funded plaintiffs pay all their own legal expenses. Legal aid plaintiffs receive financial aid from the government that partially covers their legal expenses. Union assisted plaintiffs receive financial assistance from trade unions that partially covers their legal expenses.

access to legal services in litigations and pretrial negotiations, such as individuals receiving legal aid, the frequency is 24%. Whereas for privately-funded players, the frequency is 41%. Union-represented plaintiffs in workplace injury lawsuits, who receive full reimbursement for their legal costs[19], settled all their claims out of court.

Table 2 shows the frequency of trial success for different types of plaintiffs. The empirical evidence reveals three striking features that cannot be explained by any existing theory. First, the majority of the cases (57%) actually brought to verdict result in a judgement in favor of the defense.[20]

Consequently, the court does not award any compensation in these cases. Second, these win rates are drastically different between bargained and not-bargained cases – they are close or equal to 1 in the bargaining pool, which are consistent with the basic implication of the asymmetric information theories; however, they rest in the middle between 0 and 0.5 in the non-bargaining pool – an observa-

[19] In England, if an injury is closely related to employment conditions (workplace injury claims) or against the public body, the plaintiff is likely to be assisted in its action by its trade-union representatives. In this case, the action is the plaintiff's in name only and is being conducted (and fully financed) for the plaintiff's benefit by the union.

[20] Similar empirical observations were recorded by Farber and White (1991), Vidmar *et al.* (1998), Sieg (2000) and Spurr (2000). Farber and White provide evidence from 252 U.S. medical malpractice cases from 1977 to 1989 and show that the defendants have won all the cases tried to completion. Vidmar *et al.* report that plaintiffs prevail in 22.5% of the California medical malpractice cases from 1991 through 1997. Using data on 8,306 medical malpractice cases in Florida, Sieg shows that only 29% of tried cases result in a verdict for the plaintiff. Spurr (2000) provides evidence from 424 medical malpractice cases in Michigan that, the cases that went to trial are drawn disproportionately from claims that are weak.

Table 3. Probit Regression Parameter Estimates

Dependent variable	*BARGAINING RATE*	*WIN RATE*
Independent Variables		
LEGAL UNCERTAINTY	-0.729**	-0.899*
	(0.215)	(0.442)
FINANCIAL AID	0.272 †	0.760*
	(0.185)	(0.372)
CONSTANT	-0.036	-1.561
	(0.188)	(0.402)
Pseudo R-squared	0.060	0.152
Observations	242	63

Source. Author's calculations using data from Taxed Cases Study by Swanson (1988).
Notes: Values are estimated by probit equations, and standard errors are reported in parentheses. *BARGAINING RATE* means the likelihood that bargaining occurred before trial. *WIN RATE* means the frequency that the plaintiffs prevailed at trial. *LEGAL UNCERTAINTY* is an indicator with value 1 if the case is medical negligence or automobile accident, 0 if the case is workplace injury or against public body. *FINANCIAL AID* is an indicator with value 1 if the plaintiff received financial support, 0 if the case was privately-financed.
† Significant at 10% level; * Significant at 5% level; ** Significant at 1% level.

tion not explained by existing AI theories. Third, the win rates in the non-bargaining pool vary greatly between different types. For those who are assisted by legal aid or receive financial support from trade unions, the proportion winning in court is more than 40%, whereas for self-financed plaintiffs, the proportion is around 17%.

The first column of Tables 3 reports the results of a regression model that demonstrate the influence of the two factors – the heterogeneity in plaintiff's uncertainty and the financing of litigation on the incidence of bargaining. There are two important features of these results: first, for the types of cases associated with more uncertain legal outcomes[21], plaintiffs are less likely to bargain with the defendants than plaintiffs involved in cases that are associated with less uncertainty[22]; second, plaintiffs receiving legal aid from the government or financial support from trade unions are more likely to negotiate with the defendants than privately funded plaintiffs.

The second column of Table 3 reports the results of regression models that demonstrate the influence of the plaintiff financing and the heterogeneity in the levels of uncertainty associated with legal outcomes on the likelihood of plaintiff trial success for those cases that have not been bargained prior to trial. The important features of these results are: first, the plaintiffs in a litigation environment associated with less uncertainty are more likely to win in court; second, plaintiffs receiving legal aid from the government and those receiving financial support from trade unions are more likely win in court than privately funded plaintiffs.[23]

Tables 1, 2 and 3 contain the key challenges for a theory of settlement-litigation decision. First it must clarify the phenomenon of "partial bargaining" – the empirical observation that the probability that parties engage in settlement negotiation is neither zero nor one. Second it must elucidate why plaintiffs would so often pursue expensive litigation when the chance of success is so low. Third it

[21] They are motor vehicle accidents and medical negligence cases.

[22] These are plaintiffs involved in workplace injury cases and cases against the public body.

[23] I do not discuss further the plaintiff's settlement-litigation decision and trial success rate for the negotiated cases, because it is not of interest in this study and the sample in the bargaining-pool is too small (the number of observations is 19) to give empirically reliable conclusions.

must rationalize the variation in litigation frequency across plaintiff types and identify factors that are relevant for settlement-litigation incentives. Finally, it must explain the heterogeneity in win ratios between different types of plaintiffs. My model is an attempt to unravel these paradoxes.

This article broadens the discussion of the strategic settlement-litigation decision. The most important distinction between my work and previous game theoretic analysis of pretrial bargaining is the principal-agent impediment to settlement. Previous studies ignore the fact that settlement negotiations are costly in themselves: attorneys spend time on discovery, establishing contact, and searching for legal precedents; they have incentive to increase the time to settlement *and* billable hours by fielding unattractive bids and encouraging clients to refuse early settlement offers. My model emphasizes the role of agency costs in bargaining processes.

3. Theoretical Analysis

3.1. Pretrial Bargaining without Attorney

The main difference between my model and previous game theoretic models of pretrial bargaining is that my model incorporates the attorney as a key participant in the bargaining game – it focuses on the principal-agent aspect of the problem. Before I start my analysis, however, Bebchuk's (1984) canonical model of settlement bargaining deserves some review. Bebchuk considers the case where a *plaintiff* has been injured in a tort accident. The plaintiff then files a lawsuit against the *defendant*. The plaintiff and the defendant then play a bargaining game. The bargaining game has the following structure:

Let θ represent the *strength* ("legal quality" and "state of the world" are synonyms) of the plaintiff's case, which reflects the likelihood that the plaintiff receives damage award at trial. The strength of the case depends on the quality of evidence, the law defining liability and the burden of proof. Higher values of θ indicate greater strength of the plaintiff's case. The defendant is aware of the strength of the claim, but the plaintiff is not.[24] This is a reasonable assumption as usually the defendant is privately informed about whether he behaved negligently while the plaintiff is not.

Following the Bayesian approach, assume that the plaintiff has some subjective prior probability distribution for the unknown parameter θ prior to receiving any report from her attorney on the perspective of her suit. Let θ be distributed on $\Theta = [\underline{\theta}, \overline{\theta}]$ according to a density function $f(\cdot)$ with $f(\theta) > 0$ for all $\theta \in \Theta$. Let $F(\cdot)$ be the cumulative distribution function.

If the plaintiff goes to trial, a court will conduct its own independent investigation.[25] Without loss of generality, normalize the *probability* that the *plaintiff prevails at trial* to θ and normalize the amount of *judgment* ("value of damage" is a synonym) to unity.[26]

[24] P'ng (1983), Bebchuk (1984), Nalebuff (1987), Spier (1992) and Sieg (2000) make the same assumption that the defendant has private knowledge about the outcome at trial. Rubinfeld and Scotchmer (1993) assume that there is asymmetric information between attorneys and clients and derive endogenously the optimal fee arrangements arising in litigation in response to this asymmetry. But these authors did not investigate the role of agency problems in bargaining processes.

[25] A variety of papers in the literature weaken or manipulate some of these assumptions. See Daughety and Reinganum (2005).

[26] The model can be easily extended to a case where the size of the judgment, and not only the defendant's liability, is uncertain.

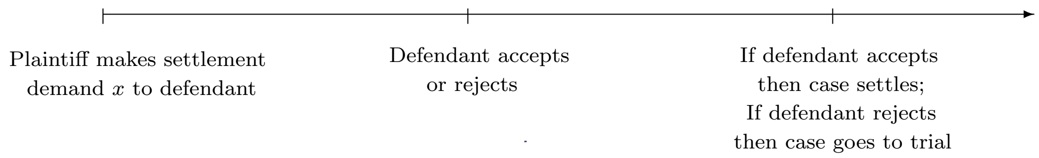

Figure 1 Timing of Litigation without Attorney

The sequence of the game is as follows: the plaintiff makes a settlement demand, x, to the defendant, who either agrees to pay x or refuses. Refusal means that the case proceeds to trial. Each party must pay their own court costs, denoted k (with $k > 0$) for the plaintiff and K (with $K > 0$) for the defendant (respectively), if bargaining fails and they go to trial. Assume that litigation has a positive value for the plaintiff even if the case is of the lowest type, that is, $\theta > k$ for all $\theta \in [\underline{\theta}, \overline{\theta}]$.[27] This assumption is made to rule out the possibility that the plaintiff will not actually go to trial even if he gets no payment whatsoever from the defendant in pretrial negotiation. The game is illustrated in Figure 1.

To simplify the exposition, assume that the plaintiff and the defendant are risk neutral.[28] The plaintiff must decide on an optimal settlement demand, x. The plaintiff knows that the defendant will only agree to pay x if $x \leq \theta + K$. The plaintiff maximizes her expected payoff by solving

$$\max_{x} \quad x\{1 - F(x - K)\} + \int_{\underline{\theta}}^{x-K} (\theta - k) f(\theta) d\theta.$$

The first-order condition determining the optimal settlement demand $\tilde{x}$ is

$$\frac{1}{k + K} = \frac{f(\tilde{x} - K)}{1 - F(\tilde{x} - K)}. \tag{1}$$

To illustrate, consider the equilibrium for the case where θ is uniformly distributed on $[\frac{1}{2}, 1]$. By solving the problem in equation (1) above, one can show that the equilibrium settlement demand is $\tilde{x} = 1 - k$. This is an equilibrium as long as $k + K < \frac{1}{2}$, so the limits on the integral are not violated. Then, the likelihood of settlement is $1 - F(\tilde{x} - K) = 2(k + K)$. This model provides a number of implications; I list a few here. First, the plaintiff's equilibrium settlement demand is decreasing in her trial costs. Second, a decrease in either litigant's trial costs leads to a reduction in the likelihood of settlement. Third, redistribution of trial costs from one litigant to the other (that is, adjustments in k and K, holding $k + K$ fixed) has no impact on the likelihood of settlement.

Up to this point it has been assumed that the plaintiff cannot obtain better information about her prospect at trial from professionals. In that case, settlement failure arises from inevitable information asymmetry. In reality, however, the plaintiff is usually able to obtain information on the strength of her claim. Furthermore, the model so far ignores the fact that settlement negotiations are costly in themselves: in order to negotiate, attorneys spend time on discovery, establishing contact, and searching for legal precedents. Finally, by construction the model cannot explain the absence

[27] P,ng (1983), Reinganum and Wilde (1986) and Spier (1992) make the same assumption. The assumption is made to rule out the possibility that the plaintiff will not go to trial even if he get no payment whatsoever from the defendant in pretrial bargaining.

[28] Bebchuk (1984), Nalebuff (1987), Spier (1992) and Sieg (2000) make the same assumption that the plaintiff is risk-neutral.

of bargaining observed in the TCS study. The next section incorporates these considerations into a simple model that includes the plaintiff's attorney as a key player in the litigation game.

3.2. Pretrial Negotiation with Attorney

My model has *three* players. All players are assumed to be risk-neutral. I take the same structure as Bebchuk's model but assume that the plaintiff retains an *attorney* ("agent" is a synonym) to work on her behalf to conduct pretrial bargaining with another principal – the tortfeasor's insurer. The plaintiff-attorney and the defendant are aware of the strength of the claim θ, but the plaintiff is not. I assume that $f(\cdot)$ is twice differentiable and weakly increasing on Θ. For analytical convenience, assume that $\frac{d}{d\theta}\frac{1-F(\theta)}{f(\theta)} < 0$, for all $\theta \in \Theta$. Several common distributions, including the uniform distribution, satisfy this condition.[29] This assumption is used to prove propositions 1 and 2.

Let $\overline{\gamma}(\theta) = \theta + K$ be the maximum amount the defendant is willing to offer to avoid litigation in state θ, and let $\underline{\gamma}(\theta) = \theta - k$ be the minimum amount the plaintiff would be willing to accept in case she would know θ.

Assume that, in state θ, any agreement inside of the interval $[\underline{\gamma}(\theta), \overline{\gamma}(\theta)]$ can be achieved by the attorney provided that he spends sufficient time ("costs" and "effort" are synonyms).[30] Let $t(x, \theta)$ denote the amount of *time* needed to negotiate *settlement* x in state θ. Furthermore, assume that $t(x, \theta)$ is differentiable and absolutely continuous[31] in θ for all $x \geq 0$. I shall make three important assumptions:

Assumption 1. For all $\theta \in \Theta$,

$$\frac{\partial^2}{\partial\theta\partial x} t(x, \theta) < 0 \text{ for all } x \in (\underline{\gamma}(\theta), \overline{\gamma}(\theta)]; \qquad [1.1]$$

$$t(x, \theta) = 0 \text{ for all } x \in [0, \underline{\gamma}(\theta)]; \qquad [1.2]$$

$$\lim_{x \to \overline{\gamma}(\theta)} t(x, \theta) = +\infty. \qquad [1.3]$$

Recall that θ represents the plaintiff's optimism in pretrial negotiation. When θ is high (resp. low), the plaintiff is more optimistic (resp. pessimistic) about the trial outcome. Then it is less (resp. more) time consuming for the attorney to improve settlement terms. This is captured by assumption 1.1. Assumption 1.2 is a normalization implying that it is costless for the attorney to obtain a settlement that is (weakly) lower than the plaintiff's trial payoff. Assumption 1.3 is a normalization implying that it is impossible for the attorney to obtain a settlement that is (weakly) larger than the

[29] This condition is also satisfied by normal, logistic, chi-squared, exponential, and Laplace distributions. See Bagnoli and Bergström (2005) for a complete list and for results allowing the identification of distributions with monotone hazard rates.

[30] To concentrate on the principal-agent aspects of the problem, I abstract away from any bargaining aspects of negotiated settlement. In addition, strategic aspects of attorney choice will not be studied (see Jones (1989)). I am grateful to Jan Boone and Suzanne Scotchmer for making this suggestion.

[31] The function $t : \Theta \times \mathbb{R} \to \mathbb{R}$ is absolutely continuous on Θ if for every positive number ε, there is a positive number μ such that whenever a sequence of pairwise disjoint sub-intervals $[\theta_k, \vartheta_k]$ of Θ satisfies $\sum_k \mid \vartheta_k - \theta_k \mid < \mu$ then $\sum_k d(t(x, \vartheta_k), t(x, \theta_k)) < \varepsilon$. Absolutely continuity of $t(x, \cdot)$ ensures that the attorney's value function is differentiable almost everywhere and can be represented as an integral of its derivative. See Milgrom and Segal (2002) Theorem 2 (pp. 586).

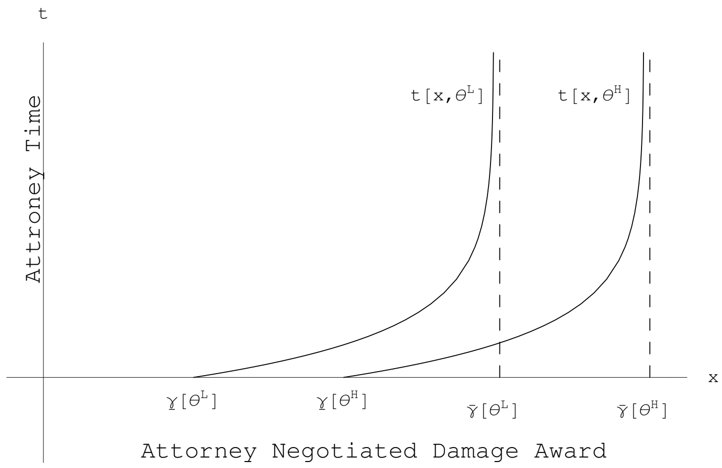

Figure 2. State-dependent Attorney Hours

defendant's trial payoff.

In order to keep the presentation simple I impose two regularity conditions:

Assumption 2. For all $\theta \in \Theta$

$$\frac{\partial^3}{\partial x^2 \partial \theta} t(x,\theta) < 0 \text{ and } \frac{\partial^3}{\partial x \partial \theta^2} t(x,\theta) > 0 \text{ for all } x \in (\underline{\gamma}(\theta), \overline{\gamma}(\theta)]; \quad [2.1]$$

$$\frac{d}{dx} t(x,\theta) \mid_{x=\underline{\gamma}(\theta)} = 0. \quad [2.2]$$

Assumption 2.1 states that the attorney's bargaining technology exhibits diminishing marginal returns to both time and case strength.[32] This assumption is used in the proofs of Propositions 2 (i) and 3. Assumption 2.2 states that a small but positive increase in settlement amount from $\underline{\gamma}(\theta)$ will not lead to increase in the attorney's time. Since the plaintiff obtains $\underline{\gamma}(\theta)$ at trial, this assumption implies that the plaintiff is (strictly) worse off pursuing the case to trial than settling out-of-court in each state of the world. This assumption is used to prove complete information solution 1.

Figure 2 illustrates the relationship between two different attorney time schedules $t(x, \theta^H)$ and $t(x, \theta^L)$ in two distinct states θ^L and θ^H, where $\theta^H > \theta^L$.

Furthermore, assume that if the plaintiff forces her case to trial, the trial outcome will be independent of the attorney's time spent in pretrial negotiation.[33]

In seeking resolution, the plaintiff weights the benefits and costs of settlement and litigation and has three basic instruments available to achieve her objective: (i) the plaintiff can decide whether to go to trial or to engage in negotiation; (ii) if she decides to negotiate, then she will demand a sum of settlement; and (iii) the attorney may be given a reward ("monetary transfer" is a synonym) for handling the suit.

[32] See Fudenberg and Tirole (1991) A8 (pp. 263) and A10 (pp. 267).

[33] One way to justify this assumption is as follows. The English legal profession is formally divided into two divisions, solicitors and barristers. While solicitors usually conduct pretrial negotiation, barristers are best known for their role as courtroom advocates. In addition, practice rules in England prohibit joint practice between barristers and solicitors. For general discussion of the divided legal services in England, see Jackson (1977), Flood (1983) and Kritzer (1989).

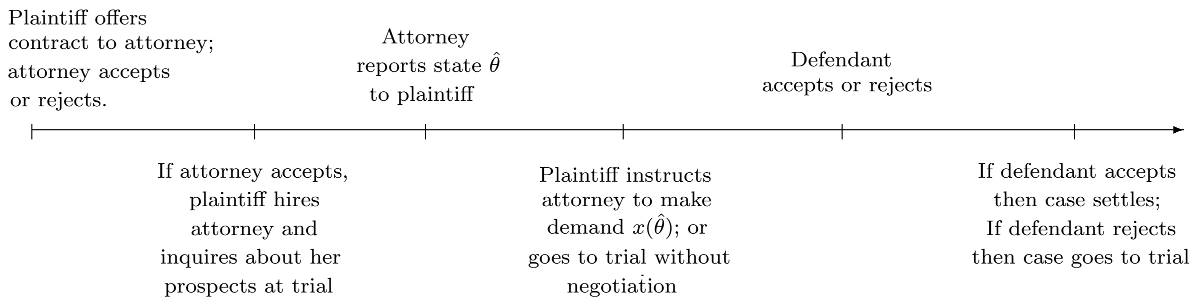

Figure 3. Timing of Litigation with Attorney

Formally, I shall describe a *contract* between the plaintiff and the attorney by three outcome functions $s = \langle \phi, x, r \rangle$, to be interpreted as follows. For any $\hat{\theta} \in \Theta$, if the plaintiff chooses s after receiving report $\hat{\theta}$, the plaintiff instructs her attorney to negotiate if $\phi(\hat{\theta}) = 1$ and she litigates without negotiation if $\phi(\hat{\theta}) = 0$; If the plaintiff decides to settle her claim, then $x(\hat{\theta})$ is the sum of settlement she will demand; $r(\hat{\theta})$ is the amount of *reward* the attorney receives in pretrial negotiation or in litigation. The plaintiff can "write" litigation into any contract entered into with her attorney because it is observable and verifiable (as the damage compensation that the attorney obtains from the defendant). Let S denote the *set of contracts*.

Now using the *revelation principle* (see Myerson (1979)), we may consider only plaintiff's choices under which the attorney's report will truthfully reveal the case strength parameter θ, so the plaintiff's choices can be made as functions of θ. To simplify presentation, I suppose that the plaintiff designs the contract. This assumption puts the whole bargaining power (in the pair plaintiff-attorney) on the plaintiff's side, although generally the plaintiff and the attorney bargain over reward and discuss settlement-litigation strategy.[34]

To further simplify exposition, I focus on deterministic contracts.[35]

Given the plaintiff's choice s, if the case strength parameter is θ, and if the attorney reports θ truthfully, the attorney's expected utility $u(\theta)$ is

$$u(\theta) = r(\theta) - t(x(\theta), \theta)\phi(\theta). \tag{2}$$

If the attorney were to misrepresent the strength of the case and report $\hat{\theta}$, when θ is the true case strength parameter, its expected utility would be

$$u(\hat{\theta}, \theta) = r(\hat{\theta}) - t(x(\hat{\theta}), \theta)\phi(\hat{\theta}).$$

The attorney's utility of the outside option is the same across the states and is normalized to be zero. Figure 3 illustrates this game.

The plaintiff's objective is then to select a contract s and maximize

$$\int_{\Theta} \{ \, (x(\theta) - r(\theta))\phi(\theta) \, + (\theta - k - r(\theta))(1 - \phi(\theta)) \, \} f(\theta) d\theta,$$

subject to

[34]This assumption is not meant to be realistic but rather to avoid the signalling phenomena that arise in situations in which the informed attorney takes part in contract design. See Laffont and Tirole (1993) A10 (pp.39).

[35]Under the assumptions that the attorney is risk neutral and that the attorney's cost function is monotonic, it is not worth considering stochastic contracts, that is contracts for a given report of type draw from a nondegenerate distribution the settlement-litigation decision, the reward the attorney receives and the settlement demand the attorney produces. See Laffont and Tirole (1993) and Strausz (2006).

$$u(\theta) = \max_{\hat{\theta}} u(\hat{\theta}, \theta) \quad \forall\, \theta \in \Theta; \qquad [\alpha]$$
$$u(\theta) \geq 0 \quad \forall\, \theta \in \Theta. \qquad [\beta]$$

Here, condition (α) represents the incentive compatibility constraint. This condition formalizes the notion that the attorney must not prefer to misrepresent the strength of the case as $\hat{\theta}$ when the true state is θ. Condition (β) represents the individual rationality constraint; the attorney's utility cannot be lower than what is obtained in an alternative lawsuit (which is normalized to zero). We shall say a contract is *feasible* if it satisfies conditions (α) and (β).

3.3. Analysis of Optimal Settlement Timing

3.3.1. Preliminary Analysis: Complete Information

As a preliminary, we solve the plaintiff's problem under complete information. Let $c = \langle \phi^c, x^c, t^c \rangle$ be the plaintiff 's *complete-information solutions.* We have,

1. *When the plaintiff has complete information about the strength of the case, there is no litigation:*

$$\phi^c(\theta) = 1 \text{ for all } \theta \in \Theta; \text{ and}$$

2. *When the plaintiff has complete information about the strength of the case, the attorney earns no profit and his effort is optimal:*

$$r^c(\theta) = t(x^c(\theta), \theta) \quad \text{and} \quad \frac{d}{dx} t(x^c(\theta), \theta) = 1 \quad \text{ for all } \theta \in \Theta.$$

Proof. I shall prove that solutions 1 and 2 hold simultaneously. It follows from assumption 1.3 that $x^c(\theta) < \overline{\gamma}(\theta)$ for all θ. This immediately implies that the defendant will always accept $x^c(\theta)$. This is because if the defendant rejects $x^c(\theta)$ the plaintiff will go to trial since $\theta > k$ for all $\theta \in \Theta$. Then the defendant would pay $\overline{\gamma}(\theta)$ at trial, which is more than the settlement demand. Suppose that 2 is true so that $r^c(\theta) = t(x^c(\theta), \theta)$. Further, $\frac{d}{dx} t(x, \theta) \mid_{x = \underline{\gamma}(\theta)} = 0$ for all $\theta \in \Theta$ implies that , given any $\epsilon > 0$, we can find a $\Delta > 0$ and an $\tilde{s} \in S$ such that $t(x^{\tilde{s}}(\theta), \theta) < \epsilon$ provided that $\theta - k < x^{\tilde{s}}(\theta) < \Delta + \theta - k$, for all $\theta \in \Theta$. Or equivalently, there exists $\tilde{s}$ such that $x^{\tilde{s}}(\theta) - t(x^{\tilde{s}}(\theta), \theta) > \theta - k$, for all $\theta \in \Theta$. But c is optimal implies that $x^c(\theta) - t(x^c(\theta), \theta) \geq x^{\tilde{s}}(\theta) - t(x^{\tilde{s}}(\theta), \theta)$ for all $\theta \in \Theta$. Therefore, the plaintiff is better off settling all her case out-of-court. Given that solution 1 holds, solution 2 is familiar from the incentive literature. ■

Of course, this contract offer to attorney is not feasible for the plaintiff when θ is unknown, because it does not satisfy the incentive-compatibility constraint (α). The attorney would have incentives to misrepresent the strength of the claim by reporting states lower than the true θ. It will be instructive to compare this complete-information solution to the optimal litigation-settlement decision under incomplete-information, to be derived in what follows. ||

Example 1. *Complete Information.*

Let $K = 1$. Suppose that attorney's cost function is given by $t(x, \theta) = \ln(k + 1) - \ln(\theta + 1 - x)$.

The reader can easily check that for this cost function, the optimal settlement term under complete information is:

$$x^c = \theta, \qquad \text{for all } \theta \in \Theta,$$

which is increasing in θ and has range $[\underline{\theta}, \bar{\theta}]$. The optimal reward and attorney time are given by

$$r^c(\theta) = t(x^c(\theta), \theta) = \ln(k+1), \qquad \text{for all } \theta \in \Theta.$$

This contract is not feasible for the plaintiff under incomplete information. To see this, suppose that the attorney were to misrepresent the strength of the case and report $\hat{\theta}$, when θ is the true case strength parameter. Then the attorney's payoff is

$$u(\hat{\theta}, \theta) = r^c(\hat{\theta}) - t(x^c(\hat{\theta}), \theta) = \ln(\theta - \hat{\theta} + 1),$$

which is strictly decreasing in $\hat{\theta}$. Therefore, the attorney will always report that the strength of case is $\underline{\theta}$. Thus, as θ is increased, the attorney's payoff is increased, as it becomes easier to negotiate settlement terms with the defendant. But the settlement term is unchanged for the plaintiff because of the attorney's misreport.

3.3.2. Settlement-Litigation Decision under Incomplete Information

Now we turn to the central part of this chapter. The objective here is to demonstrate how inefficient litigation can arise as an instrument for the plaintiff to extract information concerning the strength of cases from the attorney. The key point here is that if a plaintiff pushes *weak* cases toward trial, then the incentive compatibility problem, embodied in equations (α), is mitigated. This occurs because the attorney has less incentive to sell out when the cases are strong.

The first result demonstrates how a plaintiff could improve her net gain from settlement by pushing some weak cases toward trial. The plaintiff's optimal settlement-litigation decision has four properties:

Proposition 1.

(i) *The optimal contract s^* entails that the plaintiff will only force weak cases to trial and do so without bargaining with the defendant, i.e., there is a $\theta^* \in \Theta$ such that the plaintiff will go to trial if $\theta < \theta^*$.*

Further, the plaintiff's unique optimal contract $\langle \phi^*, x^*, r^* \rangle$ entails

(ii) *The optimal cutoff level θ^* is given by*

$$\theta^* = x^*(\theta^*) - t(x^*(\theta^*), \theta^*) + \frac{1 - F(\theta^*)}{f(\theta^*)} \frac{d}{d\theta} t(x^*(\theta^*), \theta^*) + k,$$

where $x^*(\cdot)$ is given by $\frac{d}{dx} t(x^*(\theta), \theta) - \frac{1-F(\theta)}{f(\theta)} \frac{\partial^2}{\partial x \partial \theta} t(x^*(\theta), \theta) = 1$.

(iii) *If the plaintiff decides to go to trial, the attorney's utility is zero, i.e., $u(\theta) = 0$ for $\theta \in [\underline{\theta}, \theta^*]$.*

(iv) *If the plaintiff decides to settle the dispute, the attorney's utility is*

$$u(\theta) = -\int_{\theta^*}^{\theta} \{\frac{d}{d\tilde{\theta}} t(x^*(\tilde{\theta}), \tilde{\theta})\} d\tilde{\theta} \quad \text{for } \theta \in [\theta^*, \bar{\theta}].$$

Proof. The proof of (i) is standard, see appendix. Let a feasible contract $s \in S$ be given.[36] Due to (1), the plaintiff-attorney's surplus in settlement is $u(\theta) = \max_{\hat{\theta}}\{r(\hat{\theta}) - t(x(\hat{\theta}), \theta)\}$. Due to envelope theorem,[37] we obtain that

$$\frac{d}{d\theta}u(\theta) = -\frac{d}{d\theta}t(x(\theta), \theta).$$

This immediately implies that $u(\theta) = u(\theta^*) - \int_{\theta^*}^{\theta}\{\frac{d}{d\tilde{\theta}}t(x^*(\tilde{\theta}), \tilde{\theta})\}d\tilde{\theta}$. The optimal contract on $[\underline{\theta}, \theta^*]$ follows from the fact that incentive compatibility constraint is maintained when the individual rationality constraint holds in equality. So the plaintiff can maximize her expected utility without violating conditions $[\alpha]$ and $[\beta]$ by setting $u(\theta^*) = 0$. ‖

The problem of the plaintiff can be written as

$$\max_{\theta}\left\{ \int_{\underline{\theta}}^{\theta}(\tilde{\theta} - k)f(\tilde{\theta})d\tilde{\theta} + \int_{\theta}^{\overline{\theta}}\{x^*(\tilde{\theta}) - t(x^*(\tilde{\theta}), \tilde{\theta}) - u(\tilde{\theta})\}f(\tilde{\theta})d\tilde{\theta} \right\}. \tag{3}$$

$u(\theta) = -\int_{\theta^*}^{\theta}\frac{d}{d\tilde{\theta}}t(x^*(\tilde{\theta}), \tilde{\theta})d\tilde{\theta}$ due to (iv) of the proposition. Integration by parts yields

$$\int_{\theta^*}^{\theta}\frac{d}{d\tilde{\theta}}t(x^*(\tilde{\theta}), \tilde{\theta})d\tilde{\theta} = \frac{1 - F(\theta)}{f(\theta)}\frac{d}{d\theta}t(x^*(\theta), \theta). \tag{4}$$

Substituting (4) into (3) and differentiate, we obtain

$$\theta^* = x^*(\theta^*) - t(x^*(\theta^*), \theta^*) + \frac{1 - F(\theta^*)}{f(\theta^*)}\frac{d}{d\theta}t(x^*(\theta^*), \theta^*) + k.$$

Furthermore, due to envelop theorem, $\frac{d}{d\theta}\{x^*(\theta) - t(x^*(\theta), \theta) + \frac{1-F(\theta)}{f(\theta)}\frac{d}{d\theta}t(x^*(\theta), \theta)\} = -\frac{d}{d\theta}\{t(x^*, \theta) - \frac{1-F(\theta)}{f(\theta)}\frac{d}{d\theta}t(x^*, \theta)\}$. But $\frac{d}{d\theta}\frac{1-F(\theta)}{f(\theta)} < 0$ and $\frac{d}{d\theta}t(x, \theta) < 0$ and $\frac{\partial^2}{\partial\theta^2}t(x, \theta) < 0$ for all $\theta \in \Theta$ by construction. Then $-\frac{d}{d\theta}\{t(x^*, \theta) - \frac{1-F(\theta)}{f(\theta)}\frac{d}{d\theta}t(x^*(\theta), \theta)\} < 0$. It follows that expression (3) is strictly concave, so the unique maximizer of (3) is given by the first-order condition.

It remains to determine the plaintiff's optimal settlement demand. $u(\theta) = r(\theta) - t(x(\theta), \theta)$. Substituting, the plaintiff's optimization problem on $[\theta^*, \overline{\theta}]$ becomes,

$$\max_{s\in S}\int_{\theta^*}^{\overline{\theta}}\{\, x(\theta) - t(x(\theta), \theta) + \int_{\theta^*}^{\theta}\frac{d}{d\tilde{\theta}}t(x(\tilde{\theta}), \tilde{\theta})d\tilde{\theta}\,\}f(\theta)d\theta. \tag{5}$$

Integration by parts yields

$$\int_{\theta^*}^{\overline{\theta}}\{\int_{\theta^*}^{\theta}\frac{d}{d\tilde{\theta}}t(x(\tilde{\theta}), \tilde{\theta})d\tilde{\theta}\}f(\theta)d\theta = \int_{\theta^*}^{\overline{\theta}}\{[1 - F(\theta)]\frac{d}{d\theta}t(x(\theta), \theta)\}d\theta.$$

Hence,

$$\int_{\theta^*}^{\theta}\frac{d}{d\tilde{\theta}}t(x(\tilde{\theta}), \tilde{\theta})d\tilde{\theta} = \frac{1 - F(\theta)}{f(\theta)}\frac{d}{d\theta}t(x(\theta), \theta). \tag{6}$$

Substituting (6) into (5), the plaintiff's optimization problem then becomes

$$\max_{s\in S}\int_{\theta^*}^{\overline{\theta}}\{\, x(\theta) - t(x(\theta), \theta) + \frac{1 - F(\theta)}{f(\theta)}\frac{d}{d\theta}t(x(\theta), \theta)\,\}f(\theta)d\theta. \tag{7}$$

[36] As defined in Section 3.2, a contract is called 'feasible' if it satisfies conditions (α) and (β).

[37] See Milgrom and Segal (2002) for a general formulation of the envelope theorem.

Differentiate with respect to x yields, in the optimal contract

$$\frac{d}{dx}t(x^*(\theta),\theta) - \frac{1-F(\theta)}{f(\theta)}\frac{\partial^2}{\partial x\partial\theta}t(x^*(\theta),\theta) = 1. \tag{8}$$

By construction expression (7) is strictly concave, so the unique maximizer of (7) is given by the first-order condition. ■

A contract s^* that maximizes the plaintiff's expected payoff is called the *optimal contract.* In the optimal contract, $x^*(\hat{\theta})$ is the sum of settlement the plaintiff will demand after she receive report $\hat{\theta}$ from the attorney. Facing the dual problem of expensive, jackpot-like litigation and informational disadvantage against her attorney, the plaintiff uses one problem to solve another. The optimal cutoff level θ^* partitions Θ into two regions. Inefficient litigation (resp. efficient settlement) occurs whenever the strength of the case is below (resp. beyond) θ^*. In equilibrium, there must be no unexploited arbitrage opportunity for the plaintiff: at θ^* her net gain from going to trial (i.e., $\theta^* - k$) must equal to her gain from settling her claim (i.e., $x^*(\theta^*) - t(x^*(\theta^*),\theta^*) + \frac{1-F(\theta^*)}{f(\theta^*)}\frac{d}{d\theta}t(x^*(\theta^*),\theta^*)$).

Existing theories uniformly predict that, under asymmetric information (AI), informed parties proceed to trial only when they expect a high likelihood of winning.[38] I predict the exact opposite: upon receiving truthful report concerning the prospects of their suits, 'informed' plaintiffs proceed to trial only when they expect a low likelihood of winning, causing plaintiff win rates at trial to be low. In this way, pretrial settlement selects likely plaintiff winners from the filed pool, causing a tendency towards low plaintiff win rates at trial. If we compare this to the complete-information solutions 1 and 2 from an *ex post* point of view, it may seem inefficient and paradoxical for the plaintiff to ever force weak cases to trial. To understand why this may be optimal, observe that the plaintiff wants to encourage the attorney to admit that the case is strong, whenever it is true, so that the attorney will bargain hard with the defendant to obtain a high damage award in settlement. But to prevent the attorney from misrepresenting the strength of the case when the case is strong, the plaintiff must somehow 'punish' the attorney for reporting that the case is weak. Such punishment takes the form of pushing cases towards trial without negotiation (hence no payment to the attorney).

Example 2. *Incomplete Information.*

We continue from Example 1. Let us further assume that θ is uniformly distributed on $[a, 1]$, so that $f(\theta) = 1/(1-a)$. Suppose the plaintiff's trial costs, k, are sufficiently low, so that $k^2 \leq 1-a$. Due to proposition 2, one can show that the optimal cutoff level is $\theta^* = 1-k^2$. Thus the likelihood of trial is $F(1-k^2) = 1-k^2/(1-a)$. The optimal settlement demand is $x^*(\theta) = \theta - (1-\theta)^{\frac{1}{2}}$ if $\theta \in [1-k^2, 1]$, which is increasing in θ. A number of implications arise: First, the likelihood of settlement is increasing in the plaintiff's trial costs. Second, an improvement in the plaintiff's knowledge about her prospects at trial (captured by an increase in a) leads to an increase in the likelihood of settlement. Third, the plaintiff's settlement demand is increasing in her case strength.

[38] See Waldfogel (1998) for an excellent summary of this literature. Waldfogel (1998) presents empirical evidence from over 65,000 federal civil cases, indicating that the settlement process (the selection of cases for trial) does not obey the basic implications of these AI theories. However, Waldfogel does not provide rigorous explanations to justify his empirical findings.

3.4. 'Risk-Classes': Ranking of Litigation Lotteries

Now we arrive at the principal results of the chapter. My objective here is to show that the plaintiff's settlement-litigation decision necessarily depends on the risks inherent in the legal process and the plaintiff's prior information about her prospects at trial. Particularly, it is shown that when the plaintiff is more pessimistic about her trial outcome, i.e., the distribution of case strength has relatively more probability mass to the left, her attorney would bargain harder in pretrial negotiation and obtain more favorable settlement terms from the defendant. The plaintiff litigates *more* frequently when her case is *a priori* weaker.

Plaintiffs who share a common prior distribution function are called a 'risk-class'. We want to consider a group of plaintiffs that consists of a number of risk-classes and analyze the implications of alternative settlement-litigation decisions in the presence of such heterogeneity. First we formalize the notion that one prior distribution has a higher expected case strength than another. My approach here is a direct application of the theory of *Stochastic-Dominance*.[39]

3.4.1. *Ranking of litigation lotteries*

Consider two probability distribution functions, F_1 and F_2, both satisfying $F_i(\underline{\theta}) = 0$, $F_i(\bar{\theta}) = 1$ and $F_i(\theta)$ is weakly increasing in θ, $i = 1, 2$. The conditional probability that the plaintiff's case strength is θ (given that her case is stronger than θ), $\lambda_i(\theta) \equiv \frac{f_i(\theta)}{1-F_i(\theta)}$, is termed the *hazard-rate* associated with $F_i(\theta)$. We say that F_1 *first-order stochastically (strictly) dominates* F_2 if $F_1(\theta) < F_2(\theta)$ for all $\theta \in (\underline{\theta}, \overline{\theta})$. The following definition is central to the analysis of this section.

Definition 1 (Hazard-rate Dominance) : We say that F_1 *(strictly) dominates* F_2 *in terms of hazard rate* if $\lambda_1(\theta) < \lambda_2(\theta)$ for all $\theta \in (\underline{\theta}, \overline{\theta})$.

In words, hazard rate dominance implies that, the rate of increase of the plaintiff's chance of having a better case (i.e., $\frac{d}{d\theta} \ln(1 - F(\theta)) = -\frac{f(\theta)}{1-F(\theta)}$), is larger at all possible case strength with distribution 1 than with distribution 2. Now let's explore two important implications of Definitions 2 and 3.

Lemma 1.1. *If F_1 dominates F_2 in hazard rate, then F_1 first order stochastically dominates F_2.*

Proof. The proof is standard, see appendix B.

Lemma 1.2. *If F_1 dominates F_2 in hazard rate, then $\int_\Theta \theta f_1(\theta)d\theta > \int_\Theta \theta f_2(\theta)d\theta$.*

Proof. By Lemma 1.1, if F_1 dominates F_2 in hazard rate, then $F_1 < F_2$ for all $\theta \in (\underline{\theta}, \overline{\theta})$. Since $F_1 \geq 0$ and $F_2 \geq 0$, integration by parts yield

$$\int_\Theta F_1(\theta)d\theta < \int_\Theta F_2(\theta)d\theta \text{ if and only if } 1 - \int_\Theta \theta f_1(\theta)d\theta < 1 - \int_\Theta \theta f_2(\theta)d\theta$$

and therefore

$$\int_\Theta F_1(\theta)d\theta < \int_\Theta F_2(\theta)d\theta \text{ if and only if } \int_\Theta \theta f_1(\theta)d\theta > \int_\Theta \theta f_2(\theta)d\theta.$$

We obtain the conclusion of the lemma. ■

[39] I am grateful to Jan Boone and Eric van Damme for suggesting me to apply the theory of Stochastic-Dominance in analyzing the dependence of settlement-litigation decision on the risks inherent in the legal process.

In words, lemma 1.2 states that the strength of the plaintiff's case is *a priori* higher with distribution 1 than with 2. Following Lemma 1.2, we say that the plaintiff is *more optimistic about her trial outcome* under F_1 than under F_2, if F_1 dominates F_2 in hazard rate.

3.4.2. *Risk-class settlement-litigation pattern*

Let θ_i^* denote the optimal cutoff level, corresponding to distribution $i = 1, 2$. The equilibrium levels of settlement and attorney surplus are denoted as x_i^* and u_i^*, respectively. To further simplify notation, write $\Omega^* \equiv [\theta_1^*, \overline{\theta}] \cap [\theta_2^*, \overline{\theta}]$.

My next proposition states a comparative-static result about how the optimal cutoff level, optimal settlement demand, attorney's payoff, equilibrium probability of litigation and plaintiff's probability of winning at trial change with changes in the distribution of plaintiff's optimism about her trial outcome. This comparative static is important for empirical work, since it leads to counterintuitive and testable predictions about how bargaining outcome and litigants' welfare vary with changes in policy that affect trial outcomes.

Let $\omega_i^* = \int_{\underline{\theta}}^{\theta_i^*} \theta f_i(\theta) d\theta / F_i(\theta_i^*)$ denote the plaintiff's equilibrium (conditional) probability of winning at trial, corresponding to distribution $i = 1, 2$.[40]

Proposition 2. *If the plaintiff is more optimistic about her trial outcome under F_1 than under F_2, then*

(i) $\theta_1^* > \theta_2^*$;

(ii) $x_1^*(\theta) < x_2^*(\theta)$ *for all* $\theta \in \Omega^*$;

(iii) $u_1^*(\theta) < u_2^*(\theta)$ *for all* $\theta \in \Omega^*$;

(iv) $F_1(\theta_1^*) < F_2(\theta_2^*)$; and

(v) $\omega_1^* > \omega_2^*$.

Proof. I will start by proving (ii) of the proposition. Expression (7) is a strictly concave function in x, so

$$\int_{\Omega^*} \{\ x_i^*(\theta) - t(x_i^*(\theta), \theta) + \frac{1 - F_i(\theta)}{f_i(\theta)} \frac{d}{d\theta} t(x_i^*(\theta), \theta)\ \} f_i(\theta) d\theta >$$
$$\int_{\Omega^*} \{\ x_j^*(\theta) - t(x_j^*(\theta), \theta) + \frac{1 - F_i(\theta)}{f_i(\theta)} \frac{d}{d\theta} t(x_j^*(\theta), \theta)\ \} f_i(\theta) d\theta, \text{ for } i, j = 1, 2 \text{ and } i \neq j.$$

Adding the inequalities describing these maximum properties, we obtain for all $\theta \in \Omega^*$

$$\{\frac{1 - F_2(\theta)}{f_2(\theta)} - \frac{1 - F_1(\theta)}{f_1(\theta)}\} \frac{d}{d\theta} t(x_2^*(\theta), \theta) > \{\frac{1 - F_2(\theta)}{f_2(\theta)} - \frac{1 - F_1(\theta)}{f_1(\theta)}\} \frac{d}{d\theta} t(x_1^*(\theta), \theta).$$

Due to Assumption 1.1, $\frac{d}{d\theta} t(x, \theta)$ is strictly decreasing in x. Further, hazard rate dominance implies that $\frac{1-F_2(\theta)}{f_2(\theta)} - \frac{1-F_1(\theta)}{f_1(\theta)} < 0$. Therefore, $x_2^*(\theta) > x_1^*(\theta)$ for all $\theta \in \Omega^*$ as required.

It remains to comparative the attorney's equilibrium surplus $u_1^*(\theta)$ and $u_2^*(\theta)$. If $x_1^*(\theta) < x_2^*(\theta)$ for all $\theta \in \Omega^*$ then $-\frac{d}{d\theta} t(x_1^*(\tilde{\theta}), \tilde{\theta}) < -\frac{d}{d\theta} t(x_2^*(\tilde{\theta}), \tilde{\theta})$ for all $\theta \in \Omega^*$, by Assumption 1.1. Integrating

[40] Notice that $\int_{\underline{\theta}}^{\theta_i^*} \theta f_i(\theta) d\theta$ is the probability that the plaintiff wins at trial under $F_i inequilibrium$; $F_i(\theta_i^*)$ is the probability that the case will go to trial in equilibrium.

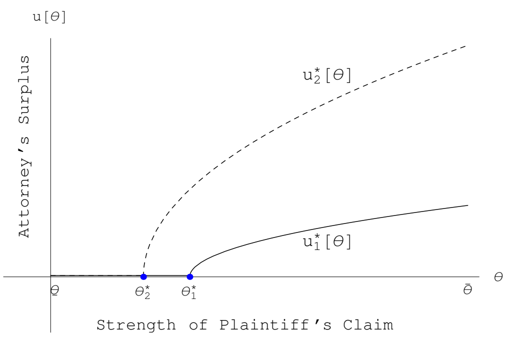

Figure 4. F_1 dominates F_2 and $\theta_1^* > \theta_2^*$

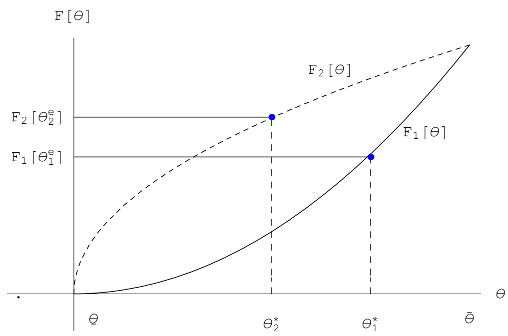

Figure 5. F_1 dominates F_2 and $F_1(\theta_1^*) < F_2(\theta_2^*)$

both sides of the inequality, we get $-\int_{\Omega^*}\{\frac{d}{d\theta}t(x_1^*(\tilde{\theta}),\tilde{\theta})\}d\theta < -\int_{\Omega^*}\{\frac{d}{d\theta}t(x_2^*(\tilde{\theta}),\tilde{\theta})\}d\theta$. The last inequality implies that $u_1^*(\theta) < u_2^*(\theta)$ for all $\theta \in \Omega^*$ due to (iv) of Proposition 1.

It remains to show that $\theta_1^* > \theta_2^*$. The proof proceeds in three steps.

Step A. $u_1^*(\theta_1^*) = u_2^*(\theta_2^*) = 0$ due to (ii) of proposition 2.

Step B. $u_2^*(\theta) > u_1^*(\theta)$ for all $\theta \in \Omega^*$ implies that $u_2^*(\theta_1^*) > 0$ by step A.

Step C. $u_2^*(\cdot)$ is continuous and monotone increasing on $[\theta_2^*, \overline{\theta}]$ due to (iii) of proposition 2; further, $u_2^*(\theta) = 0$ for all $\theta \in [\underline{\theta}, \theta_2^*]$ due to (ii) of proposition 2. Therefore, $u_2^*(\theta_2^*) = 0$ and $u_2^*(\theta_1^*) > 0$ implies $\theta_2^* < \theta_1^*$ (see Figure 4).

Therefore, we obtain that if $u_1^*(\theta) < u_2^*(\theta)$ for all $\theta \in \Omega^*$, then $\theta_1^* > \theta_2^*$. This together with proposition 2 (iii) imply $\theta_1^* > \theta_2^*$.

Now turning to the proof of (iv) of Proposition 2. Due to (iii) of proposition 1, $u_1^*(\theta_1^*) = u_2^*(\theta_2^*) = 0$. Therefore

$$\frac{1 - F_1(\theta_1^*)}{f_1(\theta_1^*)}\frac{d}{d\theta}t(x_1^*(\theta_1^*), \theta_1^*) = \frac{1 - F_2(\theta_2^*)}{f_2(\theta_2^*)}\frac{d}{d\theta}t(x_2^*(\theta_2^*), \theta_2^*). \tag{9}$$

Due to (iii) of proposition 1, $x_1^*(\theta_1^*) = x_1^*(\theta_2^*) = 0$. In addition, by construction, $\frac{d}{d\theta}t(x_i^*(\theta), \theta)$ is increasing in θ. Hence, if $\theta_1^* > \theta_2^*$ then $\frac{d}{d\theta}t(0, \theta_1^*) > \frac{d}{d\theta}t(0, \theta_2^*)$. Since $\frac{d}{d\theta}t(0, \theta_1^*) < 0$ and $\frac{d}{d\theta}t(0, \theta_2^*) < 0$, from (8) we have

$$\frac{1 - F_1(\theta_1^*)}{f_1(\theta_1^*)} > \frac{1 - F_2(\theta_2^*)}{f_2(\theta_2^*)} \quad \text{if and only if} \quad \frac{d}{d\theta}\ln(1 - F_1(\theta_1^*)) > \frac{d}{d\theta}\ln(1 - F_2(\theta_2^*)).$$

Since $\frac{d}{d\theta}\ln(1 - F_1(\theta_1^*)) \geq 0$ and $\frac{d}{d\theta}\ln(1 - F_2(\theta_2^*)) \geq 0$, we have

$$\int_\Theta \frac{d}{d\theta}\ln(1 - F_1(\theta_1^*))d\theta > \int_\Theta \frac{d}{d\theta}\ln(1 - F_2(\theta_2^*))d\theta \quad \text{if and only if } \ln(1 - F_1(\theta_1^*)) > \ln(1 - F_2(\theta_2^*)).$$

Since $\ln(\cdot)$ is monotone increasing, we have $F_1(\theta_1^*) < F_2(\theta_2^*)$ as required (see Figure 5).

It remains to show that $\omega_1^* > \omega_2^*$. The proof proceeds in three steps.

Step A. $[\underline{\theta}, \theta_i^*] \subset (0, 1)$ by construction. Further, $F_i(\theta) < 1 \;\forall\; \theta \in [\underline{\theta}, \theta_i^*]$. So $\int_{\underline{\theta}}^{\theta_i^*} F_i(\theta)d\theta < 1$, $i = 1, 2$.

Step B. Due to Proposition 4, $F_2(\theta_2^*) > F_1(\theta_1^*)$ if and only if

$$(F_2(\theta_2^*) - F_1(\theta_1^*))(1 - \text{Max}\{\int_{\underline{\theta}}^{\theta_2^*} F_2(\theta)d\theta), \int_{\underline{\theta}}^{\theta_1^*} F_1(\theta)d\theta\}) > 0.$$

But $F_2(\theta_2^*)(1 - \int_{\underline{\theta}}^{\theta_1^*} F_1(\theta)d\theta) - F_1(\theta_1^*)(1 - \int_{\underline{\theta}}^{\theta_2^*} F_2(\theta)d\theta)$
$> (F_2(\theta_2^*) - F_1(\theta_1^*))(1 - \text{Max}\{\int_{\underline{\theta}}^{\theta_2^*} F_2(\theta)d\theta), \int_{\underline{\theta}}^{\theta_1^*} F_1(\theta)d\theta\})$ implies that $F_2(\theta_2^*)(1 - \int_{\underline{\theta}}^{\theta_1^*} F_1(\theta)d\theta) > F_1(\theta_1^*)(1 - \int_{\underline{\theta}}^{\theta_2^*} F_2(\theta)d\theta)$.

Step C. Integration by parts yields $1 - \int_{\underline{\theta}}^{\theta_i^*} F_i(\theta)d\theta = \int_{\underline{\theta}}^{\theta_i^*} \theta f_i(\theta)d\theta$. Substituting and rearranging, we have $\int_{\underline{\theta}}^{\theta_1^*} \theta f_1(\theta)d\theta / F_1(\theta_1^*) > \int_{\underline{\theta}}^{\theta_2^*} \theta f_2(\theta)d\theta / F_2(\theta_2^*)$ and the proposition follows. ■

The intuition of the comparative statics of the first result is as follows. Since with a low settlement the plaintiff cannot tell whether her case was weak or her attorney "sold out", the attorney uses the court as an "auditor" to help him to verify to his client that the case was indeed lack of merits. With a better distribution, the plaintiff becomes more optimistic about her prospects at trial. Hence she is less easily convinced when the attorney says "times are tough". In this way, more *strong* cases are pushed towards trial as they more often fail to meet the optimism of the plaintiff.

The second result of Proposition 2 means that, hard bargaining takes place when the plaintiff believes her case to be weak: she would demand more (resp. less) damage award from the defendant in settlement if she is more pessimistic (resp. optimistic) about her prospects at trial. In other words, an aggressive bargaining strategy (i.e., $x_2^*(\theta) > x_1^*(\theta)$) reflects that plaintiff expect her case to be weak (captured by $\int_\Theta \theta f_2(\theta)d\theta < \int_\Theta \theta f_1(\theta)d\theta$).

The third result of Proposition 2 states that the attorney earns less (resp. more) surplus when the plaintiff is more optimistic (resp. pessimistic) about her prospects at trial. The intuition underlying the comparative statics is as follows. The plaintiff obtains settlement payment achieved by the attorney but has to compensate the attorney for his time spent on the case. Further, in order to convince the attorney to reveal the true case strength, the plaintiff has to pay an informational rent. Since the attorney's productivity improves with the strength of the case, he is *a priori* more productive under F_1 than under F_2. It is therefore harder for the attorney to convince the plaintiff that he needs to be compensated more for his time under F_1 than under F_2.

The fourth result of Proposition 2 states that the probability of trial is decreasing in the uninformed player's expected trial return (i.e., $\int_\Theta \theta f(\theta)d\theta$). This result stands sharply in contrast with those obtained from models that restrict attention to information asymmetry and strategic interactions between litigants (see Bebchuk (1984) and Spier (1992)). Although this surprising result may seem counterintuitive at first sight, its logic can be easily explained: the magnitude of expected trial return reflects the productivity of the attorney. The better the plaintiff's prospects at trial, the more optimistic the plaintiff is, the less costly it becomes for the attorney to obtain favorable settlement terms from the defendant. Since the plaintiff bears the full costs of negotiation, settlement (resp. litigation) becomes a more (resp. less) attractive option when negotiation is less costly.

The last result of the proposition means that, given that litigation occurs, the plaintiff is more likely to win with a better distribution. With a better distribution, the plaintiff litigates less often ($F_1(\theta_1^*) < F_2(\theta_2^*)$) but brings more strong cases to trial ($\theta_1^* > \theta_2^*$).

Example 3. *Stochastic Dominance.*

Continuing from Example 1, let us further assume that θ is uniformly distributed on $[a, 1]$ with distribution F_1, and uniformly distributed on $[b, 1]$ with distribution F_2, where $0 < b < a < 1$. F_1 thus first order stochastically dominates F_2. From the results of example 2, we have that the equilibrium likelihoods of trial are

$$F_1(\theta_1^*) = 1 - \frac{k^2}{1-a} < 1 - \frac{k^2}{1-b} = F_2(\theta_2^*).$$

The plaintiff's conditional probabilities of winning are

$$\omega_1^* = \frac{1}{2}(1 + a - k^2) > \frac{1}{2}(1 + b - k^2) = \omega_2^*.$$

3.5. Financial Aid

Up to this point, it has been assumed that the litigation is privately funded. In that case, litigation results when the informational rent is too high for the plaintiff to bear. The objective of this section is to understand the effect of such financial aid on the likelihood of settlement. It is shown that financial assistance (for both pre-litigation settlement and litigation) reduces the costs inherent in principal-agent problem between the plaintiff and her attorney, mitigates the negative effect of information asymmetry, thereby facilitates efficient settlement.

Formally, let $1 - \varrho$ (with $\varrho \in [0, 1]$) denote the *proportion of legal costs* financed by a third party (e.g. a trade union or legal aid funds) in settlement and litigation. Suppose that if the plaintiff decides to settle all her cases out of court, then the feasible contract $p = \langle \phi^p, x^p, r^p \rangle$ is chosen in the optimum solution, and let

$$\pi^p = \int_\Theta \{x^p(\theta) - \varrho\, r^p(\theta)\} f(\theta) d\theta$$

denote the plaintiff's payoff under contract p.

Further, suppose that if the plaintiff chooses to litigate a fraction of her cases, some feasible contract $q = \langle \phi^q, x^q, r^q \rangle$ will be chosen in the optimum solution. The corresponding payoff is

$$\pi^q = \int_{\underline{\theta}}^{\theta^q} \{\theta - \varrho\, k\} f(\theta) d\theta + \int_{\theta^q}^{\overline{\theta}} \{x^q(\theta) - \varrho\, r^q(\theta)\} f(\theta) d\theta.$$

Definition 2 (Incentive to Settle): The plaintiff's *incentive to settle* is defined as

$$\delta(\varrho) \equiv \pi^p - \pi^q.$$

Clearly, when $\delta(\varrho) > 0$ the plaintiff is better off settling all her claims out of court; when $\delta(\varrho) < 0$ the plaintiff would have incentive to force some of her weak cases to trial.

Proposition 3. *For any distribution F, there exists $\tilde{\varrho} > 0$ such that for all $\varrho < \tilde{\varrho}$, $\delta(\varrho) > 0$. That is, the plaintiff is (strictly) better off settling all her cases provided that her claim is sufficiently aided, irrespective of the magnitude of risks in litigation.*

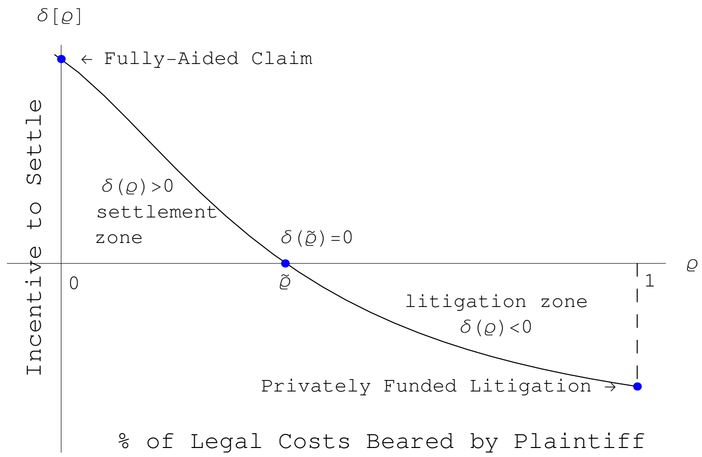

Figure 6. Financial Aid Discourages Litigation

Proof. Suppose that $\delta(1) < 0$, i.e., when the plaintiff's claim is privately funded, the plaintiff is strictly better off using contract $\langle \phi^q, x^q, r^q \rangle$. But

$$\delta(0) = \int_{\Theta} x^p(\theta) f(\theta) d\theta - \left\{ \int_{\underline{\theta}}^{\theta^q} \theta f(\theta) d\theta + \int_{\theta^q}^{\overline{\theta}} x^q(\theta) f(\theta) d\theta \right\}.$$

On reflection it is clear that, $x^p(\theta) = x^q(\theta)$ for all $\theta \in [\theta^q, \bar{\theta}]$. Then,

$$\delta(0) = \int_{\underline{\theta}}^{\theta^q} \{x^p(\theta) - \theta\} f(\theta) d\theta.$$

However, there exists a feasible contract p such that $x^p(\theta) > \theta$ by construction. Hence, $\delta(0) > 0$. Since $\delta(\cdot)$ is continuous on $[0, 1]$, by *intermediate value theorem* we can find a $\tilde{\varrho} \in [0, 1]$ such that $\delta(\tilde{\varrho}) = 0$. Further since $\delta(\cdot)$ is monotonically decreasing in ϱ, it follows that $\delta(\varrho) > 0$ for all $\varrho \in [0, \tilde{\varrho}]$ as required (see Figure 6). ■

Proposition 3 implies that for the types of people and legal matters that would be sufficiently covered by third party financing, settlement will always occur irrespective of the plaintiff's prior information and the direct trial costs. The intuition underlying the comparative statics is as follows. Litigation is costly for the plaintiff. However, in order to effectively monitor her attorney's performance in settlement negotiation when the attorney has more information than her concerning the characteristics of the lawsuit, the plaintiff uses litigation as a device for extracting information. Third party financing mitigates the cost of information asymmetry inherent in representative bargaining. Therefore, plaintiffs receiving financial support, go to court less often than those receiving no financial support. ‖

3.6. Varying Uncertainty Levels: An Example

I now turn to an example in which the plaintiff's uncertainty about her trial outcome is represented by the spread of a uniform distribution. My purpose here is to show that it is possible for the model to reproduce some key features of the data when we make plausible assumptions about the model's parameters. I use the uniform distribution, since in this case the equilibrium can be derived in closed form. Numerical calculations with other distributions such as a truncated normal distribution, suggest that my distributional assumption is not crucial to the results.

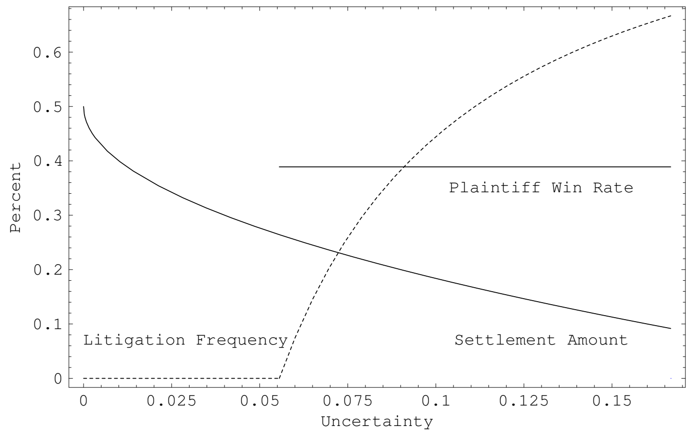

Figure 7. Varying Uncertainty Levels ($\mu = 0.5$, $k = 0.33$, $\theta = 0.5$)

To illustrate our optimal solution, let us continue from Example 1. Suppose that θ is uniformly distributed on $[\mu - d, \mu + d]$ so θ has a mean of μ and a variance of $d^2/3$. Thus, by varying d, I can vary the level of uncertainty without changing the mean of the distribution. In particular, the standard deviation increases linearly from 0 as d increases from 0. I refer to d as the *level of uncertainty.* Further I assume that $k + d \leq \mu \leq 1 - d$.

My last proposition states a comparative-static result about how bargaining and litigation outcomes change with changes in the level of uncertainty. This comparative static is consistent with the literature.

PROPOSITION 6. *In the equilibrium with uniform uncertainty with* $t(x, \theta) = \ln(k+1) - \ln(\theta + 1 - x)$,

(i) *The equilibrium probability of trial is*

$$F(\theta^*) = \begin{cases} 0 & \text{if } \ 0 \leq d \leq \frac{1}{2}k^2, \\ 1 - \frac{k^2}{2d} & \text{if } \ \frac{1}{2}k^2 < d \leq \frac{1}{2} - k, \\ 1 - \frac{k^2}{1-2k} & \text{if } \ d > \frac{1}{2} - k. \end{cases}$$

(ii) *The equilibrium settlement amount is* $x^*(\theta) = \theta - \sqrt{\mu + d - \theta}$, *for* $\theta \in [\theta^*, \mu + d]$, *where* $\theta^* = \mu + d - k^2$ *if* $d > \frac{1}{2}k^2$ *and* $\theta^* = \mu - d$ *if* $d \leq \frac{1}{2}k^2$.

(iii) *In the incidence of a trial, the plaintiff wins with probability* $\omega^* = \mu - k^2$.

Proof. It follows from result (ii) of Proposition 1 that the optimal cutoff level is given by $\theta^* = \mu + d - k^2$. $\frac{d}{dx}t(x^*(\theta), \theta) = 1/(1 - x^*(\theta) + \theta)$. $\frac{\partial^2}{\partial x \partial \theta}t(x^*(\theta), \theta) = -1/(1 - x^*(\theta) + \theta)^2$. $1 - F(\theta)/f(\theta) = \mu + d - \theta$. Substituting into equation (50), and we obtain (ii). (i) and (iii) follow by construction. ■

One critical parameter that cannot be estimated directly from the data is the level of uncertainty d. It is important, therefore, to look at how the bargaining outcome changes with the level of uncertainty increases from 0. A remarkable feature of this model is that likelihood of settlement depend only on d and k but not on the expected trial outcome or any other parameters of the model. Assume trial costs of 0.33 and mean prior probability winning of 50 percent. The likelihood of litigation increases from 0 to 67 percent as we move from little uncertainty to maximal uncertainty (see Figure 7).

The equilibrium settlement amount is decreasing in the mean and dispersion of probability, increasing in θ (holding constant the distribution of probability) but invariant to trial costs k. With higher risk it is more expensive for the plaintiff to negotiate settlement payment via her attorney, implying that the plaintiff will demand less in settlement.

Now consider how the plaintiff's *ex post* probability of winning varies with the level of her uncertainty. The plaintiff's win rate is insensitive to her uncertainty. Figure 6 shows that for trial costs of 0.33 and mean *prior* probability of winning of 50 percent, the plaintiff's equilibrium win rate is fixed at 38.9 percent. This occurs because a proportional increase in likelihood of litigation following an increase in the plaintiff's uncertainty results in an equal proportional increase in the strength of litigated cases.

4. Conclusion

My main observation is that when the plaintiff has an informational disadvantage *vis-à-vis* her attorney concerning the strength of her lawsuit and her chance of winning at trial, the plaintiff can use litigation as an instrument for extracting information. But, counterintuitively, litigation will occur only when the plaintiff is pessimistic about her prospects at trial. The plaintiff is more likely to sue if she is more pessimistic about winning the case. This is because, the attorney "passes the buck" to the court provided that his client may not believe him if he says "times are hard" and that he may be blamed for a poor performance. This, in turn, is a rational strategy for the plaintiff to pursue because if she does not *commit* to litigating her weak cases she may encourage "selling out" by her attorney. In this way, pretrial settlement selects likely plaintiff winners from the filed pool, causing a tendency towards low plaintiff win rates at trial.

Two factors are crucially important in determining the plaintiff's settlement-litigation decision: the level of uncertainty associated with the legal outcomes and the financing of litigation. Predictability of legal outcome improves the plaintiff's ability to monitor her attorney's performance, and therefore mitigates the principal-agent problem inherent in representative negotiation and facilitates successful settlement. Hence, more experienced plaintiffs go to court less often. There is another aspect of attorney-client relationship regarding the financing of litigation that can affect a plaintiff's incentive to litigate: legal aid reduces the costs inherent in representative bargaining thereby promoting efficient settlement. Therefore, plaintiffs receiving legal aid in litigation, go to court less often than those receiving no legal aid.

There are three important extensions to this research. The first is to introduce renegotiation possibilities into the analysis. After a report from the attorney on the strength of her case, the plaintiff usually has option to change her litigation-settlement decision while proposing a change in the attorney's compensation scheme. Since the attorney will take these into account, renegotiation may erode the commitment effect of litigation. The second extension is to introduce moral hazard on the part of the attorney in the litigation stage. In my analysis, the trial outcome is not influenced by the settlement-attorney's effort. This might not be a plausible assumption for the some systems. For instance, in the American legal system the trial outcome is usually a function of effort by the attorneys who handle both pretrial negotiation and litigation. Then it will be efficient to have a division of rents between the plaintiff and the attorney for litigated cases. This might erode the effect of litigation as a tool for the plaintiff to monitor her attorney's performance in settlement negotiation. The third extension is to consider the principal-agent problem on both sides of the bargaining table.

In my model, information asymmetry only exists on the plaintiff side. In principle, this setting can be extended by allowing also the defendant to have informational disadvantage *vis-à-vis* the defense lawyer. In this case, however, the characterization of the equilibrium becomes more complicated because two-sided delegation leads to a four-person bargaining game. This poses a challenge for future research.

5. Appendix

Appendix A

Proof of Proposition 1 (i).

Given that the plaintiff chooses $\langle \phi, x, r\rangle$, if the case strength is θ, and if the attorney reports θ truthfully, its expected profit $u(\theta)$ is $u(\theta) = r(\theta) - t(x(\theta), \theta)\phi(\theta)$; if the attorney were to misrepresent the strength of the case and report $\hat{\theta}$, when θ is the true strength of the case, its expected payoff is $u(\hat{\theta}, \theta) = r(\hat{\theta}) - t(x(\hat{\theta}), \theta)\phi(\hat{\theta})$. Condition (α) requires that

$$u(\theta) \geq u(\hat{\theta}, \theta) = u(\hat{\theta}) + \phi(\hat{\theta})[t(x(\hat{\theta}), \hat{\theta}) - t(x(\hat{\theta}), \theta)]. \tag{10}$$

Thus,

$$\phi(\hat{\theta})[t(x(\hat{\theta}), \hat{\theta}) - t(x(\hat{\theta}), \theta)] \leq u(\theta) - u(\hat{\theta}) \leq \phi(\theta)[t(x(\theta), \hat{\theta}) - t(x(\theta), \theta)], \tag{11}$$

where the second inequality follows from the analogue of (11) with the roles of θ and $\hat{\theta}$ reversed. Then $\theta > \hat{\theta}$ implies that $t(x(\hat{\theta}), \hat{\theta}) > t(x(\hat{\theta}), \theta)$ and $t(x(\theta), \hat{\theta}) > t(x(\theta), \theta)$ since $\frac{d}{d\theta}\frac{1-F(\theta)}{f(\theta)} < 0$, for all $\theta \in \Theta$; now suppose in negation that $\phi(\theta) < \phi(\hat{\theta})$. By construction of the characteristic function, we must have that $\phi(\theta) = 0$ and $\phi(\hat{\theta}) = 1$. But then

$$\phi(\hat{\theta})[t(x(\hat{\theta}), \hat{\theta}) - t(x(\hat{\theta}), \theta)] = t(x(\hat{\theta}), \hat{\theta}) - t(x(\hat{\theta}), \theta) > 0 = \phi(\theta)[t(x(\theta), \hat{\theta}) - t(x(\theta), \theta)]$$

which is a contradiction to (46). Therefore, there exists a $\theta^* \in \Theta$ such that for all $\theta \geq \theta^*$, $\phi^*(\theta) = 1$ and for all $\theta < \theta^*, \phi^*(\theta) = 0$. ■

Appendix B

Proof of lemma 1.1.

Since $F_1(\theta) \neq 1$ and $F_2(\theta) \neq 1$ for all $\theta \in (\underline{\theta}, \overline{\theta})$, it follows that

$$\frac{f_1(\theta)}{1 - F_1(\theta)} < \frac{f_2(\theta)}{1 - F_2(\theta)} \quad \text{if an donly if} \quad \frac{d}{d\theta}\ln(1 - F_1(\theta)) > \frac{d}{d\theta}\ln(1 - F_2(\theta)) \text{ for all } \quad \theta \in (\underline{\theta}, \overline{\theta}).$$

Integrate both sides of the inequality, we have

$$\int_{\underline{\theta}}^{\theta} \frac{d}{d\tilde{\theta}}\ln(1 - F_1(\tilde{\theta}))d\tilde{\theta} > \int_{0}^{\theta} \frac{d}{d\tilde{\theta}}\ln(1 - F_2(\tilde{\theta}))d\tilde{\theta}, \text{ for all } \theta \in (\underline{\theta}, \overline{\theta}). \tag{12}$$

But $\int_{\underline{\theta}}^{\theta} \frac{d}{d\tilde{\theta}}\ln(1 - F_1(\tilde{\theta}))d\tilde{\theta} = \ln(1 - F_i(\theta))$, $i = 1, 2$. Inequality (54) thus becomes

$$\ln(1 - F_1(\theta)) > \ln(1 - F_2(\theta)) \text{ for all } \theta \in (\underline{\theta}, \overline{\theta}).$$

Since $\ln(\cdot)$ is monotone increasing, it follows that $1 - F_1(\theta) > 1 - F_2(\theta)$ or equivalently $F_1(\theta) < F_2(\theta)$ for all $\theta \in (\underline{\theta}, \overline{\theta})$. ■

Appendix C

Dropping the suit.

Let's now assume that $\theta < k$ for some $\theta \in \Theta$ and allow the plaintiff to drop her claim upon receiving report from the attorney on the case strength.

Definition 3 (settlement-litigation-dropping decision): For any $\hat{\theta}$ in Θ, provided that the attorney reports that the strength of the claim is $\hat{\theta}$, a *settlement-litigation-dropping decision* $\varphi : \Theta \to \{-1, 0, 1\}$ is a function that is defined to be

$$\varphi(\hat{\theta}) = \begin{cases} 1 & \text{if the plaintiff instructs her attorney to negotiate;} \\ 0 & \text{if the plaintiff litigates without negotiation;} \\ -1 & \text{if the plaintiff drops her case.} \end{cases}$$

Further, let

$$\theta^{**} := \max_{\theta} \left\{ \int_k^{\theta} (\tilde{\theta} - k) f(\tilde{\theta}) d\tilde{\theta} + \int_{\theta}^{\overline{\theta}} \{x^{**}(\tilde{\theta}) - t(x^{**}(\tilde{\theta}), \tilde{\theta}) - \frac{1-F(\tilde{\theta})}{f(\tilde{\theta})} \frac{d}{d\tilde{\theta}} t(x^{**}(\tilde{\theta}), \tilde{\theta})\} f(\tilde{\theta}) d\tilde{\theta} \right\}. \tag{13}$$

If the plaintiff drops her lawsuit, she will receive no damage award. The net expected gain for the plaintiff from dropping the case would be

$$\int_{\underline{\theta}}^{\overline{\theta}} r(\theta)\varphi(\theta) f(\theta) d\theta.$$

All other definitions and assumptions remain unchanged. Figure 8 illustrates the game.

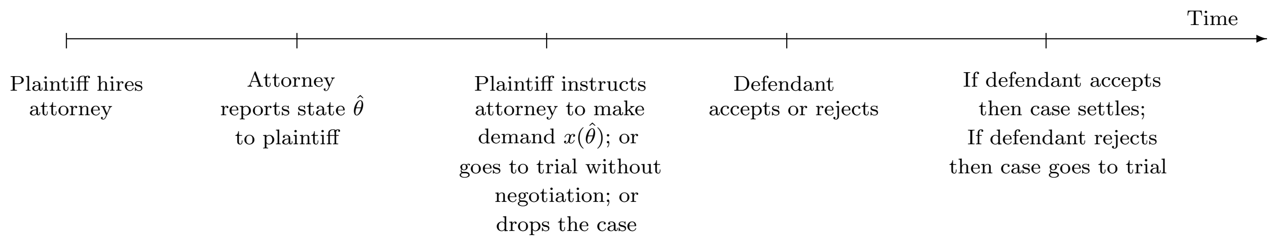

Figure 8. Timing of Litigation with Attorney (dropping cases)

The equilibrium takes a simple form. If θ is sufficiently low (below k), the plaintiff decides to drop the case; if θ is sufficiently high (greater than a cutoff level θ^{**}, the plaintiff decides to settle; otherwise ($k < \theta \leq \theta^{**}$)

The following proposition is an extension of Proposition 2.

Proposition 5. *The plaintiff's optimal contract* $\langle \phi^{**}, x^{**}, r^{**} \rangle$ *entails*

(i) *The plaintiff will bargain with the defendant and settle the dispute if* $\theta \geq \theta^{**}$, *where* θ^{**} *is given by*

$$\theta^{**} = x^{**}(\theta^{**}) - t(x^{**}(\theta^{**}), \theta^{**}) + \frac{1-F(\theta^{**})}{f(\theta^{**})} \frac{d}{d\theta} t(x^{**}(\theta), \theta^{**}) + k.$$

with $x^{**}(\cdot)$ given by $\frac{d}{dx} t(x^{**}(\theta), \theta) - \frac{1-F(\theta)}{f(\theta)} \frac{\partial^2}{\partial x \partial \theta} t(x^{**}(\theta), \theta) = 1$. *She will go to trial if* $k \leq \theta \leq \theta^{**}$. *She will drop the case if* $\theta < k$.

(ii) $u(\theta) = 0$ and $\{x^{**}(\theta), r^{**}(\theta)\} = \{0, 0\}$ *for* $[\underline{\theta}, \theta^{**}]$;

(iii) $u(\theta) = -\int_{\theta^{**}}^{\theta} \{\frac{d}{d\tilde{\theta}} t(x^{**}(\tilde{\theta}), \tilde{\theta})\} d\tilde{\theta}$ *for* $\theta \in [\theta^{**}, \overline{\theta}]$.

Proof. I only give the proof of (i) of the proposition. The proofs of (ii) and (iii) are similar to those in Proposition 2. Suppose in negation that will go to trial at some $\theta_1 < k$ in state θ_1. Then, the plaintiff earns net payoff $\theta_1 - k < 0$. But she could earn 0 by dropping the case at θ_1 while setting $x(\theta_1) = 0$ and $r(\theta_1) = 0$ without violating conditions (α) and (β). Therefore, going to trial at $\theta_1 < k$ cannot occur in equilibrium. So we have arrived at a contradiction. ■

References

[1] Apple, J., and Deyling, R. (1995): "A Primer on the Civil-Law System", *Federal Judicial Center*, pp. 37.

[2] Bagnoli, M., and Bergström, T. (2005): "Log-concave probability and Its Applications", *Economic Theory* 89-23, Univesity of Michigan.

[3] Baron, D., and Myerson, R. (1982): "Regulating a Monopolist with Unknown Costs", *Econometrica*, 26, pp. 445-69.

[4] Bebchuk, L. A. (1984): "Litigation and Settlement under Incomplete Information", *Rand Journal of Economics*, 15, pp. 404-15.

[5] Boon, A. (1995): "Ethics and Strategy in Personal Injury Litigation", *Journal of Law and Society*, 22, pp. 353-73.

[6] Cooter, R., Marks, S. & Mnookin, R. (1982): "Bargaining in the Shadow of the Law: A Testable Model for Strategic Behavior", *Journal of Legal Studies* 11, pp. 225.

[7] Daughety, A. F. and Reinganum, J. F. (2005): "Economomic Theories of Settlement Bargaining", *Annual Review of Law and Social Science* 1, pp. 35-59.

[8] Eisenberg, T., and Farber, H. S. (1996): "The Litigious Plaintiff Hypothesis: Case Selection and Resolution", *Rand Journal of Economics*, 28, pp. 92-112.

[9] Farber, H. S., and White, M. J. (1991): "Medical Malpractice: An Empirical Examination of the Litigation Process", *The RAND Journal of Economics*, 22, pp. 199-217.

[10] Farmer, A., and Pecorino, P. (2002):"Pretrial Bargaining with Self-serving Bias and Asymmetric Information", *Journal of Economic Behavior & Organization*, 48, pp. 163-76.

[11] Flood, J. (1983): "Barristers' Clerks: The Law's Middlemen", *Manchester & Dover, NH: Manchester University Press.*

[12] Fudenberg, D., and Tirole, J. (1991): "Game Theory", MIT Press, Cambridge Mass. pp. 263, 265, 267.

[13] Genn, H. (1988): "Hard Bargaining: Out of Court Settlement in Personal Injury Actions", *Oxford: Clarendon Press.*

[14] Gould, J. (1973): "The Economics of Legal Conflicts", *The Journal of Legal Studies*, 2, pp. 279-300.

[15] Harris, D., MacLean, M., Glenn, H., Lloyd-Bostock, S., Fenn, P., Corfield, P., and Brittan, Y. (1987): "Compensation and Support for Illness and Injury", *American Journal of Comparative Law*, 35, pp. 431-35.

[16] Hersch, J., and Viscusi, W. (2007): "Tort Liability Litigation Costs", *Vanderbilt Law and Economics Research Paper* No. 07-16

[17] Hylton, K. "Asymmetric Information and the Selection of Disputes for Litigation", *The Journal of Legal Studies*, 22, pp. 187-210.

[18] Jackson, R. (1977): "The Machinery of Justice in England (7th ed.)", *Cambridge: Cambridge University Press*, pp. 418-33, 448-56.

[19] Jones, S. R. G. (1989): "The Role of Negotiators in Union-Firm Bargaining", *The Canadian Journal of Economics*, 22, pp. 630-42.

[20] Kennan, J., and Wilson, R. (1993): "Bargaining with Private Information", *Journal of Economic Literature*, 31, pp. 45-104.

[21] Kritzer, H. (1989): "A Comparative Perspective on Settlement and Bargaining in Personal Injury Cases", *Law & Social Inquiry*, 14, pp. 167-84.

[22] Laffont, J., and Tirole, J. (1993): "A Theory of Incentives in Procurement and Regulation", MIT Press, Cambridge Mass. pp. 39, 55, 119.

[23] Landes, W. (1971): "An Economic Analysis of the Courts", *Journal of Law and Economics*, 14, pp. 61-107.

[24] McQuillan, L. J., Abramyan, H., Archie, A. P., Johnson, J. A., and Erokhina, A. (2007): "Jackpot Justice The True Cost of America's Tort System", Pacific Research Institute, San Francisco. ISBN-13: 978-1-934276-00-6.

[25] Milgrom, P., and Segal, I. (2002): "Envelope Theorems for Arbitrary Choice Sets", *Econometrica*, 70, pp. 583-601.

[26] Myerson, R. (1979): "Incentive Compatibility and the Bargaining Problem", *Econometrica*, 47, pp. 61-74.

[27] Myerson, R. (1981): "Optimal Auction Design", *Mathematics of Operationas Research*, 6, pp. 58-73.

[28] Nalebuff, B. (1987): "Credible Pretrial Negotiation", *The RAND Journal of Economics*, 18, pp. 198-210.

[29] NAO (2001): "Handling Clinical Negligence in England", National Audit Office, London. HC 403, Session 2001-01.

[30] Posner, R. (1973): "An Economic Approach to Legal Procedure and Judicial Administration", *The Journal of Legal Studies*, 2, pp. 399-458.

[31] P'ng, I. (1983): "Strategic Behavior in Suit, Settlement, and Trial", *Bell Journal of Economics*, 14, pp. 539-50.

[32] Rubinfeld, D. L. and Scotchmer, S. (1993): "Contingent Fees for Attorneys: an Economic Analysis", *The RAND Journal of Economics*, 24, pp. 343-56.

[33] Sieg, H. (2000): "Estimating a Bargaining Model with Asymmetric Information: Evidence from Medical Malpractice Disputes", *Journal of Political Economy*, 108, pp. 1006-21 .

[34] Siegelman, P., and Waldfogel, J. (1999): "Toward a Taxonomy of Disputes: New Evidence through the Prism of the Priest/Klein Model", *Journal of Legal Studies*, 28, pp. 101-30.

[35] Schelling, T. C. (1956): "An Essay on Bargaining", *The American Economic Review*, 46, pp. 281-306.

[36] Schweizer, U. (1989) : "Litigation and Settlement under Two-Sided Incomplete Information", *The Review of Economic Studies*, 56, pp. 163-78.

[37] Spier, K. (1992): "The Dynamics of Pretrial Negotiation", *Review of Economic Studies*, 59, pp. 93-108.

[38] Strausz, R. (2006): "Deterministic versus Stochastic Mechanisms in Principal-Agent Models," *Journal of Economic Theory*, 127, pp. 306-14.

[39] Swanson, T. M. (1988): "Bargaining with Repeat Players: the Impact of Insurance Compnay Defendants upon Tort Litigation", *University College London Discussion Paper*, No. 88-08.

[40] Swanson, T. M., and Mason, R. (1998): "Nonbargaining in the Shadow of the Law", *International Review of Law and Economics*, 18, pp. 121-40.

[41] Tillinghast (2006): "U.S. Tort Costs and Cross-Border Perspectives: 2005 Update", New York: Tillinghast-Towers Perrin.

[42] Vidmar, N., Gross, F., and Rose, M. R. (1998): "Jury Awards for Medical Malpractice and Post-Verdict Adjustments of Those Awards", *DePaul Law Review*, 48, pp. 265-301.

[43] Waldfogel, J. (1998): "Reconciling Asymmetric Information and Divergent Expectations Theories of Litigation", *Journal of Law and Economics*, 41, pp. 451-76.

[44] Watanabe, Y. (2007): "Estimating the Degree of Experts Agency Problem: The Case of Medical Malpractice Lawyers", *American Law & Economics Association Annual Meetings 2007*.

[45] Watts, A. (1994): "Bargaining through an Expert Attorney", *Journal of Law, Economics, & Organization*, 10, pp. 168-86.