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LIABILITY AND LITIGATION UNDER SELF-SERVING BIAS

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This paper presents a strategic model of litigation under asymmetric information about the (economic) damage level, and divergent beliefs about the size of the compensatory award (economic and noneconomic) characterized by self-serving bias. In the unique separating universally-divine perfect Bayesian equilibrium, some cases are resolved out-of-court and some go to trial. We find that the self-serving bias in the litigants' beliefs about the size of the award unambiguously increases the likelihood of trial and the defendant's expected losses. Although the parties' biases might act as a commitment device to adopt a tough bargaining position, we observe that litigants do not generally benefit from this device. We then extend our basic model by allowing for accident prevention and endogenous filing and find that the self-serving bias reduces expenditures on accident prevention, but counterintuitively, reduces filing by injurees. We also study the effects of caps on non-economic damages. Following empirical regularities, we assume that the bias on litigants' beliefs about the size of the award is a function of the cap, and this relationship depends on the size of the cap relative to the economic damage level. We find that, under certain conditions, the adoption of damage caps increases the likelihood of dispute.

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1 Introduction

Bargaining processes are found in at least four different domains: civil litigation, labor negotiations, international negotiations and market operations (trade). Delayed settlement or impasse causes high costs for the parties and for society. These costs range from the resources devoted to attorneys' fees, to costs related to work stoppages, war, and suspension of trade operations.[1] In civil litigation, although most cases settle before trial, many do not settle early, and some do not settle at all. Applied models of pre-trial settlement bargaining have been developed to explain the sources of negotiation breakdown and to propose mechanisms to improve efficiency. Primarily law, economics and game theory have influenced these models. Two main sources of dispute have been studied, divergent beliefs and asymmetric information.

Seminal models of litigation view impasse as a consequence of disputants' divergent beliefs about the award at trial outcome due to uncertainty about the judicial adjudication. For instance, Priest and Klein (1984) argue that potential litigants are unable to estimate precisely the decision of a judge or jury if a case goes to trial.[2] Similarly, Shavell (1982) assesses theoretically the conditions under which a lawsuit is filed and disputes arise, in an environment that allows for divergent exogenous litigants' beliefs about the likelihood of prevailing at trial and the size of the award at trial.[3]

Babcock et al. (1995a) propose an explanation for impasse that also rests on disputants' divergent beliefs about the judicial decisions but that differs from Priest and Klein' s(1984) in one important aspect. Drawing upon psychological research documenting systematic biases in individual judgments of

[1] To assess the magnitude of cases and expenditures in civil litigation, take the case of the American tort system. The number of new lawsuits filed each year in the United States, in state and federal courts, is approximately 19 million. The estimated cost of the American tort system is 117 billion dollars. Only 40 percent of these expenses serve to compensate victims while most of the rest represents lawyers' fees (The Economist, 1992; Hyde, 1995; and O' Beirne, 1995; as quoted in Coghlan and Plott, 1997).

[2] They show that, if both parties exhibit *unbiased* but incorrect beliefs of the award at trial, half of the time plaintiffs will anticipate a higher judgment than defendants. Disputes will occur when the plaintiff's estimate of the award at trial exceeds the defendant's by enough to offset the incentive for settlement that is produced by risk aversion and trial costs.

[3] This model is then used to analyze the likelihood of trial under two methods for allocation of the legal costs, the American and English rules (under the American rule, each party pays its litigation costs; and, under the English rule the losing party pays the litigation costs of both parties) and finds that, when the plaintiff is sufficiently optimistic about prevailing at trial, the likelihood of trial will be higher under the British rule.

fairness, they conjecture that predictions of judicial decisions will be *systematically biased in a self-serving manner.*[4] In a series of experimental studies, Babcock et al. (1995a, 1997) and Loewenstein, et al. (1993) demonstrate that subjects consistently arrive to self-serving predictions of trial outcomes.[5] Bebchuk (1984) and Reinganum and Wilde (1986), on the other hand, explore the connection between asymmetric information and disputes using a game-theoretic approach. Both frameworks show that, disputes might occur even in environments with no divergent expectations when asymmetric information is present.[6]

Our paper captures these two important sources of bargaining failure, asymmetric information and divergent beliefs characterized by self-serving bias. We present a strategic model of litigation under asymmetric informa-

[4]The authors claim that, even when parties have the same information, they will come to different conclusions about what a fair settlement would be and base their predictions of judicial behavior on their own views of what is fair. As a result, expectations of an adjudicated settlement are likely to be biased in a manner that increases the likelihood of an impasse. Whereas Priest and Klein (1984) would argue that the parties are drawing randomly from the same distribution of judicial preferences, Babcock et al. (1995a) claim that they are, in effect, drawing from different distributions.

[5]In these experiments, subjects were randomly assigned the role of plaintiff or defendant and given detailed materials outlining a personal injury lawsuit. Before settlement discussions, each subject predicted the trial outcome after being assured their prediction would not be shared with their adversary. Although plaintiff and defendant subjects received identical case materials, plaintiffs' estimates exceeded defendants' estimates by a substantial margin.

In addition, experimental evidence suggests that self-serving bias is generally resilient to debiasing mechanisms (see Babcock and Loewenstein, 1997). Note that the self-serving bias might represent a powerful commitment device in negotiations, leading to better outcomes for the biased party. This might explain its resilience to debiasing mechanisms. An interesting analysis of the persistence of the unrealistic optimism under an evolutionary game-theoretic approach is presented in Bar-Gill (2007).

[6]Bebchuk (1984) presents a screening game between an uninformed plaintiff and an informed defendant. He shows that information asymmetry on the plaintiff's likelihood of prevailing in court might lead to disputes. In addition, he finds that an increase in the award at trial increases the settlement amount and the likelihood of disputes, and that the adoption of the English rule increases the likelihood of trial. Reinganum and Wilde (1986), on the other hand, construct a signaling model of settlement and litigation between an informed plaintiff and an uninformed defendant. They find that, when both parties share common beliefs about the likelihood of a judgment in favor of the plaintiff, asymmetric information about the damages suffered by the plaintiff is sufficient to generate disputes. They also show that in an environment characterized by common beliefs about the likelihood of a judgment in favor of the plaintiff and plaintiff' retention of the entire settlement, then the system for allocating litigation costs does not affect the likelihood of disputes.

tion about the economic damage level and self-serving beliefs about the size of the award (economic and non-economic damages). Our model extends Reinganum and Wilde (1986) by allowing for self-serving beliefs about the size of the award and caps on non-economic damages. We focus on a unique universally-divine separating equilibrium. In this equilibrium, some cases are resolved out-of-court and some go to trial. We find that the self-serving bias in the litigants' beliefs about the size of the award unambiguously increases the likelihood of trial. We then derive conditions under which the introduction of caps on non-economic damages increases the likelihood of disputes. Interestingly, these findings are robust to model specification.

Our strategic environment involves two Bayesian risk-neutral litigants, a defendant and a plaintiff. The dispute is originated by an act committed by the defendant, which harmed the plaintiff. We assume that only the plaintiff knows the amount of economic damage inflicted.[7] We also assume that in an information environment characterized by ambiguity about the size of the non-economic award and "unpredictability" on non-economic damages,[8] the litigants will exhibit self-serving bias in their beliefs about the award at trial. The dynamics of the game involves a take-it-or-leave-it proposal by the informed plaintiff. An acceptance of the offer by the defendant implies an out-of-court settlement. If the defendant rejects the plaintiff's proposal, the case goes to trial. Using the court to resolve the dispute is costly to both the defendant and the plaintiff and may be subject to error.

We first characterize the equilibrium of the asymmetric information game played by litigants who exhibit self-serving bias in their beliefs about the award at trial. The litigants' unawareness of their own bias and the bias of their opponent permits us to apply the perfect Bayesian equilibrium concept. This equilibrium specifies, for the biased plaintiff and defendant, a settlement demand for each possible level of damages given the plaintiff's biased beliefs

[7] Following Reinganum and Wilde (1986), we assume that although during bargaining, information may be exchanged, at the end of this process there is still some residual uncertainty on the part of the defendant about the level of true economic damages; that is, the defendant knows only that true economic damages are confined to some range and are distributed according to some frequency distribution.

[8] Non-economic damages are primarily intended to compensate plaintiffs for injuries and losses that are not easily quantified by a dollar amount (pain and suffering, for instance). These awards have been widely criticized for being unpredictable (Economic Report of the President, 2004). "Unpredictability" of non-economic damages may also affect the beliefs of the litigants about the size of the award. As Babcock et al. (1997) suggest, self-serving bias on litigants' beliefs might be triggered by environments characterized by ambiguous information.

about the size of the award, and a probability of rejection for each possible level of settlement demand which is aligned to the defendant's biased beliefs about the distribution of awards, respectively. We focus our analysis on the unique separating universally-divine perfect Bayesian equilibrium, in which some cases are resolved out-of-court and some go to trial. Our results unambiguously indicate that the self-serving bias in the litigants' beliefs about the size of the award increases the likelihood of trial, the plaintiff's expected net payoff, and the defendant's expected loss.

We then extend our basic model by allowing for costly accident-prevention measures by prospective defendant and for endogenous filing decision by injurees. In the modified framework the likelihood of being found liable by the court is lower if the defendant did invest in accident prevention. We find that the self-serving bias of the prospective defendant reduces spending on accident prevention and raises the probability of an accident. We also obtain a counterintuitive result that self-serving bias of the plaintiff *lowers* filing. This happens because an injuree (prospective plaintiff) believes that the injurer (prospective defendant) shares his biased beliefs about the size of the award. Therefore, in view of prospective plaintiffs, prospective defendants exercise higher care (take more precautions).

Finally, we extend our basic model by allowing for caps on non-economic damages.[9] Experimental evidence suggests that self-serving beliefs about the award at trial are influenced by damage caps. Following these empirical regularities, we assume that the bias on litigants' beliefs about the size of

[9] There is a common perception that excessive non-economic damage awards promote unnecessary litigation (Danzon, 1986) and the escalation of liability insurance premiums. In an attempt to overcome some of these negative effects, several US states have implemented different kinds of tort reform (Sloane, 1993). Some reforms take the form of caps or limits on non-economic and punitive damage awards. Damage caps have been widely implemented in the U.S. Approximately thirty states currently employ some form of liability limits (Babcock and Pogarsky, 1999). Specifically, by 2007, twenty-six states had enacted some type of caps on non-economic damages (Avraham and Bustos, 2010).

There exist as many different cap schemes as states that employ them. Ranging from Georgia's straightforward cap, which limits punitive damages to $250,000, to elaborate attempts to tailor punitive damages to the assets of the defendant and the degree that the defendant benefited from its tortuous conduct. Some states employ a flat dollar cap, a multiplier of compensatory damages, or some combination of both. Some caps pertain to all civil cases, while others apply to certain classes of actions, such as medical malpractice or product liability. "[T]he variety of statutory damage limitations share a common feature– they circumscribe a previously unbounded array of potential trial outcomes" (Babcock and Pogarsky, 1999; p. 345). In this paper, we initially employ a straightforward cap, one that limits plaintiff's recovery to a specific dollar amount. i.e., reduces the maximum plaintiff's recovery.

the award is a function of the cap, and that this relationship depends on the size of the cap relative to the damage level. We find that, under certain conditions, the adoption of damage caps increases the likelihood of dispute.[10]

Several policy implications follow from our analysis.[11] Note first that asymmetric information and self-serving bias might influence pretrial bargaining outcomes, in separate and combined ways. Then, a model of litigation aimed to guide the design of public policy must encompass these two potential sources of dispute. Specifically, our model points to the significance of combining the strategic behavior of litigants with their potential cognitive biases for the analysis of pretrial bargaining outcomes. In addition, our analysis underlines the importance of combining these two bargaining failure forces to the study of the effects of tort reform on litigation outcomes. In particular, the analysis indicates, somewhat counter-intuitively, that damage caps may increase the likelihood of disputes. The reason is this: when damage caps are high relative to the true damage, then the parties might tend to align their beliefs about the award at trial according to this high focal point. As a consequence, the likelihood of disputes might increase.

To the best of our knowledge, only Farmer and Pecorino (2002) analyze litigation using a game-theoretic model that allow for asymmetric information and self-serving bias. They extend Bebchuk (1984) by allowing for self-serving bias. The source of information asymmetry is the plaintiff's probability of prevailing at trial. Although the defendant possesses private information about this parameter, they assume that both players exhibit self-serving biases on their assessment of the plaintiff's probability of prevailing at trial. In addition, they assume that the plaintiff is aware about the defendant's bias. Note that empirical findings indicate that self-serving

[10] Babcock and Pogarsky (1999) analyze the effect on settlement rates of a damage cap set lower than the value of the underlying claim, using a bargaining experiment. They find that damage caps constrain the parties' judgments and produce more settlement. Pogarsky and Babcock (2001) empirically study the effects of size of the damage caps relative to the actual damage on litigation outcomes. They find that litigants' beliefs about the size of the award are affected by the cap, in case of a relatively high cap, and that this motivating anchoring generates higher likelihood of dispute and higher settlement amounts.

Note that these studies show that low caps (relative to the true damages) might act as *debiasing through law* mechanisms. Landeo (2009) finds that the split-awards tort reform can also act as a *debiasing through law* mechanism. See Jolls and Sunstein (2006) for a general discussion of debiasing through law. See Landeo, Nikitin, and Baker (2007) for a previous theoretical analysis of the effects of damage caps.

[11] As Shavell (1982) states, '[T]he aim [of a model] is [...] to provide a generally useful tool for thought" (p. 56).

bias occurs in environments characterized by ambiguity, which is not the case of the information environment experienced by the informed defendant. Note also that, experimental studies also suggest that litigants are generally unaware about their own bias and the bias of their opponent. Then, the empirical rationale for Farmer and Pecorino' (2002) assumptions is not clear. The authors find that the plaintiff's bias positively affects the likelihood of trial. The effect of the defendant's bias on the likelihood of disputes is, however, ambiguous and depends on the modeling choice for the bias.[12] In contrast, our model assumptions are aligned with empirical regularities, and our findings are unambiguous and robust to modeling choices.

The paper is organized as follows. Section Two presents the setup of the benchmark model, describes the equilibrium solution, and analyzes the effects of litigants' biases. Section Three studies the impact of biases on the level of care (spending on accident prevention) and decision to file a lawsuit by prospective litigants. Section Four extends the basic model by allowing for caps on non-economic damages and describes the effects of damage caps. Section Five concludes and outlines possible directions for further research.

2 Benchmark Model

This section presents the basic framework, outlines the equilibrium solution, and analyzes the effects of self-serving bias on litigants' equilibrium strategies and pretrial bargaining outcomes. We extend Reinganum and Wilde (1986) by allowing for self-serving beliefs about the size of the award.[13]

2.1 Model Setup

Our pretrial bargaining model consists of a signaling game, where two Bayesian risk-neutral players, a plaintiff and a defendant, negotiate prior to a costly trial. The model assumptions and sequence of moves are as follows. Nature decides the economic-damage level d (plaintiff's type) from a continuum of types. This level is informed only to the plaintiff. The defendant knows

[12] In their model, the bias is applied to the plaintiff's probability of prevailing at trial p. Under a multiplicative bias, they find that the effect of the bias of the defendant is ambiguous. Under an additive bias, on the other hand, an increase in the bias of the defendant increases the likelihood of trial.

[13] Most of the notation used in this section follows Reinganum and Wilde (1986).

that the economic damages lie within some interval $[\underline{d}, +\infty)$ and are distributed according to a strictly increasing frequency distribution $F(d)$. The informed plaintiff then makes a take-it-or-leave-it settlement proposal, S to the defendant. We allow S to take on any value in $(-\infty, +\infty)$, although one would expect it to be nonnegative in equilibrium. If the defendant rejects the proposal, the case goes to trial. There is an exogenous probability, $(1-\pi)$, that the court will make a mistake and find (incorrectly) in favor of the defendant. Note that the court finds (correctly) in favor of the plaintiff with the complementary probability π. Then, π can be interpreted as the measure of court accuracy, which is common knowledge. If the court finds in favor of the plaintiff, it perfectly assesses the extent of true economic damages, d and awards compensation to the plaintiff. This compensation need not equal true economic damages. In fact, the court may also award non-economic damages.[14] The award when true economic damages are d is assumed to be td, where $t \geq 1$. When $t > 1$, the court awards non-economic damages. We denote the non-economic damage award by A. Then, when $t > 1$, $A = (t-1)d$, i.e., non-economic damages A will be equal to the total award at trial td minus the economic part of the award d.[15] We assume that trial is costly. Specifically, c_i, $i = P, D$, denote expected litigation costs for the plaintiff and the defendant, respectively. The total litigations costs are common knowledge and denoted by T.

Following empirical regularities, we also assume that in an information environment characterized by ambiguity and unpredictable non-economic awards, the litigants exhibit self-serving beliefs about the *award to economic damage* ratio, t, i.e., the size of the total award at trial.[16]

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[14] Economic and non-economic damages are the main components of compensatory damages. For instance, in auto accident cases, economic damages are defined very generally as money damages intended to compensate an injured party for actual economic loss. (Texas Statutes Civil Practice and Remedies Code, Chapter 41: Damages, Section 41.001(4)).

Non-economic damages, on the other hand, may include ((Texas Statutes Civil Practice and Remedies Code, Chapter 41: Damages, Section 41.001(12)): physical pain and suffering, mental or emotional pain or anguish, disfigurement, physical impairment, loss of companionship and society, inconvenience, loss of enjoyment of life, injury to reputation, loss of consortium (loss of spousal companionship and services).

[15] We assume that the economic part of the award is equal to the true economic damage level, which is perfectly observed by the court when no mistake is present. We also assume that the total compensatory award is proportional to the true damages d. However, our results are robust to other specifications of the relationship between the total compensatory damages and d.

[16] Note that in Reinganum and Wilde's (1986) setting, t is a constant perfectly known by both litigants. In real-world settings, however, given the ambiguity of the information

Specifically, we assume that the plaintiff believes that the *award to economic damage* ratio is $t + h_P$ (an additive bias), and the defendant believes that this ratio is $t - h_D$, where $h_P > 0$ and $h_D > 0$. Then, the self-serving bias regarding the award at trial for the plaintiff is equal to $h_P d$, and the self-serving bias regarding the award at trial for the defendant is equal to $h_D d$. [17]

Importantly, we assume that the litigants are neither aware about their own bias nor about the bias of the other party. In other words, both litigants assume that their individual beliefs about the value of the parameter affected

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environment and the unpredictability of punitive damage awards, the parties' beliefs about the award at trial might be formed in a self-serving manner.

Note also that in Reinganum and Wilde (1986), the actual damage type is represented by d. They assume that d is distributed over the interval $[\underline{\mathrm{d}}, \bar{d}]$. The introduction of biased beliefs about the size of the award requires a modified assumption about the upper bound of the distribution of damage types. Under the original assumption, the plaintiff with the highest damage type and self-serving beliefs about the size of the award at trial will make an offer that exceeds the equilibrium offer for a plaintiff with type $\bar{d}$, which will not be an equilibrium strategy from the defendant's perspective. As a result, we now assume that the distribution of damage types does not have an upper bound.

[17] The incorporation of the self-serving bias can be accomplished in at least eight meaningful ways. Our qualitative results are robust across these different settings. In every case both parties play the same asymmetric-information game. However, in each case litigants have biased perception about different parameters of the model and/or the bias is modeled in a different form (i.e., multiplicative or additive form). The relevant parameters are: the actual damage type, d, the probability that the court will find in favor of the plaintiff, π, the size of the award, which is captured through the award-to-damage ratio, $t = \text{Award/d}$, and the court fee of the defendant, c_D. For each parameter we can consider 2 types of bias, an additive bias, and a multiplicative one.

The biases affecting litigants' perception of π, and the biases affecting the plaintiff's perception of d and c_D are defined in exactly the same way. The bias affecting the defendant's perception of d should be defined differently, because in this asymmetric information framework, the defendant knows only the distribution of damage types, not the actual damage of the plaintiff who sues him. We assume that the defendant has a biased perception of the whole distribution, i.e. he believes that the award is distributed over the interval $[\underline{\mathrm{d}} - h_D, +\infty)$ and that the whole distribution is just shifted to the left with all the second and higher moments preserved. Mathematically, the defendant believes that the probability density function of the damage is $f(x)$ that has the following property: for any d_1 and d_2, such that $d_2 > d_1 \geq \underline{\mathrm{d}}$, $\int_{d_1}^{d_2} f(x)dx = \int_{d_1 - h_D}^{d_2 - h_D} f(x)dx$, where $h_D > 0$. Analogously, for the case of multiplicative bias, the defendant believes that the whole distribution is shifted to the left and compressed in such way that for any d_1 and d_2 such that and $d_2 > d_1 \geq \underline{\mathrm{d}}$ the actual probability of the damage type being in the interval $[d_1, d_2]$, $\int_{d_1}^{d_2} f(x)dx = \int_{h_D * d_1}^{h_D * d_2} f(x)dx$, where $h_D < 1$. Given the robustness of our results to model specification, we present the analysis of the additive self-serving bias on the award-to-damage ratio, t.

by the bias are correct and shared by the other party. Hence, the plaintiff presumes that $t+h_P$ is the shared belief about the *award to economic damage* ratio. Similarly, the defendant presumes that $t - h_D$ is the shared belief. These assumptions are aligned with empirical findings.

Given these assumptions, the plaintiff's expected net payoff at trial is $\pi(t + h_P)d - c_P$. If the plaintiff's settlement demand S is accepted, the plaintiff's payoff is equal to S. Similarly, the defendant's expected loss at trial is $-\pi(t - h_D)d - c_D$. His loss under out-of-court settlement is $-S$. Finally, we assume that $\pi(t+h_P)d \geq c_P$, so that a party damaged by a firm (potential defendant) will always has an incentive to file a lawsuit.

2.2 Equilibrium Solution

We characterize the equilibrium of an asymmetric information game played by litigants who exhibit self-serving bias in their beliefs about the award at trial. The litigants' unawareness of their own bias and the bias of their opponent permits us to apply the perfect Bayesian equilibrium (PBE) concept. Note that, although all the requirements of the PBE concept are satisfied, the application of this concept involves the litigants' self-serving beliefs about the award at trial.

We approximate the environment in which litigants are unaware of their own bias and the bias of the other party through a game between the litigant and an "apparent opponent."[18] Specifically, each litigant believes that her *apparent* opponent plays an equilibrium strategy that reflects the litigant's biased beliefs about the award at trial, i.e., an *apparent* opponent's strategy. Then, the litigant's equilibrium strategy corresponds to her best response to the equilibrium strategy of this *apparent* opponent. This equilibrium specifies, for the biased plaintiff and defendant, respectively, a settlement demand for each possible level of damages given the plaintiff's biased beliefs about the size of the award, and a probability of rejection for each possible level of settlement demand which is aligned to the defendant's biased beliefs. Given the litigants' unawareness of the biases, both parties believe that their own beliefs are shared by the other party. Then, this equilibrium should also include a settlement demand that the biased defendant assigns to each plaintiff's type (a settlement demand for the apparent plaintiff), and

[18]The word "apparent" refers to "appearing as actual to the eye or mind" (*Merriam-Webster Dictionary*; http://www.merriam-webster.com/dictionary/; online search July 23, 2009).

a probability of rejection for each possible level of settlement demand that the biased plaintiff assigns to the defendant (a probability of rejection for the apparent defendant). In this sense, the equilibrium of this game involves the application of the PBE concept twice.

We focus our analysis on the separating universally-divine perfect Bayesian equilibrium (PBE) in which the biased defendant believes that he can assess the plaintiff's damage type by the size of the settlement demand he makes. We derive closed-form characterizations of the equilibrium settlement demand for the actual and apparent plaintiff, and the probability of rejection for the actual and apparent defendant. In this equilibrium, some cases are resolved out-of-court and some go to trial.

A strategy for the plaintiff, is a function $S = S(d)$, which specifies a settlement demand for each possible level of damages. The plaintiff plays the game against an *apparent* defendant.[19] A strategy for the apparent defendant is a function $p_a = p_a(S)$, which specifies the probability that the apparent defendant rejects the demand S. Because the apparent defendant does not know the true damages d, the plaintiff infers that he must form some conjectures or beliefs about d. The plaintiff assigns beliefs to the apparent defendant on the basis of the settlement demand S, Bayes' rule, and the plaintiff's biased beliefs about the award at trial. Define point beliefs $d = b_a(S)$, which assign a unique type of plaintiff (level of damages) to each settlement demand. Given the beliefs $b_a(.)$, the expected payoff for the apparent defendant when a demand S is made by the plaintiff and he rejects it with probability p_a, is

$$\Pi_{Da}(S, p_a; b_a) = p_a[-\pi(t + h_P)b_a(S) - c_D] + (1 - p_a)(-S). \qquad (1)$$

The expected payoff for a plaintiff who has suffered damages d, demands S to settle, and takes as given the strategy $p_a(S)$ of the apparent defendant, is

$$\Pi_P(d, S; p_a) = p_a(S)(\pi(t + h_P)d - c_P) + (1 - p_a)(S). \qquad (2)$$

Similarly, the defendant plays a game against an *apparent* plaintiff. The strategy for the apparent plaintiff, is a function $S_a = S_a(d)$, which specifies a settlement demand for each possible level of damages. A strategy for the defendant is a function $p = p(S_a)$, which specifies the probability that the defendant rejects the demand S_a. Because the defendant does not know the

[19]The superscript a refers to the *apparent* players.

true damages d, he must form some conjectures or beliefs about d on the basis of the settlement demand S_a, Bayes' rule, and his biased beliefs about the award at trial. Define point beliefs $d = b(S_a)$, which assign a unique type of plaintiff (level of damages) to each settlement demand. Given the beliefs $b(.)$, the expected payoff for the defendant when a demand S_a is made by the apparent plaintiff and he rejects it with probability p, is

$$\Pi_D(S_a, p; b) = p[-\pi(t - h_D)b(S_a) - c_D] + (1 - p)(-S_a). \tag{3}$$

The expected payoff for a apparent plaintiff who has suffered damaged d, demands S_a to settle, and takes as given the strategy $\rho(S)$ of the defendant, is

$$\Pi_{Pa}(d, S_a; p) = p(S_a)(\pi(t - h_D)d - c_P) + (1 - p)S_a \tag{4}$$

We follow Reinganum and Wilde (1986) and focus on a separating equilibrium, in which each type of the plaintiff makes a distinct settlement demand, and defendant deduces the type of the plaintiff from the demand. As Reinganum and Wilde (1986) show, one can apply the universal divinity refinement due to Banks and Sobel (1987) to eliminate pooling and partially-pooling equilibria.

Definition. A set $(b^*, p^*, S^*, b_a^*, p_a^*, S_a^*)$ is a separating PBE equilibrium if:

(a1) Given the beliefs b_a^*, assigned by the plaintiff to the apparent defendant, the probability of rejection $p_a^*(.)$ maximizes the *apparent* defendant's expected payoff;

(b1) Given the probability of rejection p_a^*, assigned by the plaintiff to the apparent defendant, the settlement demand S^* maximizes the plaintiff's expected payoff;

(c1) $b_a^*(S^*(d)) = d$, i.e. the plaintiff believes that the apparent defendant assigns an existing type to every demand S, and that his beliefs are correct for demands made in equilibrium.

(a2) Given his beliefs b^*, the probability of rejection $p^*(.)$ maximizes the defendant's expected payoff.

(b2) Given his probability of rejection p^*, the settlement demand S_a^*, assigned by the defendant to the apparent plaintiff, maximizes the apparent plaintiff's expected payoff;

(c2) $b^*(s_a^*(d)) = d$, i.e., the defendant believes that he assigns an existing type to every demand S, and that his beliefs are correct for demands made in equilibrium.

(d) $b^*(s_a(d)) \in [\underline{d}, +\infty)$,

The definition consists of three parts. (a1)-(c1) are the Reinganum-Wilde equilibrium conditions for the pair plaintiff - apparent defendant. (a2)-(c2) are the Reinganum-Wilde equilibrium conditions for the pair defendant apparent plaintiff. Finally, condition (d) states that the actual settlement demand belongs to the set of apparent plaintiffs equilibrium strategies. In other words, when the defendant observes a settlement demand, "he is never surprised," and assigns a damage type that belongs to the set of existing types to this demand (given his biased beliefs about the award at trial).

We can construct a candidate for equilibrium as follows. Consider first the decision problem facing plaintiff playing against an *apparent* defendant. Clearly Π_D is differentiable and concave in the apparent defendant's decision variable p_a. Differentiating Π_D with respect to p_a gives

$$\partial \Pi_{D_a} / \partial p_a = -\pi(t + h_P) b_a(S) - c_D + S. \tag{5}$$

This expression is independent of p_a; if it is positive, then $p_a^*(S) = 1$; if it is negative, then $p_a^* = 0$; if it is zero, then the apparent defendant is indifferent about the value of $p_a^*(S)$. Consider initially an interior solution, in which $p_a^*(S) \in (0,1)$. Then $S^*(d)$ must satisfy $\partial \Pi_D / \partial p_a = 0$, which, after incorporating the consistency condition that $b_a^*(S) = d$, yields

$$s^*(d) = \pi(t + h_P)d + c_D. \tag{6}$$

But the settlement demand function $S^*(d)$ must also solve

$$d\Pi_P / dS = p_a^{*\prime}(S)(\pi(t + h_P)d - c_P - S) + 1 - p_a^*(S) = 0. \tag{7}$$

Combining equations (6) and (7) yields a first-order linear differential equation, which $p_a^*(S)$ must satisfy:

$$-p_a^{'}(S)T + 1 - p_a(S) = 0, \tag{8}$$

where $T = c_P + c_D$ is the total litigation cost. Equation (8) has a one-parameter family of solutions $p_a(S) = 1 + \lambda \exp\{-S/T\}$. As is shown in the Appendix, the appropriate boundary condition is $p_a(\underline{S}_P) = 0$, where

$\underline{S}_P = S^*(\underline{d}) = \pi(t+h_P)\underline{d}+c_D$ is the settlement that would be demanded by the least-damaged plaintiff. This yields the probability of rejection function $p_a(S) = 1 - \exp\{-(S - \underline{S}_P)/T\}$.

We also need to specify beliefs about settlement demands outside the range $[\underline{S}_P, +\infty)$. Recall that the only restriction imposed on these beliefs by the perfect bayesian equilibrium concept is that they do not assign any probability to types that are known not to exist. We find the following off-equilibrium beliefs both simple and intuitive: if $S < \underline{S}_P$, let $b_a^*(S) = \underline{d}$. That is, when a demand is made that ought not to be made by any plaintiff in equilibrium, the defendant believes the plaintiff to be that type whose equilibrium demand is closest to the one that was made.

Similarly, the decision problem facing the defendant who plays against a apparent plaintiff is as follows. Clearly Π_D is differentiable and concave in the defendant's decision variable p. Differentiating Π_D with respect to p gives

$$\partial\Pi_D/\partial p = -\pi(t - h_D)b(S_a) - c_D + S. \tag{9}$$

This expression is independent of p; if it is positive, then $p^*(S) = 1$; if it is negative, then $p^* = 0$; if it is zero, then the defendant is indifferent about the value of $p^*(S)$. Consider initially an interior solution, in which $p^*(S) \in (0, 1)$. Then $S_a^*(d)$ must satisfy $\partial\Pi_D/\partial p = 0$, which, after incorporating the consistency condition that $b^*(S_a(d)) = d$, yields

$$s_a^*(d) = \pi(t - h_D)d + c_D. \tag{10}$$

But the settlement demand function $s^*(d)$ must also solve

$$d\Pi_{P_a}/dS = p^{*\prime}(S)(\pi(t - h_D)d - c_P - S) + 1 - p^*(S) = 0. \tag{11}$$

Combining equations (10) and (11) yields a first-order linear differential equation, which $p^*(S)$ must satisfy:

$$-p^{'}(S)T + 1 - p(S) = 0, \tag{12}$$

where $T = c_P + c_D$ is total litigation costs. Equation (12) has a one-parameter family of solutions $p(S) = 1 + \lambda_D \exp\{-S/T\}$. The appropriate boundary condition is $p(\underline{S}_D) = 0$, where $\underline{S}_D = S_a^*(\underline{d}) = \pi(t - h_P)\underline{d} + c_D$ is the settlement that would be demanded by the least-damaged plaintiff. This yields the probability of rejection function $p(S) = 1 - \exp\{-(S - \underline{S}_D)/T\}$.

We also need to specify beliefs about settlement demands outside the range $[\underline{S}_D, +\infty)$. If $S < \underline{S}_D$, let $b^*(S) = \underline{d}$. That is, when a demand is made that ought not to be made by any plaintiff in equilibrium, the defendant believes the plaintiff to be that type whose equilibrium demand is closest to the one that was made.

Proposition 1. The following set $(b^*, p^*, s^*, b_a^*, p_a^*, s_a^*)$ is the unique separating equilibrium of the game: define $\underline{\mathrm{S}}_D = \pi(t-h_D)\underline{\mathrm{d}}+c_D$ and $\underline{\mathrm{S}}_P = \pi(t+h_P)\underline{\mathrm{d}}+c_D$. Then we have (i) $p^*(S) = 1 - \exp(-(S - \underline{\mathrm{S}}_D)/T)$ for $S \geq \underline{\mathrm{S}}$; and $p^*(S) = 0$ for $S < \underline{\mathrm{S}}_D$; $p_a^*(S) = 1 - \exp(-(S - \underline{\mathrm{S}}_P)/T)$ for $S \geq \underline{\mathrm{S}}_P$; and $p_a^*(S) = 0$ for $S < \underline{\mathrm{S}}_P$; (ii) $s^*(d) = \pi(t + h_P)d + C_D$ and $s_a^*(d) = \pi(t - h_D)d + C_D$; and (iii) $b^*(S) = (S - c_D)/[\pi(t - h_D)]$ for $S \geq \underline{\mathrm{S}}_D$; and $b^*(S) = \underline{\mathrm{d}}$ for $S < \underline{\mathrm{S}}_D$; $b_a^*(S) = (S - c_D)/[\pi(t + h_P)]$ for $S \geq \underline{\mathrm{S}}_P$; and $b_a^*(S) = \underline{\mathrm{d}}$ for $S < \underline{\mathrm{S}}_P$.

Proof. See Appendix.

It is important to note that the defendant 'is not surprised' when he observes s^*. From his point of view, s^* is an equilibrium settlement demand of another type of the plaintiff, the one with a relatively higher damage.

The proof of Proposition 1 can be found in the Appendix, but we give here a sketch of the argument for the necessity of the boundary condition $p^*(\underline{S}) = 0$. Note that $p^*(S)$ must be increasing; since the settlement demand function reveals true damages d, larger settlement demands are less attractive to the defendant. Thus, any discontinuities in $p^*(.)$ must consist of upward jumps. But an upward jump at any demand $S \in [\underline{S}, +\infty]$ implies that the plaintiff d for whom $s^*(d) = S$ would strictly prefer to demand $S - \delta$ for sufficiently small δ.

Note that the equilibrium settlement demand is an increasing function of the extent of damages, and the equilibrium probability of rejection is an increasing function of the settlement demand. Note also that the settlement demand can serve as a signal in this model because the cost of a breakdown in negotiations is lower for a more severely damaged plaintiff, who can expect to obtain more at trial than a less severely damaged plaintiff. Finally note that, although the probability of a judgment in favor of the plaintiff is common knowledge in our model, the potential litigants do not always settle out of court. Asymmetric information regarding the level of damages suffered by the plaintiff and biased beliefs about the size of the award are sufficient to generate a nonzero probability of going to court in equilibrium.[20]

[20]Reinganum and Wilde (1986) show that asymmetry of information is sufficient to

2.3 Effects of the Litigants' Biases

The following propositions state the main comparative statics results regarding the effects of the litigants' biases. Our results suggest that the likelihood of trial is an increasing function of the self-serving bias in the litigants' beliefs about the size of the award.

Proposition 2. For any given damage type, d, the settlement proposal of the plaintiff is increasing in his bias.

$$\frac{\partial S^*(d)}{\partial h_P} > 0$$

This result follows directly from part (ii) of Proposition 1. The plaintiff thinks that t is higher than it actually is. Therefore, he believes that he will get more at trial and makes a higher settlement demand.

Proof. See Appendix.

Corollary 1. The expected settlement demand of the plaintiff is increasing in his bias.

The Corollary 1 follows trivially from Proposition 2, if one aggregates across damage types.

Proposition 3. For any damage type, d, the probability of rejection, $p * (S)$ is increasing in biases of both litigants.

$$\frac{\partial p^*(S)}{\partial h_P} > 0; \frac{\partial p^*(S)}{\partial h_D} > 0;$$

Proof. See Appendix.

The intuition for these results is as follows: A higher self-serving bias of the plaintiff raises his settlement demand (see proposition 2), which, in turn, raises the probability of rejection (see part (i) of Proposition 1). On the other hand, a higher self-serving bias of the defendant reduces the minimum perceived settlement demand of the plaintiff, $\underline{S}$, which in turn increases the

generate this result.

probability of rejection. The probability of rejection depends on the relative place of the actual settlement demand in the distribution: the defendant is more willing to accept relatively low settlement demands and less willing to accept relatively high demands.

Corollary 2. The expected probability of rejection is increasing in the biases of both litigants.

The Corollary 2 follows trivially from Proposition 3, if one aggregates across damage types.

Proposition 4. The expected litigation costs are increasing in the biases of both litigants.

Proof. See Appendix.

Proposition 4 follows trivially from Corollary 2. Litigation costs (court fees) are incurred only if the case proceeds to trial. Hence the higher expected probability of rejection implies a higher expected probability of trial and higher expected litigation costs.

Finally, it is easy to show that the defendant is strictly worse off compared with the game without a self-serving bias. When the defendant rejects the settlement demand of the plaintiff of type d, his expected payoff will be negative $\pi td + c_D$, and that is his expected loss in the game without biases. However, if he accepts the demand, he loses $\pi(t + h_P)d + c_D$, i.e. more than in the game without biases.

On the other hand, the impact of biases on the welfare of the plaintiff is ambiguous. The positive impact of the higher settlement demand may be fully or partially offset by the lower probability of acceptance.

Interestingly, our qualitative results are robust to model specification. In particular, across all 8 specifications, the plaintiff's bias raises his settlement demand, and both biases positively affect the likelihood of disputes.

3 The Effect of Cognitive Biases on the Level of Care and on the Filing Decision

In this section we present an extension of the basic model in which prospective defendants decide on the level of care, i.e. on the level of spending on precautionary measures that reduce the likelihood of the accident. If the defendant did take the costly precautions, he is considered careful by the court and it is not liable for the damages. If the defendant did not take the precautions, he is considered (grossly) negligent, and it is liable for damages. Furthermore, we assume that some (but not all) plaintiffs file the suit. Plaintiffs with the lower damages do not expect to recover their litigation costs, and hence they do not file.

The following subsection solves the model without the cognitive bias. The next subsection studies the impact of the self-serving bias in that framework.

3.1 The Basic Model Extended: Level of Care and Endogenous Filing

We assume that all prospective defendants are *a priori* identical. We are interested in empirically relevant equilibrium, in which some defendants are grossly negligent, but some are not, and hence there exists uncertainty regarding the type of the defendant. Therefore, in equilibrium prospective defendants are indifferent between their two strategies, and they mix them with positive probabilities. We also assume that the probability of an accident is higher if the prospective defendant is grossly negligent, than if it is careful. In mathematical terms, $\gamma_l > \gamma_h$, where l stands for low effort and h stands for high effort.

Once an accident happens, and the plaintiff files a lawsuit, the structure of the game is the same as in section 2. The only difference is that in court the careful (not grossly negligent, or high-effort) defendant expects to pay td with probability π_h, while the grossly negligent (or low-effort) defendant expects to pay td with probability π_l, where $\pi_l > \pi_h$.

As in section 2, we focus on the separating equilibrium, in which plaintiffs demand $S = \pi td + c_D$, and defendants mix accepting and rejecting this settlement demand. However, because of two types of the defendants there exist two candidate equilibria:

Candidate equilibrium 1: Type d plaintiff demands: $S(d) = \pi_l td + c_D$. The grossly negligent (low-effort) defendant rejects this demand with positive probability, while the careful (high-effort) defendant always rejects this demand.

Candidate equilibrium 2: Type d plaintiff demands: $S(d) = \pi_h td + c_D$. The grossly negligent (low-effort) defendant always accepts this demand, while the careful (high-effort) defendant rejects this demand with a positive probability.

Nest, we find a solution to the model compatible with the candidate equilibrium 1. Later on, we show that there is no solution compatible with the candidate equilibrium 2.

In this model extension we allow for endogenous filing, i.e. there exist an (endogenous) level of damage $\tilde{d}$ such that plaintiffs with $d < \tilde{d}$ choose not to file, plaintiffs with $d > \tilde{d}$ do file, and the plaintiff with $d = \tilde{d}$ is indifferent between filing and not filing.

The equilibrium value for $\tilde{d}$ can be computed from the indifference condition of prospective defendant.

$$C + \gamma_h \int_{\tilde{d}}^{+\infty} (\pi_h td + c_D) f(d) dd = \gamma_l \int_{\tilde{d}}^{+\infty} (\pi_l td + c_D) f(d) dd \tag{13}$$

Where C is the cost of precautions, that the prospective defendant has to undertake to be considered careful by the court.

The indifference condition of the type-$\tilde{d}$ plaintiff relates $\tilde{d}$ and the post-accident probability that an accident was caused by a grossly negligent (low-effort) defendant, q.

$$(1-q)(\pi_h t\tilde{d} - c_P) + qp(S(\tilde{d}))(\pi_l t\tilde{d} - c_P) + q(1 - p(S(\tilde{d})))S(\tilde{d}) = 0 \tag{14}$$

Taking into account that

$$S(\tilde{d}) = \pi_l t\tilde{d} + c_D \tag{15}$$

and that using the Universal divinity refinement,

$$p(S(\tilde{d})) = 0, \tag{16}$$

One gets

$$q = \frac{c_P - \pi_l t\tilde{d}}{t\tilde{d}(\pi_l - \pi_h) + T} \tag{17}$$

Finally, q is related to the probability of choosing the low effort by the prospective defendant, ρ_l, through the Bayes rule:

$$q = \frac{\rho_l \gamma_l}{\rho_l \gamma_l + (1 - \rho_l)\gamma_h} \tag{18}$$

Now consider the candidate equilibrium 2: Type d plaintiff demands: $S(d) = \pi_h td + c_D$. The grossly negligent (low-effort) defendant always accepts this demand, while the careful (high-effort) defendant rejects this demand with a positive probability.

In that case, the settlement demand of the threshold type $\tilde{d}$ is:

$$S(\tilde{d}) = \pi_h t\tilde{d} + c_D$$

And by the Universal divinity refinement,

$$p(S(\tilde{d})) = 0$$

The indifference condition of the threshold type $\tilde{d}$ becomes:

$$0 = q(\pi_h t\tilde{d} + c_D) + (1-q)p(S(\tilde{d}))(\pi_h t\tilde{d} - c_P) + (1-q)(1-p(S(\tilde{d})))(\pi_h t\tilde{d} + c_D) \quad (19)$$

which collapses into:

$$\pi_h t\tilde{d} + c_D = 0$$

Which contradicts the assumptions that all variables in the last equation are positive. Hence the only equilibrium of the model is the one compatible with the candidate equilibrium 1.

3.2 The Effect of Self-Serving Bias on the Level of Care and Filing

This subsection utilizes the framework introduced in the subsection 3.1. to analyze the impact of cognitive biases of the litigants on the level of care and filing.

Proposition 5 An increase in the self-serving bias of the plaintiff raises $\tilde{d}$ and hence reduces the likelihood of filing.

This result seems quite counterintuitive. One would expect that injurees should be more likely to file because the cognitive bias leads to excessive optimism regarding their expected payoff at trial. However, one should note that plaintiffs believe that defendants have the same beliefs about t as they do. Therefore, in view of prospective plaintiffs, prospective defendants exercise higher care (take more precautions). The proof of Proposition 5 verifies the positive relationship between t and $\tilde{d}$, In words, prospective plaintiffs expect the higher expected level of care, the higher post-accident probability that an accident was caused by the high-effort plaintiff, and hence, lower expected return from filing for a given level of damage.

Proposition 6 An increase in the self-serving bias of the defendant raises the probability of gross negligence.

This result makes perfect sense. Prospective defendants expect lower damage awards, and hence spend, on average, less on precautions.

4 Damage Caps under Biased Litigants: An Extension

4.1 Model Setup

Now suppose that a cap on the punitive part of the award is introduced. As Babcock et al. (2001) findings suggest, the cap affects the beliefs of the litigants about the court award at trial, and this effect depends on the size of the cap relative to the true damage.

These experimental findings also suggest that the cap should affect the perception of the expected award at trial (the variable affected by the bias) in the same direction for both litigants. Note that the bias for the plaintiff implies that he believes that the award is higher than it actually is. The bias for the defendant implies that she believes that the award is lower than it actually is. Hence, the cap should affect the bias of litigants in the opposite direction. Specifically, a non-binding cap (i.e., a high cap relative to the true damage) should increase the perception of the award for both parties. As a result, the biases for the plaintiff will increase but the bias for the defendant will decrease. A binding cap (i.e., a low cap relative to the true damage), on the other hand, should reduce the perception of the award for both litigants. As a result, the bias of the plaintiff will decrease but the bias of the defendant will increase.

To capture these empirical regularities, we extend the basic framework by modeling the self-serving bias about the size of the award as a function of the cap. We assume that the self-serving bias of the plaintiff, h_P^c, is a function of the difference between the cap, $\bar{A}$, and the punitive part of the expected award, $(t-1)d$: the greater the (positive) difference, the larger the self-serving bias. This assumption implies that the post-cap h_P^c is monotonically decreasing in d. Let us also assume that

$$\lim_{d \to \bar{A}/(t-1)} h_P^c(d) = 0 \tag{20}$$

The last assumption effectively says that the bias vanishes, when d approaches the value, $\bar{A}/(t-1)$, at which the actual (unbiased) punitive damage award equals the cap.

An example of the functional form satisfying the assumptions above is

$$h_P^c = \sqrt{\frac{(t-1)A}{d}} - (t-1)$$

for $d \leq \frac{\bar{A}}{t-1}$. This functional form gives rise to the following post-cap biased perception of the punitive damage award by the plaintiff: $\sqrt{(t-1)\bar{A}d}$. For $d > \frac{\bar{A}}{t-1}$, the perceived punitive damage award will be simply equal to $\bar{A}$.

Proposition 7 If $h_P^c(\underline{\mathrm{d}}) > h_P$, there exists a critical value of the damage type of the plaintiff, d^*, such that for $d < d^*$, the self-serving bias of the plaintiff about the punitive damage award at trial will rise when a cap on punitive damages $\bar{A}$ is imposed.

This result trivially follows by continuity of $h_P^c(d)$ from the assumption $h_P^c(\underline{\mathrm{d}}) > h_P$ and (20).

We will now proceed to model the self-serving bias of the defendant under caps. Given that the defendant does not know the actual level of damage, d, the introduction of a cap on punitive damages will affect the whole biased distribution of the expected punitive awards for the defendant. Specifically, the defendant expects smaller punitive awards, i.e., the self-serving bias of the defendant rises, if the cap is smaller than the median of the biased distribution of expected punitive awards. The self-serving bias falls (the defendant expects a higher award) if the cap is larger than the median of the perceived distribution.

Mathematically, the median of the biased distribution of punitive awards is A_{med} such that

$$\int_{\underline{\mathrm{d}}}^{A_{med}} (t - h_D - 1)d * f(x)dx = \int_{A_{med}}^{+\infty} (t - h_D - 1)d * f(x)dx \tag{21}$$

where $f(x)$ is the pdf of the distribution of the damage type.

4.2 Effects of Damage Caps on Litigants' Beliefs and Litigation Outcomes

Now, we will show the effect of the cap on the litigation outcomes. Assuming that the relationship between the median of the biased distribution of the award (as perceived by the defendant) and the cap holds, then, Propositions 7 and 8 summarize the effect of caps on litigation outcomes.

Proposition 8. Suppose that $d < d^*$. Then the introduction of a cap on punitive damages, $\bar{A}$, increases the settlement demand of the plaintiff.

This result follows trivially from Proposition 7, because $\frac{\partial S}{\partial h_P} > 0$ (see Proposition 2).

Proposition 9. Suppose that $d < d^*$, and the median of the biased distribution of $A_{med} > \bar{A}$. Then, the introduction of the cap lowers the probability of acceptance of the settlement demand and raises the probability of trial.

Proof. See Appendix.

This counterintuitive result is consistent with Babcock et al. (2001) experimental findings.

5 Conclusions

This paper presents a strategic model of litigation under asymmetric information about the economic damage level and self-serving beliefs about the size of the award. Although the paper is motivated by a legal setting, our findings are applicable to other bargaining settings such as labor negotiations and trade.

We construct a take-it-or-leave-it signaling model and focus on the separating unique universally-divine (Banks and Sobel, 1987) perfect Bayesian equilibrium equilibrium. We derive closed-form characterizations of the equilibrium settlement demand and probability of rejection. In this equilibrium, some cases are resolved out-of-court and some go to trial. We find that self-serving bias in the litigants' beliefs of the size of the award unambiguously increases the likelihood of trial and the expected loss of the defendant. We then extend our basic model by allowing for caps on punitive damages. We derive conditions under which the adoption of caps on non-economic damages increases the likelihood of trial.

An interesting extension to this study might be to use this framework to study the effects of contingency fees on litigation outcomes. An extension that relaxes the assumption of risk neutrality would be also relevant. These and other extensions remain fruitful areas for future research.

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Appendix

Proof of Proposition 1. To verify conditions (a1)-(c1) one needs just to redo all the steps of the proof of Theorem 1 of Reinganum and Wilde (1986), pp. 565-566, as the plaintiff believes that he plays the Reinganum and Wilde game against the apparent defendant. To verify conditions (a2)-(c2) one also needs to redo all the steps of the proof of Theorem 1 of Reinganum and Wilde (1986), pp. 565-566, as the defendant believes that he plays the ReinganumWilde game against the apparent plaintiff.

Finally, condition (d) holds, as the set of the equilibrium offers of plaintiffs is $[\underline{S}_P, +\infty)$, and the set of the equilibrium offers of apparent plaintiffs is $[\underline{S}_D, +\infty)$, and the latter set belongs to the second one, as $\underline{S}_P = \pi(t + h_P)\underline{d} + c_D > \pi(t - h_D)\underline{d} + c_D = \underline{S}_D$. Q.E.D.

Proof of Proposition 2.

$$\frac{\partial S^*(d)}{\partial h_P} = \pi * d > 0$$

Q.E.D.

Proof of Proposition 3.

$$\frac{\partial p^*(S)}{\partial h_P} = \frac{\partial p*}{\partial S} * \frac{\partial S}{\partial h_P} = -\exp(-(S - \underline{S}_D)/T) * \left(-\frac{1}{T}\right) * \pi * d > 0;$$

$$\frac{\partial p^*(S)}{\partial h_D} = \frac{\partial p*}{\partial \underline{S}_D} * \frac{\partial \underline{S}_D}{\partial h_D} = -\exp(-(S - \underline{S}_D)/T) * \left(\frac{1}{T}\right) * (-\pi * d) > 0;$$

Q.E.D.

Proof of Proposition 4.

Expected litigation costs equal:

$$T * \int_{\underline{d}}^{+\infty} p^*(S(d))f(d)dd$$

By proposition 3, $p^*(S(d))$ depends positively on h_P and h_D for all d. Hence the integral expression is rising in both litigants biases. Q.E.D.

Proof of Proposition 5.

Rearranging equation (13) one gets:

$$t = \frac{C - (\gamma_l - \gamma_h)c_D(1 - F(\tilde{d}))}{\gamma_l\pi_l - \gamma_h\pi_h)\Phi(\tilde{d})}, \tag{22}$$

Where $F(d)$ is a cdf of distribution of d, and

$$\Phi(\tilde{d}) \equiv \int_{\tilde{d}}^{+\infty} df(d)dd$$

By Leibnitz rule,

$$\Phi'(\tilde{d}) = -\tilde{d}f(\tilde{d}) < 0$$

By definition of cdf,

$$\frac{\partial}{\partial \tilde{d}}\left(1 - F(\tilde{d})\right) = -f(\tilde{d}) < 0$$

Therefore, the right-hand side of equation (22) positively depends on $\tilde{d}$. Totally differentiating equation (22) one can easily show that

$$\frac{\partial \tilde{d}}{\partial t} > 0$$

An increase in the self-serving bias of the plaintiff raises his perception of t, and hence $\tilde{d}$. This reduces the measure of plaintiffs who file a lawsuit,

$$\int_{\tilde{d}}^{+\infty} f(d)dd$$

Q.E.D.

Proof of Proposition 6.
From equation (17) it follows directly that

$$\frac{\partial q}{\partial (t\tilde{d})} < 0,$$

where q is the post-accident probability of low-effort injure. The self-serving bias of the defendant reduces his perception of t and hence, his perception of $\tilde{d}$. The reduction in the product $(t * \tilde{d})$ raises the value of q. But the Bayes rule (18) establishes the positive relationship between ρ_l, the probability of gross negligence, and q. Therefore, an increase in the self-serving bias of the defendant raises the probability of gross negligence. Q.E.D.

Proof of Proposition 9.
As $d < d^*$, introduction of the cap increases self-serving bias of the plaintiff and hence, raises his settlement demand (Proposition 2). As $A_{med} > \bar{A}$,

introduction of a cap raises the self-serving bias of the defendant, and reduces the probability of the settlement demand acceptance (Proposition 3), which in turn, raises the probability of trial. Q.E.D.

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Работа представляет собой стратегическую модель гражданско-правового спора с асимметричной информацией об уровне ущерба и различающимися представлениями о присуждаемом судом размере возмещения, характеризующимися завышенными ожиданиями (ЗО) истца и ответчика. В состоянии единственного разделяющего равновесия, удовлетворяющего критерию «универсальной святости», часть исков разрешаются мировым соглашением, а другая часть – судом. Мы находим, что ЗО относительно размера возмещения уменьшают вероятность мирового соглашения и увеличивают средние потери ответчика. Мы далее модифицируем модель, вводя в нее эндогенное решение потенциального ответчика о предотвращении аварии и эндогенное решение потенциального истца о выставлении иска. Мы находим, что ЗО сокращают расходы на предотвращение аварий, но в то же время сокращают число исков. Мы также изучаем влияние верхних лимитов на возмещение неэкономического ущерба на результаты гражданско-правового спора. Оказывается, что при определенных условиях введение таких лимитов увеличивает вероятность гражданско-правового спора.

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(*на английском языке*)

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