Gambling for the Upper Hand - Settlement Negotiations in the Lab*

Topi Miettinen † Olli Ropponen ‡ Pekka Sääskilahti §

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Abstract

We exploit a controlled non-framed laboratory experiment to study settlement negotiations and the plaintiff's decision to raise a lawsuit in case of an impasse. We find that greater variance in court outcomes increases the litigation rate and the settlement rate when legal costs are high and litigation is suboptimal. When the plaintiff's probability of winning is low, riskiness of court rulings does not impact the litigation rate but increases the conflict rate. This latter finding goes against the received wisdom and earlier experimental evidence (Ashenfelter et al. 1992) that greater risk in arbitration outcomes increases the settlement rate. We find that logit quantal response equilibrium and loss aversion, with respect to ex-ante expected payoffs, help to organize the negotiation patterns. With regards to litigation, disadvantageous social comparison with the defendant induces the plaintiffs to excessive risk-taking in an attempt to narrow the gap.

KEYWORDS: bargaining; frivolous litigation; loss aversion; quantal-response equilibrium; settlement
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†Hanken School of Economics, Dept of Economics, HECER, Arkadiankatu 7, PO Box 479, Fi-00101 Helsinki and SITE, Stockholm School of Economics, E-mail: topi.miettinen@hanken.fi

‡Government Institute for Economic Research (VATT), Arkadiankatu 7, PO Box 1279, Fi-00101 Helsinki, E-mail: olli.ropponen@vatt.fi

§Nokia Corporation, Keilalahdentie 2-4, Fi-00250 Espoo, E-mail: pekka.saaskilahti@nokia.com

1 Introduction

Extensive theoretical and experimental literature regards asymmetric information about the likely sentence as the main impediment to settlement (Daugherty, 2000). Babcock et al. (1995) provide experimental evidence that introducing asymmetric information severs bargaining inefficiencies. Recent findings suggest that psychological biases might for their part contribute to the failure to reconcile a deal. Firstly, early theoretical pioneering work in this domain highlights the role of mutually incompatible self-serving beliefs in bringing negotiations to a deadlock (Gould, 1973; Landes 1971; Posner, 1973; Shavell, 1982). Experimental research reviewed in Babcock and Loewenstein (1997) indeed came to confirm this view. Secondly, psychological biases in risk attitudes may also bring about negotiation deadlocks. While lawyers have extensively studied the topic in non-incentivized and framed experiments (Rachlinski, 1996; Guthrie, 2000; Korobkin 2002; Guthrie 2003) it has received little attention among economists, and to our knowledge few incentivized laboratory studies on the topic exist.

In an attempt to narrow this gap, and building on the work on behavioral law and economics summarized in Guthrie (2003) or more broadly in Camerer and Talley (2007) and Jolls (2007), we study the effect of dispersion in trial outcomes on settlement and litigation in a non-framed, anonymous computerized experiment. In our design, parties first attempt a settlement through take-it-or-leave-it offers. A failure to strike a deal gives one party of the negotiations an option either to acquiesce or to engage in inefficient rent-seeking. Settlement negotiations prior to the plaintiff's decision to raise a lawsuit constitute a typical application of the setup. To fix ideas, let us therefore proceed with the legal context terminology in what follows while keeping in mind the wide range of alternative applications. In addition to the typical advantages of controlled experimentation put forward by numerous authors,[1] there is an added advantage of the adopted methodology in the study of legal disputes. Settled cases are under-represented in field data whereas a laboratory experiment fully avoids this selection bias.[2] It is particularly difficult to find unbiased data with natural independent variation in dispersion of court decrees. There may prevail differences in dispersion in adjudications across countries and jurisdictions but these latter also differ in many other key aspects which also might influence settlement and litigation and the selection biases in the data.

Our design excludes asymmetric information and self-serving biases *about likely decrees* as explanations for impasse. The decision to litigate results in a computerized court ruling of the dispute with an exogenous and publicly known probability of winning and losing, and equally large publicly known expenses to each side of the dispute.[3] We experimentally vary (i) the

[1] See Falk and Heckman (2009), for instance.

[2] External validity poses a challenge to lab studies and ideally the field and the lab complement each other in promoting our understanding of such disputes.

[3] Thus our study reflects the American rule, see Plott (1987) and Coughlan and Plott (1997) for an experimental

plaintiff's probability of winning, (ii) the expenses of going to court, and (iii), while preserving the expected payoffs at court, whether the court rulings are risky.

We find that the litigation rates are higher with aleatory adjudication. Plaintiffs choose to litigate more often than not even when doing so is suboptimal. This finding has at least three non-exclusive explanations (i) illusion of control (Langer, 1975); (ii) loss aversion, and (iii) overweighting of small probabilities (Tversky and Kahnemann, 1992). Our evidence favors the second explanation.

Turning interest to the laboratory negotiations preceding the litigation choices, we find that settlement rates are highest when it is expensive to appeal. This is in line with the predictions of traditional theory: higher legal expenses should increase the scope for settlement.[4] Indeed, the comparative statics predictions of the logit-quantal-response equilibrium, a parametric generalization of the Nash equilibrium, capture well the treatment effects on the settlement rate in our data as well as the observed litigation rates. Yet, due to a small twist in our experimental design, prescriptive sequential rationality fails to pass the hurdle: it predicts that all cases should settle in the benchmark condition while there should only be conflict when costs are high or the plaintiff's winning-probability is low. Thus, our design allows to point out some limitations of extreme prescriptive rationality assumptions in empirical work which can be circumvented by the adoption of more empirically driven concepts.

Yet, we also find that variant decrees induce more disagreement when the plaintiffs have scant chances of winning. This finding stands in contrast to the expected utility prediction that risk-averse subjects should take more precaution in securing a deal when court decrees are more variant and thus the scope for settlement should be larger. The result cannot be construed by alternative solution concepts. Contrary to our results, Ashenfelter et al. (1992) found that (commonly known) more erratic arbitration increases the settlement rate. They studied effects of *forced arbitration* if failing to agree. In our setup, arbitration is costly and an option chosen by the plaintiff thus leaving room for mistaken beliefs about opponent behavior. Nevertheless, when legal costs are high in our setup, our findings are in line with those of Ashenfelter et al.: settlement rate is higher when there is more variance in court rulings. Overall, our negotiation data can be organized fairly well by incorporating a plausible error structure in the equilibrium concept (logit quantal-response equilibrium) and by considering reference-dependent risk preferences where the loss reference coincides with the expected ex-ante compensation (Köszegi and Rabin, 2007). This implies risk-seeking behavior from the defendants' side and risk-avoidance from the plaintffs' side in the negotiation table - a pattern first proposed by Rachlinski (1996) and replicated in this study in a non-framed incentivized context.

The paper is structured as follows. In the follow-up section, we lay out the model and the experimental setup. In Section 3 the empirical results regarding litigation behavior are studied

comparison of the English and American rules of attribution of legal expenses.

[4] See Hay and Spier (1998), for instance.

while Section 4 resumes the behavioral patterns in settlement negotiations with Subsection 4.1 addressing negotiation outcomes and Subsection 4.2 studying bargaining behavior in further detail. We draw conclusions in Section 5.

2 Theoretical background and experimental design

2.1 Framework

In this section we present a stylized model of settlement negotiations and litigation. There are two players: the plaintiff (P), and the defendant (D). The players engage in commercial negotiations over a sharing of value X, which is common to both parties. In the experiment, we set $X = 200$. If negotiations break, the plaintiff will have a possibility to sue the defendant to claim a share of X. The model treats the implications of a won court case on the defendant as a "court-imposed profit-share". As an example, the plaintiff assumes the role of a patent holder and the defendant is an alleged infringer of the patent rights, and the court imposed profit share corresponds to damages paid to the plaintiff by the defendant. If P wins the court case, he receives a total of rX of damages where $r \in (0, 1)$ is the court-imposed profit-share in the experiment set equal to 2/5. The probability that P wins the court case is p. In the experiment we consider two alternative values, $p = 0.7$ and $p = 0.1$ where the latter condition is coined as the *low proba(bility)* for P's victory. Litigation is costly as both parties incur legal costs L. We assume that both parties pay their own costs of trial irrespective of the court outcome (i.e. American legal system). There are two alternative legal cost conditions in the experiment $L = 10$ and $L = 58$ where the latter holds in the so called *high cost* of litigation condition (see Table 1).

If the parties reach an ex ante agreement (prior to litigation), they share the value X in corresponding shares. Let us denote P's share in such an agreement by s (so that P gets sX) and D's share by $(1 - s) X$. If the parties fail to reach an ex ante agreement, then P chooses whether to litigate or not. In the experiment, for the sake of tractability, negotiations take a specific and simple form where each party makes a take-it-or-leave-it offer to the other and one of the proposals is randomly drawn as the actual proposal, each with probability 50%. In this special case of ultimatum bargaining, actually one of the parties has all bargaining power in sketching a proposal and the other party is only granted a right to veto it. Asking for each party to contrive a proposal for one contingency and a *minimal acceptable offer (MAO)* for the other allows us to collect more informative negotiation plans in a concise and simple manner. The structure and the payoffs of the bargaining game are illustrated in Figure 1 below.

Sequential rationality suggests that the proposed and vetoed shares should depend on the expected payoffs from the litigation stage. The lowest offer the opponent is willing to accept makes her (almost) indifferent between accepting and vetoing it. For a risk-neutral negotiator, it is the share which coincides with her expected payoff from the game ensuing to the litigation

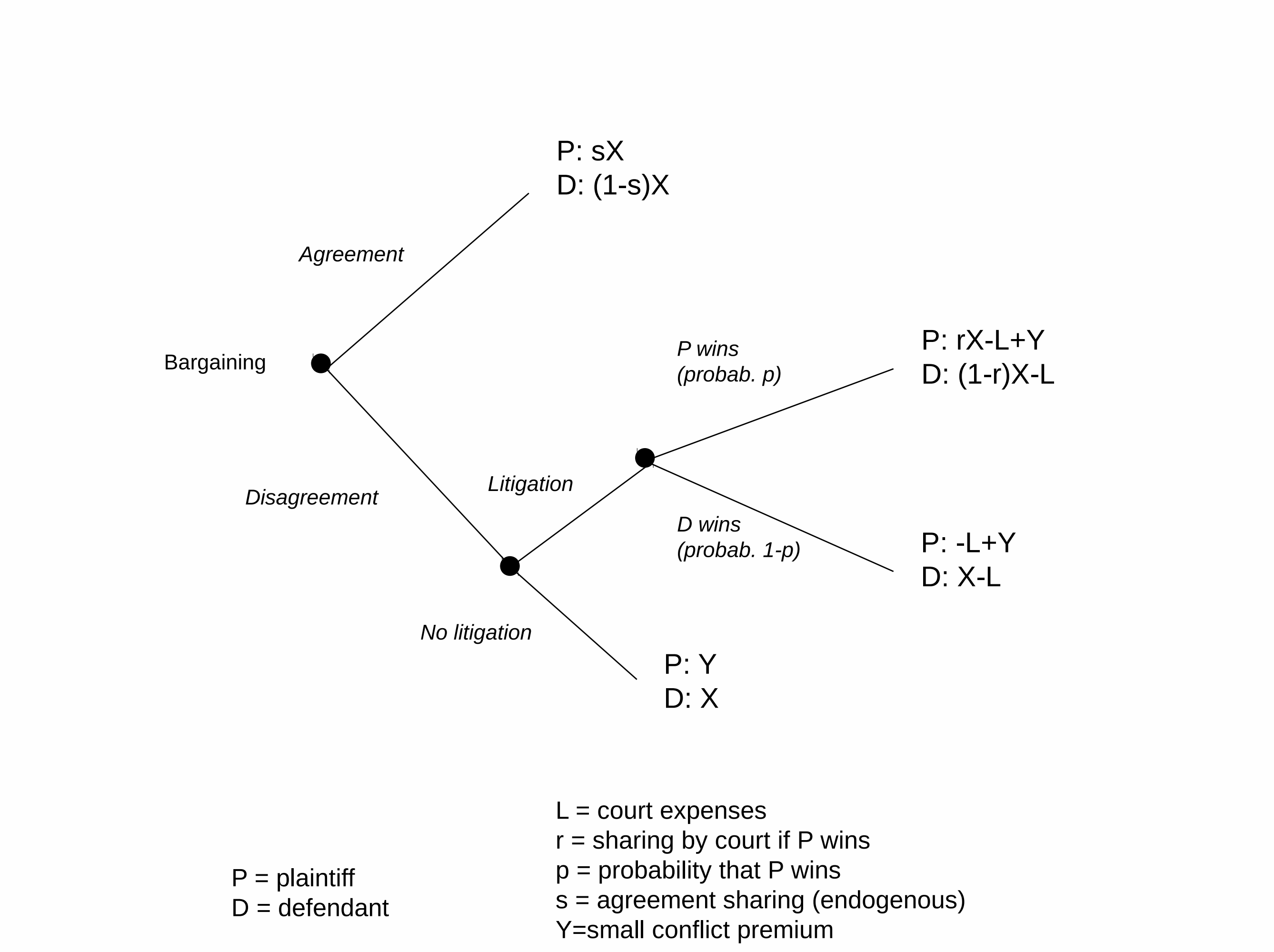

Figure 1: Game Tree.

stage.[5] Sequentially rational negotiation parties should foresee that litigation undermines the mutual gains from trade and strike an agreement at terms which ensures that rejecting and litigating instead is suboptimal.

To secure a deal, P must be offered more than her conflict payoff. If P decides to litigate, then her expected return is

$$prX + Y - L, \tag{1}$$

and the expected return for D is

$$(1 - pr)\,X - L. \tag{2}$$

[5]Notice that even a risk-averse opponent would accept this offer which is clearly greater than the certainty equivalent of the litigation lottery.

Not litigating yields Y for P while D gets X. We have three cases in focus: benchmark condition ($p = 0.7, L = 10$), low probability of winning condition ($p = 0.1, L = 10$), and high legal costs condition ($p = 0.7, L = 58$). The parameters are chosen so that the expected payoff for the plaintiff coincides in the latter two conditions. The plaintiff's winning probability was public information to all subjects.

We endow P with a small additional payment $Y = 10$, which he gets only in the case where no ex ante agreement is reached. In our design, Y is there to slightly perturb the balance to point out some limits of sequential rationality and subgame perfection in empirical work. This additional payoff seems negligibly small relative to the stakes of negotiation to induce any dramatic effects on behavior and it has no impact on the optimality of litigation itself. Yet, theoretically the impact is drastic: conflict becomes the only the rational solution (subgame perfect equilibrium) of the game in the high-cost and low-proba conditions (as will be explained shortly).

Our behavioral patterns fail to replicate this dramatic effect and thus the introduction of Y serves to illustrate an important caveat of prescriptive solution concepts in empirical applications: the inability to convincingly account for the heterogeneity in behavior that is characteristic of empirical data. We show that by introducing the logit-quantal-response equilibrium and the associated plausible noise structure into the notion of equilibrium, we can better account for the behavioral patterns without sacrificing too much on the decision makers' rational striving for their best interest (McKelvey and Palfrey, 1998).

The introduction of Y has a further benefit: litigation in the high-cost and low-proba conditions is our core interest and thus Y has, ex-ante, the desirable effect of inducing more conflict and thus making litigation choices to bear more impact.

Moreover, we consider a deterministic and a stochastic court. The deterministic court differs from the stochastic only in that the former implements the expected litigation payoffs of the two parties with certainty whereas the stochastic court truly implements a random draw using the publicly known probability of winning for the plaintiff (the complementary probability is the winning probability of the defendant). The litigation payoffs are given in Table 1 below.

$r = 0.4$; $Y = 10$	*Benchmark* $p = 0.7$ $L = 10$	*High cost* $p = 0.7$ $L = 58$	*Low proba* $p = 0.1$ $L = 10$
risky court *(P win, p)* *(D win, 1-p)*	$\pi_{plain} = 80, \pi_{def} = 110$ $\pi_{plain} = 0, \pi_{def} = 190$	$\pi_{plain} = 32, \pi_{def} = 62$ $\pi_{plain} = -48, \pi_{def} = 142$	$\pi_{plain} = 80, \pi_{def} = 110$ $\pi_{plain} = 0, \pi_{def} = 190$
certain court	$\pi_{plain} = 56, \pi_{def} = 134$	$\pi_{plain} = 8, \pi_{def} = 86$	$\pi_{plain} = 8, \pi_{def} = 182$

Table 1: LITIGATION PAYOFFS ACROSS CONDITIONS.

In the benchmark condition, the plaintiff's probability of winning is so high and the cost of litigating so low that the optimal (highest expected monetary return) choice calls for litigation by the P. His expected return from litigation (1) exceeds the payoff from not litigating (the endowment Y). In the negotiations stage, a self-interested sequentially rational P should therefore accept all offers weakly greater than his expected return from litigation.

To the contrary, in the low probability of winning case, P's probability of winning is so low that it is (barely) suboptimal to litigate. On the other hand, in the high cost of litigation case, the cost is so high that it is again suboptimal to litigate. Recall that the expected return from litigation (1) to P is equal in the low probability and in the high cost conditions. Thus in the high cost and low proba conditions a rational P should accept all offers exceeding the endowment Y in the negotiations and the endowment Y has the obvious effect of inducing marginally more conflict by raising the P's litigation stage payoffs.

In fact in the high-cost and the low-proba conditions the unique subgame-perfect equilibrium between risk-neutral self-interested parties predicts conflict: the defendant should never propose a positive amount or accept anything less than 200 since she expects to receive 200 in case of conflict knowing that a rational plaintiff never litigates. Similarly the plaintiff should not propose more than 190 or accept less than 10 since she will receive 10 in case of conflit. Thus rational theory somewhat counter-intuitively predicts that cases never settle and plaintiffs never litigate in the high-cost and low-proba conditions while cases will always settle and plaintiffs always litigate in the benchmark condition.

While providing a useful benchmarking role for understanding behavior, the subgame perfect Nash equilibrium turns out too precise and extreme for providing the best fit. Actual behavior always includes noise and decision makers tend to expect this. When plaintiffs tremble in the litigation decisions, the noise has a much more drastic impact on the defendants' incentives in the negotiation table than it has on the plaintiffs' incentives making the former dramatically more cautious and willing to avoid impasse. This argument can be incorporated using the notion of (agent) logit quantal response equilibrium (Kelvey and Palfrey, 1998). In the logit-QRE the choice probabilities reflect rationality in the sense that they are inversely related to the opportunity costs of the choices and the implied choice probabilities are correctly anticipated by the opponents. This relatively small departure from perfect rationality allows us to drastically improve the settlement and litigation rate predictions. This general idea has proved successful in a number of other strategic interaction situations (see Goeree and Holt, 2001, for a particularly illustrative account) but to our knowledge, we are the first to apply it to settlement negotiations.

In the logit quantal-response model, the choice probabilities are proportional to the exponentials of the expected payoffs of the actions given the beliefs on the opponents' behavior. That is, given expectations of i about the action profile, a_{-i}, of other players, $\overline{\sigma}^i_{-i}(a_{-i})$, player i chooses action a_i with probability

$$\sigma_i(a_i) = \frac{exp(1/\mu(\sum_{a_{-i}} \overline{\sigma}^i_{-i}(a_{-i})\pi_i(a_i, a_{-i}))}{\sum_a exp(1/\mu(\sum_{a_{-i}} \overline{\sigma}^i_{-i}(a_{-i})\pi_i(a, a_{-i})} \tag{3}$$

Taking the ratio of choice probabilities of two different actions a_i' and a_i' yields merely

$$\frac{\sigma_i(a_i')}{\sigma_i(a_i'')} = \frac{exp(1/\mu \sum_{a_{-i}} \overline{\sigma}^i_{-i}(a_{-i})\pi_i(a_i', a_{-i}))}{exp(1/\mu \sum_{a_{-i}} \overline{\sigma}^i_{-i}(a_{-i})\pi_i(a_i'', a_{-i})}, \tag{4}$$

and thus the ratio of choice probabilities is proportional to the ratio of exponentials of expected payoffs. In equilibrium expectations and choice probabilities must coincide and thus $\overline{\sigma}^j_i = \sigma_i$ for $j \neq i$. The novel feature is noise which is increasing in μ. As μ tends to zero, the choice probabilities converge to a Nash equilibrium of the game.

For our settlement negotiation game, it is crucial to note that when litigation is suboptimal due to high legal costs, the opportunity cost of litigating is 2 for the plaintiff while it is 114 for the defendant. Equations (3) and (4) imply that letting μ tend towards zero and thus making parties more rational in their choices, the defendant tends to shy away from suboptimal negotiation strategies much faster than the plaintiff abandons litigation. Due to his opponent's trembling litigation hand, the defendant quickly realizes that by giving marginally more to the litigant, say 10 ECUs, one can drastically raise the settlement rate and reduce litigation by increasing the plaintiffs opportunity cost of settlement. Thus for instance with $\mu = 13$, in the logit quantal-response equilibrium the defendant is about 3.6 times more likely to propose 10 to the plaintiff than 0, and yet the latter is part of the unique subgame perfect equilibrium path in our setup. The litigation rate conditional on impasse is about 46% in both cases but by increasing the plaintiff's share in the settlement agreement from 0 to 10, the defendant can increase the settlement probability from about 1/3 to about 1/2.

We employ maximum likelihood estimation to yield an estimate for μ. We first classify offers (MAOs) into 21 coarse classes rounding offers from 0-9 to 0 (MAOs from 1-10 to 10), offers 10-19 to 10 (MAOs 11-20 to 20) and so forth so that offeres labeled as k are all compatible with MAOs labelled as k.[6] and use this coarsened empirical distribution of offers and responses to calculate the log-likelihood of the profile of choices given the value of parameter μ. The corresponding choice probabilities predicted by the model constitute the unique solution of the system of equations (4). The maximum-likelihood μ estimate thus received is $\mu^* \approx 55$. The corresponding litigation and disagreement rates alongside the associated empirical frequencies are given in Tables 2 and 3, respectively.

Regarding litigation, both the perfect Nash equilibrium and the logit-QRE correctly predict the there is more litigation in the benchmark condition than in the high cost and low proba conditions. The logit-QRE is the more accurate of the two. However, the concepts capture neither the difference in litigation rate between risky and certain courts nor the difference between high cost and low proba when courts are risky. The plaintiffs exhibit a tendency to accept negative expected value bets (in high cost and low proba conditions) and they litigate more than in the corresponding certain courts case. We will study these issues in more detail in Section 3.

Considering the disagreement rate, the logit-QRE makes better point predictions and better

[6] See Costa-Gomes and Zauner (2001) The coarsening is needed to facilitate the numerical calculation of the equilibrium choice probabilities and their estimation.

	Benchmark $p = 0.7$ $L = 10$	*High cost* $p = 0.7$ $L = 58$	*Low Proba* $p = 0.1$ $L = 10$	Total
RISKY (*early periods*)	89% (87%)	73% (72%)	64% (58%)	73% (68%)
CERTAIN (*early periods*)	83% (91%)	48 % (48%)	48% (39%)	56% (51%)
TOTAL (*early periods*)	86% (89%)	60% (61%)	57% (48%)	65% (59%)
logit-QRE with $\mu = 55$	71%	49%	49%	-
Perfect Nash	100%	0%	0%	-

Table 2: Litigation rates and theoretical predictions, pooled over all rounds (in brackets: first two rounds).

	Benchmark $p = 0.7$ $L = 10$	*High cost* $p = 0.7$ $L = 58$	*Low proba* $p = 0.1$ $L = 10$	*Total*
risky court (*early periods*)	51% (57%)	38% (42%)	47% (63%)	45% (53%)
certain court (*early periods*)	55% (48%)	37% (41%)	50% (39%)	46% (41%)
Total (*early*)	53% (52%)	37% (41%)	49% (50%)	45% (47%)
logit-QRE with $\mu = 55$	62%	55%	61%	-
Perfect Nash	0%	100%	100%	-

Table 3: Disagreement rates and theoretical predictions, pooled over all rounds (in brackets: first two rounds).

captures comparative statics between benchmark, high cost, and low proba conditions than the perfect Nash equilibrium. Remarkably, the logit-QRE correctly predicts that settlement rate is approximately equal in the low proba and the benchmark condition while the settlement rate in the high cost condition is higher. Yet again, the differences in disagreement rates between risky and certain courts in the early rounds are not explained by neither of the concepts. We address these issues in Section 4.

2.2 Experimental setup

The computerized experiment was conducted in the laboratory of the Max Planck Institute of Economics in Jena in May 2008, February 2010, and August 2010. Participants were 316 undergraduates from the university of Jena[7], randomly drawn from different fields of study.

[7] In Table 5 we report a regression where we include additional observations from 64 individuals who took part to a treatments where pretrial negotiations were entirely excluded. The plaintiffs thus made 8 litigation choices in three different experimental conditions and the defendants attempted to guess the choices made by the plaintiffs in each of the 8 periods.

Participants were recruited using the ORSEE software (Greiner, 2004) and the experiment was programmed with the z-Tree software (Fischbacher, 2007).

At the beginning of each session, participants were seated at visually isolated computer terminals where they received a hardcopy of the German instructions[8]. Subsequently, participants would answer a control questionnaire to ensure their understanding (screenshots of control questions in the appendix). The experiment started after all participants had successfully completed the questionnaire.[9] At the beginning of each session, each subject was assigned one of the two roles, the plaintiff (P) or the defendant (D). These roles correspond to the roles in the theoretical setup explained in Section 2.1.

Each experimental session lasted for 8 rounds[10], and the outcome of one round was randomly drawn for the actual payment. Each round consisted of the game described in Section 2.1. One ECU (experimental currency unit) corresponds to 0.03 euros. Each plaintiff could make losses in any given round including the round randomly drawn for payment. The incurred losses were subtracted of the show-up fee of 3.5 euros which was announced in the opening paragraph of the experimental instructions. Thus the aggregate payment to a subject was never negative. The average earnings were 11.50 euros. The average duration of a session was 1 hour and 20 minutes.

Once the negotiation and litigation choices were elicited, we asked each subject to guess the choices made by the agent on the opposing side. These guesses were incentivized. Each correct guess yielded a supplementary payoff of 11 ECU. A payoff of 1 ECU was subtracted for each unit (ECU) by which the subject misguessed the actual negotiation choice so that missing the actual choice (proposal or acceptance threshold) by 10 units delivered 1 ECU and missing by a larger margin than that gave no supplementary payoff at all. To incentivize the binary litigation choice, we used the proper scoring rule which we discretized to simplify exposition.[11] Each defendant could thus pick one of the following five guesses: that the plaintiff surely litigates (refrains from litigating), that the plaintiff is more likely to litigate (to refrain from litigating), that litigation and refraining from it are equally likely. In the end of the experiment, one of the guesses was randomly drawn for payment from each round but for the round whose negotiation and litigation choices were paid for. Once beliefs were elicited the actual strategy of the opponent was revealed

[8]Instructions, screenshots and further documentation available upon request.

[9]If a participant could not answer a control question, we did not allow her to proceed to the actual experiment until understanding was ensured. By raising a hand, a subject could ask a laboratory operator to come to her cabin and the subject could pose further questions to the operator individually. About 5% of the subjects posed further questions regarding the instructions. The questions helped to clarify the problems in understanding and eventually none of the subjects were excluded from the experiment.

[10]In one session, there were just 7 rounds due to absence of invited subjects. We dropped one round of play in the benchmark condition in that session.

[11]The proper scoring rule is widely used in economic experiments. See Nyarko and Schotter (2002) for an exposition how proper scoring rule can be used in belief elicitation in an economic experiment.

to the subject and she was also reminded of her own strategy. Thus the participants did not learn any population statistics about litigation or negotiation choices nor the outcome of the random outcome of the court ruling between two periods of interaction. This left room for learning only from private experiences. The experiment then proceeded to the following round where each participant was matched with a new subject in the opposing role (perfect strangers) thus removing any repeated game or reputation incentives.

There were 12 treatments each consisting of three blocks of 2 (*benchmark* condition) or 3 (*low proba* and *high cost* conditions) rounds and of 16 participants playing in a fixed role, once against each of the participants in the opposing role. While in each block the probability of winning and the cost of litigation were fixed, there was variation in these parameters across the blocks as specified in Table 1. Having one treatment for each potential order of the three blocks while having alternatively either stochastic or deterministic court, fixed for the entire 8 rounds of a treatment, yields 12 treatments of that were run in May 2008. In February 2010 we ran some additional sessions with blocks starting either with the high cost block or the low probability block. In August 2010 we ran special sessions the design of which is explained in Section 3 and the data of which is only included in the regressions of Table 5.

3 Litigation

3.1 Plaintiff's litigation choices

The litigation rates across the various treatment conditions are given in Table 2 above. There are more appeals to court when the legal costs are low and the probability of winning is high ($p = 0.7$ and $L = 10$) than when these parameters are less propitious to litigation ($p = 0.1$ or $L = 58$). These patterns resumed in Table 2 and further analyzed in Table 4 are in line with the comparative statics predictions of self-interested rationality. Yet, our data exhibits an abundance of choices not maximizing expected monetary return. With low costs and high probability of winning, 10% of the subjects do not litigate although they should. With prohibitively high costs, still 59% of the subjects appeal to court while 41% of the subjects litigate when chances of winning are suboptimally low. As illustrated in Section 2, these patterns can be fairly well accommodated within the logit-quantal-response equilibrium framework.

In Table 4, a dummy variable indicating whether the plaintff chose to litigate (1) or not (0) is regressed on treatment variables HIGH (high cost), LOW (low proba), and RISK (risky courts) and their interactions controlling for the period of interaction. The benchline condition in this regression is our benchmark condition ($p = 0.7$, $L = 10$) with certain court rulings. This closer regression analysis shows that there is more litigation in later periods (statistically significant positive effect of the Period-variable) even in conditions where the plaintiff should refrain from litigation (the interaction terms $HIGH \times Period$ and $LOW \times Period$ are insignificant or positive in regressions (5) and (6) in Table 4). Notice that the incentive to keep up a reputation for being tough on litigation cannot account for this effect since there is no information feed-back about the opponent's choices in previous rounds and in each round each participant is matched with a new opponent.[12] The high frequency of litigation when it is not optimal is striking, underlining the behavioral biases that must affect the plaintiff's choices, particularly so when court rulings are risky.

LITIGATION	(1) logit	(2) logit	(3) GLS	(4) logit	(5) logit	(6) GLS
RISK	0.961***	0.530	0.205***	0.296	0.526	0.0602
	(0.201)	(0.366)	(0.0491)	(0.457)	(0.363)	(0.0421)
HIGH	-1.472***	-1.811***	-0.155***	-1.831***	-1.982***	-0.360***
	(0.212)	(0.283)	(0.0311)	(0.281)	(0.569)	(0.0956)
RISK × HIGH		0.834**	0.168**	0.881**	0.827**	0.255***
		(0.411)	(0.0681)	(0.411)	(0.410)	(0.0655)
LOW	-1.685***	-1.718***	-0.271***	-1.748***	-2.457***	-0.413***
	(0.219)	(0.281)	(0.0535)	(0.280)	(0.531)	(0.0846)
RISK × LOW		0.178	0.0265	0.245	0.202	0.113
		(0.422)	(0.0723)	(0.426)	(0.422)	(0.0695)
Period	0.105***	0.105***	0.0220***	0.0854**	0.0252	0.0184*
	(0.029)	(0.029)	(0.006)	(0.0354)	(0.0712)	(0.00982)
RISK × Period				0.0443		
				(0.0584)		
LOW × Period					0.157*	.0121
					(0.0906)	(0.015)
HIGH × Period					0.0189	-0.00603
					(0.0946)	(0.0160)
Constant	0.892***	1.049***	0.580***	1.157***	1.487***	0.731***
	(0.236)	(0.275)	(0.0508)	(0.288)	(0.467)	(0.0648)
Observations	1,506					

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Litigation regressions, main treatment effects

A more puzzling finding is that there is more litigation in the conditions with uncertain trial outcomes (variable RISK in Table 4 and three top panels of Table 2) than in the respective conditions which grant the corresponding expected payoffs for sure (bottom panels). This is particularly true for the high cost condition (variable RISK × HIGH in Table 4).

This finding is surprising at first sight. Most theoretical analysis of settlement would assume that agents are risk-averse or risk neutral and thus predict that litigation rate is lower when trial outcomes are more variant. Prescriptive rational settlement negotiation theory advocates that greater riskiness in court decisions would induce more precaution at the negotiation table thus

[12]This is the so called perfect strangers design.

reducing the conflict rate and widening the contract zone.[13] The above result yet alleges that the majority of plaintiffs, at least, are not risk averse but risk loving thus turning the conventional wisdom on its head.

There are at least three overlapping accounts of this puzzling result. First, people tend to hold illusionary control of influencing entirely aleatory events turning in their favor. This is the inescapable conclusion of Langer's (1975) intriguing series of experiments - a conclusion which also has been confirmed in a number of follow up studies. The plaintiffs' such illusions in the random court condition may have strengthened the plaintiff's faith in getting a favorable court ruling. Thompson et al. (1998) even remark, reviewing the accumulated evidence, that contexts where favorable and non-favorable outcomes are salient are particularly likely to conceive illusion of control. The salient monetary payoffs associated with winning and losing in our setup fit well this description. Naturally, to keep check of such wishful thinking, our instructions explicitly emphasized that the outcome draw is a fully computerized random draw. Yet, the illusion of control literature enumerates several cases where the phenomenon stands firm even in the face of such attempts of its dismissal particularly in settings where decisions are real and not hypothetical (Thompson et al. 1998, pp. 147).

When it comes to the second explanation, the risk-loving choice patterns we observe most frequently appear in contexts where decision makers perceive themselves in a loss frame and are willing to take negative expected value bets on reducing losses. This is a pattern predicted by prospect theory (Kahneman and Tversky, 1979; Tversky and Kahneman, 1992). Why then, in our experiment, would the plaintiffs position themselves to a loss frame when litigating? Loewenstein et al. (1989) studied the interplay of risk and other-regarding preference in a hypothetical choice experiment, where subjects self-report their satisfaction with the two parties' monetary outcomes, and found that disadvantageous inequality[14] can be accounted as a loss in the prospect theory sense. If disadvantageous inequality is perceived as a loss in this manner, then the disadvantaged plaintiffs will litigate more the riskier the court rulings. The implications for settlement patterns could be dramatic: riskiness of court outcomes could increase inefficient litigation, not to reduce it as suggested by risk aversion. Notice that central for this explanation to have bite is that the plaintiff's least upper bound of the loss domain in earnings is substantially above zero when litigating. In addition to social comparison, such high loss references may be driven by high aspirations set at the negotiation table (Korobkin, 2003), for instance.

A third explanation also relates to Kahnemann and Tversky's prospect theory which holds that small-probability events are overweighted in human estimation of the likelihood of uncertain events. Thus in our experimental condition where the winning probability is low, 10 %, the winning event might receive a higher weight in subjects' minds thus making the prospect of litigation look overly favorable. Guthrie (2000) building on the work of Rachlinski (1996)

[13]For a review, see Hay and Spier (1998), for instance.

[14]See also Fehr and Schmidt, 1999.

discusses in depth the interplay of overweighting and loss aversion in litigation contexts. He extends Rachlinski's analysis to contexts of frivolous litigation where the chances of winning (or losing) are small but paid damages are substantial. In line with the prediction of prospect theory, the small probability contexts tend to reverse the risky choice patterns implied by mere loss aversion so that choices appear risk-loving (risk-averse) in the gains domain (loss domain) when probability of winning (losing) is small.

Let us discuss how evidence fits each of these explanations in turn. First considering the third explanation, the low winning probability should be overweighted when evaluating the lottery. The winning-outcome in the aleatory condition with low winning probability, $p = 0.1$ and $L = 10$, may thus yield a disproportionate weight. This should increase the likelihood of litigation in that condition. The same effect should be absent or weaker in the high cost condition, $p = 0.1$ and $L = 10$, since the chances of winning and losing are more equal and in fact the probability of losing is smaller than that of winning and should thus be given a disproportionate weight if any. In conclusion, probability overweighting predicts a negative interaction effect between riskiness and costliness of court rulings when comparing the high cost condition against the low proba condition (where the expected monetary payoffs for the plaintiff are the same) and excluding data from the benchmark condition. Notice yet, that our setup does not allow us to rule out that frivolous litigation would not matter in contexts where the probability of winning is smaller than 10%.

As for the first explanation, illusion of control also suggests that there should be more litigation when courts are aleatory but it does not predict a discriminatory effect between the low probability and high cost conditions, or if it does it predicts a stronger effect in the low probability condition where the gains are more vivid than in the high cost condition.[15]

The second explanation, loss aversion in social comparison, predicts a positive interaction effect of risk and legal costs on litigation. Let us elaborate the argument in more detail. When court outcomes are certain, each side of the dispute is allocated her expected payoff in the corresponding random court condition for sure. The (expected) payoff of 8 ECU to the plaintiff is identical in the high cost and low probability conditions.[16] The conditions differ in how much the court ruling allocates to the defendant (in expected terms): 182 in the low probability condition and 86 in the high cost condition. The expected payoff for the plaintiff being smaller than 10 which the plaintiff guarantees by not litigating, a rational plaintiff only interested in maximizing her payoff would never litigate. Yet, the intrinsic other-regarding preference theories suggest that the plaintiff might prefer litigating in order to render payoffs more equal, especially when such equalizing punishment is effective.[17]

When court rulings are stochastic, they only have an effect on the expected equity of payoffs.

[15] Alloy and Abramson (1979) or Dunn and Wilson (1990) for the vividness argument in illusion of control.

[16] See the section on experimental setup and Table 1.

[17] See Camerer (2003), for instance.

While there is a chance that payoffs are much more equal than when outcomes are certain (70% chance of yielding 32 for the plaintiff and 62 for the defendant in the high cost scenario; 10% chance of 70 for the plaintiff and 110 for the defendant in the low probability scenario) there is also a chance of losing big time (in the high cost scenario a 30%-chance of losing 48 while the defendant wins 142; in the low probability scenario a 90%-chance of getting nothing while the defendant receives 190). Yet, prospect theory holds that a plaintiff experiencing her payoff disadvantage as a loss is willing to take negative expected value bets on reducing inequality, in line with our finding that there is more litigation under risky court.

This prediction runs counter to the findings of Bolton et al. (2005) whose experimental data illustrate that although expected equality also matters for people, it is less influential than when equality can be generated with certainty. [18] Also if people tend to be risk averse (see Holt and Laury, 2002, for instance), one would expect that the litigation rate is lower when court rulings are stochastic. We find the exact opposite: there is *more* litigation in the conditions where trial outcomes are stochastic.

We ran additional sessions where only litigation decisions were made and there were no pretrial negotiations. We did this in order to exclude any spillover effects of negotiation choices on litigation choices. In Table 5, we report the results of a logit and a linear panel regression clustering the standard errors of each individual subject. The comparison in the regression is between the high cost condition and the low winning probability condition where expected payoffs for the litigant are identical (thus benchmark condition data, $L = 10$ and $p = 0.7$, are excluded). The litigation choice is regressed on treatment variables (excluding the benchmark condition) where the pretrial dummy-variable takes value one when negotiation choices are extracted from the subjects as well, and value zero when litigation choices are made without negotiations.

When court rulings are aleatory, the litigation rates in the high cost and the low proba conditions fall drastically apart unlike in the deterministic case. The fact that litigation rates differ significantly when trial outcomes are risky but not when they are certain in the high cost case, clearly advocates that there is an interaction effect between other-regarding and risk attitudes. Disadvantageous inequality is perceived as a loss and high costs generate more equal payoffs thus inducing loss averse subjects to take the negative expected return bet in the hope of substantially reducing the inequality.

Litigation tends to be more prevalent when done in the context with pretrial negotiations

[18] They study subjects in simplified ultimatum games where the pie can only be shared in two asymmetric ways: 80% for proposer and 20% for responder or 20% for proposer and 80% for responder. They found that subjects were more willing to reject proposals favoring the proposer if the proposer had an alternative option to propose a lottery over the same unequal outcomes but with equal expected payoffs. The responder could decide whether to reject or accept that lottery without knowing its realization. Rejection led to zero payoffs for each side with certainty. Yet, the rejection rate of the proposal favorable to the proposer was even higher when there was a sure fifty-fifty split alternative available.

LITIGATION	(1) Logit	(2) GLS
RISK	1.048*	0.303**
	(0.632)	(0.119)
HIGH	-.710	-0.0573
	(0.620)	(0.0903)
RISK × HIGH	1.901**	0.336**
	(0.838)	(0.148)
Pretrial	0.889*	0.296***
	(0.530)	(0.0777)
RISK × Pretrial	-0.380	-0.152
	(0.689)	(0.136)
HIGH × Pretrial	0.714	0.0490
	(0.636)	(0.0977)
RISK × HIGH × Pretrial	-1.472	-0.227
	(0.899)	(0.165)
Period	0.105***	0.0207***
	(0.0337)	(0.00741)
Constant	-1.424***	0.103
	(0.499)	(0.0712)
Observations	1,140	1,134

Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Litigation regressions, comparision of low-proba and high-cost treatments

(the positive coefficient of the pretrial variable). This may reflect negative reciprocation of failures to agree which are attributed to the opponent (see Cox et al., 2007, for instance) or the lower opportunity cost of not making an optimal litigation choice. There also tends to be more litigation at the later periods, which is surprising since litigation is suboptimal according to self-interested rationality in all the conditions included in these regressions, and a standard learning argument would thus suggest less litigation in later periods.

3.2 Expectations about litigation

For the sake of understanding conflict in strategic interaction, it is crucial to understand to which extent parties have correct expectations about each other's choices. Incorrect expectations are likely to induce miscoordination and amplify conflict. Table 6 below studies the extent to which defendants expect litigation across treatment conditions and how expectations are adjusted from one period to another. In the first four regressions we use linear panel regression clustering individual standard errors. The fifth regression is a correponding ordered logit regression.

The defendants have fairly correct expectations about signs of treatment effects and they even correctly expect more litigation in the aleatory high cost case than in the corresponding deterministic condition (significant positive coefficient of HIGH × RISK in regressions (3) and

Guess Litigation	(1) GLS	(2) GLS	(3) GLS	(4) GLS	(5) ord.logit
RISK	0.325***	0.0355	-0.188	-0.156	-0.729**
	(0.111)	(0.272)	(0.322)	(0.188)	(0.355)
Period	-0.0104	-0.0576**	-0.0634**	-0.0337	-0.107***
	(0.0182)	(0.0271)	(0.0247)	(0.0310)	(0.041)
RISK×Period		0.0803**	0.0981***	0.0779***	0.180***
		(0.0375)	(0.0363)	(0.0294)	(0.056)
HIGH	-0.624***	-0.527***	-0.884***	-0.606**	-1.375***
	(0.0974)	(0.116)	(0.167)	(0.241)	(0.254)
HIGH×RISK			0.522**	0.366*	0.788**
			(0.206)	(0.188)	(0.313)
HIGH×Period				-0.0445	
				(0.0416)	
LOW	-0.561***	-0.434***	-0.658***	-0.619**	-1.005***
	(0.108)	(0.118)	(0.189)	(0.249)	(0.277)
LOW×RISK			0.184	0.0191	0.293
			(0.240)	(0.213)	(0.345)
LOW×Period				0.0122	
				(0.0423)	
Constant	3.683***	3.660***	3.886***	3.845***	-
	(0.122)	(0.208)	(0.214)	(0.182)	-
Observations	1,250	1,250	1,250	1,250	
Number of id	158	158	158	158	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Beliefs on litigation

(4)).[19] Misguided expectations about the litigation rates can thus be fairly reliably be excluded as an explanation as a source of conflict, the issue to study in further detail in the follow-up section.

4 Negotiations

4.1 Disagreement

Let us now turn our interest to how settlements are reconciled or how disagreement arises. Table 3 in Section 2 reports the disagreement rates in our six different experimental conditions.[20] It

[19]Of course these comparisons tell us little about whether defendants have correct point estimates about the average litigation rate.

[20]Recall that there are eight games played, each time against a different opponent and with private feed-back to rule out dynamic reputation and punishment incentives.

is straightforward to notice that subgame perfect Nash equilibrium fails to account for these patterns. As explained in Section 2, the subgame perfect equilibrium disagreement rate is 0% in the leftmost column and 100% in the two rightmost columns. We never observe such extreme disagreement rates and moreover even the empirical comparative statics are against the subgame perfect equilibrium prediction: there is more disagreement in the benchmark condition than in the high cost condition and not vice versa as predicted by subgame perfection.

The logit-QRE does a much better job in reconciling the patterns and the comparative statics. The logit-QRE with $\mu = 55$ which gives best fit with the data asserts that disagreement rate should be lower in the high cost treatment than in the other two. This prediction is borne out by data.

In Table 7 below, a dummy variable indicating disagreement is regressed on treatment variables controlling for the interaction period and allowing interactions between treatments and period. The (certain) high cost condition, given its lowest disagreement rate, is used as the benchline against which the other conditions (LOW, BENCH, RISK and their interactions) are compared to. Indeed, there is some indication that the high cost condition is less prone to conflict than the other two. More detailed analysis shows that initially it is particularly the risky courts which are significantly more prone to conflict when the plaintiff has a low probability of winning (RISK×LOW). The gap in the settlement rate between the risky and the certain case narrows down over time as there is more conflict in later periods in the certain case (LOW×Period) and less in the risky case (RISK×LOW×Period).

Given the interesting differential patterns in the litigation rates when comparing the high cost condition to the low proba condition (Table 5), we ran specified regressions to analyze how these litigation patterns are reflected in the settlement rate. In Table 8, the disagreement dummy is regressed in a manner similar to the regression of Table 5. The high cost condition is compared against the low probability condition including interactions with riskiness of court rulings and with experience. Data from the benchmark condition, $p = 0.7$ and $L = 10$, are excluded. The regression reveals interesting patterns: in early rounds risky courts with low plaintiff-winning probability are particularly prone to conflict (RISK). Yet, risk has the reverse impact on disagreement when costs are high (RISK×HIGH). Recall that this latter is exactly the condition where litigation rates were significantly higher. Thus the higher settlement rate could be driven by more cautious bargaining behavior by both sides, each willing to avoid the implied high litigation costs. We will address this question in the next subsection. The significance of the Period variable and its interactions suggest dynamic patterns. The high cost condition becomes more prone to conflict over time when risky and less prone to conflict when certain. In the low proba case the dynamic effect of risk is the opposite: less conflict over time with risky, more conflict over time with certain court.

Histograms in Figures 2 and 3 capture the frequencies of the plaintiffs' and the defendants' offers, respectively, for the three conditions with certain trials (three bottom panels) and the

Disagreement	(1)	(2)	(3)
RISK	-0.0592	0.0548	-0.218
	(0.162)	(0.206)	(0.428)
BENCH	0.658***	0.766***	0.487
	(0.160)	(0.212)	(0.541)
		(0.307)	
RISK×BENCH		-0.215	0.350
		(0.307)	(0.771)
Period	-0.020	-0.020	-0.0846
	(0.0262)	(0.0262)	(0.0619)
RISK×Period			0.0663
			(0.0893)
BENCH×Period			0.0673
			(0.104)
RISK×BENCH×Period			-0.121
			(0.150)
LOW	0.459***	0.537***	-0.467
	(0.131)	(0.201)	(0.441)
RISK×LOW		-0.157	1.291**
		(0.262)	(0.611)
LOW×Period			0.240***
			(0.0928)
RISK×LOW×Period			-0.347***
			(0.133)
Constant	-0.406**	-0.463***	-0.196
	(0.163)	(0.174)	(0.298)
Observations	1,250	1,250	1,250

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 7: Disagreement rate regressions, logit

three risky court conditions (top panels) in the first two rounds. The green solid vertical line is drawn at the median offer. The black upwardsloping line in each subgraph depicts the empirical cumulative distribution of the acceptance thresholds or MAOs, i.e. the aggregated acceptance probability in the population of agents on the opposing side, and the vertical dashed line captures the median MAO.

Notice that the offer of 100, if accepted, shares the pie equally. While this equal split tends to be the modal offer, the offers to the plaintiffs (Figure 3) are smaller than the offers to the defendants (Figure 2) reflecting the higher conflict payoffs that the defendants receive in all conditions whether or not the plaintiff litigates. In fact the modal offer to the plaintiffs is 80 rather than 100 in many conditions and there is also much more dispersion in the offers to the

Disagreement	(1)
RISK	1.073**
	(0.440)
HIGH	0.467
	(0.441)
RISK×HIGH	-1.291**
	(0.611)
Period	0.155**
	(0.0706)
RISK×Period	-0.280***
	(0.0943)
HIGH×Period	-0.240***
	(0.0928)
RISK×HIGH×Period	0.347***
	(0.133)
Constant	-0.663**
	(0.334)
Observations	948

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Disagreement rate, "High cost" vs "low proba"

plaintiffs. The offers are obviously much higher than what subgame perfection and self-interest predict. This is likely due to the proposer's intrinsic other-regarding concerns and to less than perfect reliance on the opponent's self-interested rationality.[21]

The majority of acceptance thresholds are set between 80 and 100. This is reflected in the figures in the steep slope of the black curve between offers 80 and 100. The defendants set higher thresholds than the plaintiffs, again in line with their higher conflict payoffs and thus with the comparative statics prediction of self-interested sequential rationality with and without noise.

The condition where adjudications are aleatory and the odds are against the plaintiff is most prone to conflict in early rounds, and yet when the court grants the corresponding expected returns for sure, the settlement rate is the highest. Not surprisingly then, the difference in disagreement rates is highly significant between these two conditions. The extent of disparity between the risky and certain conditions is exhibited in the median proposals and acceptance thresholds. The median proposal of 99 by the plaintiffs in the deterministic case is highly congruent with the defendants' median threshold of acceptance of 90. With risky court the median proposal by the plaintiffs is a meager 90 while the defendants' median threshold of acceptance is half of the pie, 100. Thus there is much more disagreement with variant trial outcomes. Nevertheless the opposite effect of risk is detected when legal costs are high.

[21] See Camerer (2003), for instance.

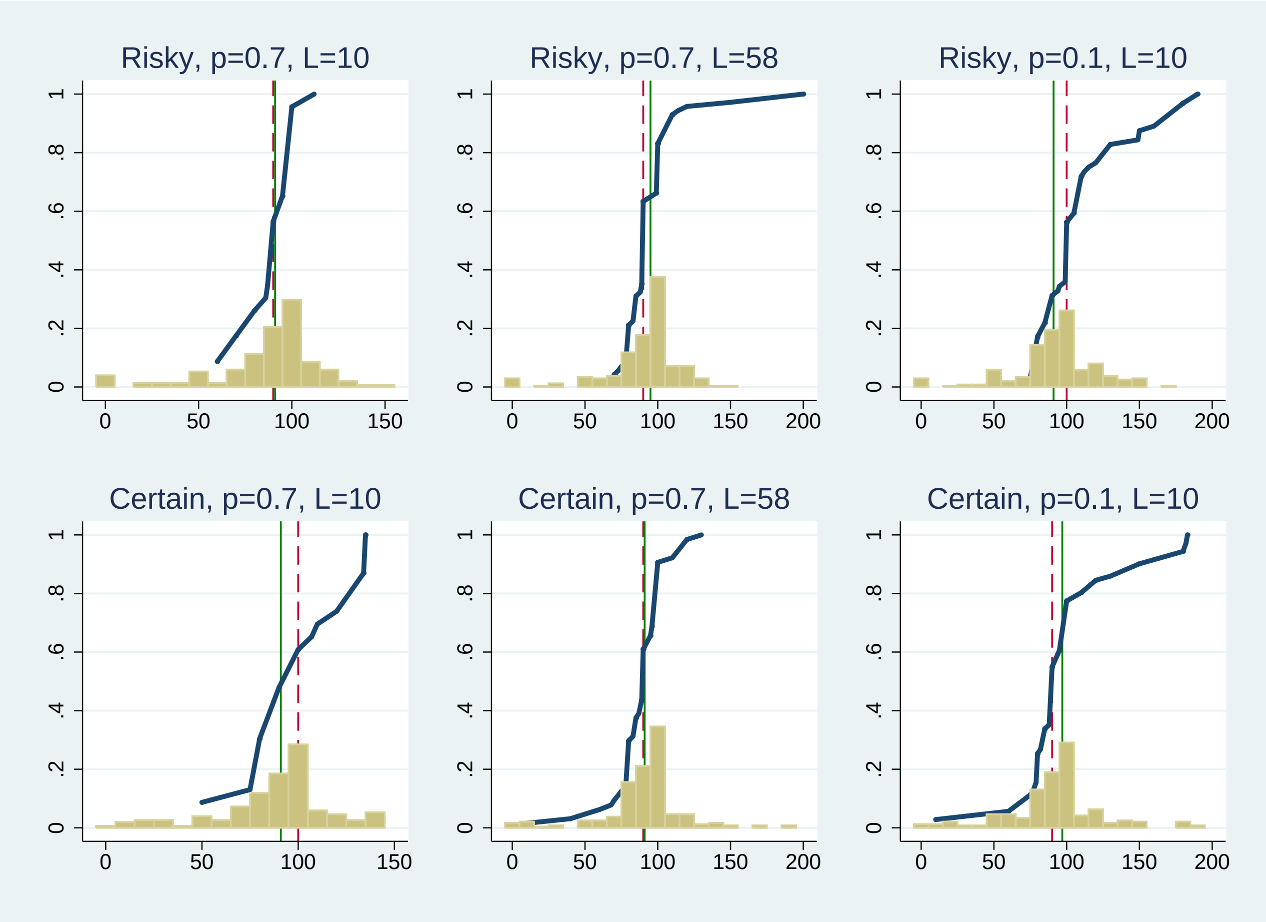

Figure 2: Plaintiff offers and defendant MAOs.

4.2 Rachlinski conjecture in the controlled laboratory

The defendants react to monetary incentives generated by the variation in legal costs and the opponent's winning probability. The expected court payoff for the defendant is highest when odds are against the plaintiff. Not surprisingly then, this is when the defendants' MAO reaches highest average levels.

Given the litigation rate of 60% in the high cost condition, there are substantial expected legal costs despite the suboptimality of litigation for the plaintiff. These expected costs push the defendant's expected conflict return below that in the benchmark condition. The strong upward slope in the litigation rate in the risky high cost condition further strengthens the incentive to avoid conflict in the high cost case. Thus a cautious defendant would bargain more aggressively in the benchmark condition than in the high cost condition. This is indeed visible in Table 9 where the defendant's minimum acceptable offer (MAO), i.e. her response, is regressed on condition dummies BENCH, $p = 0.7$ and $L = 10$, and LOW, $p = 0.1$ and $L = 10$. The MAO turns out significantly lower in the high cost case $p = 0.1$ and $L = 58$ than in the other two. The expected utility theory with diminishing marginal utility for money fails to provide an

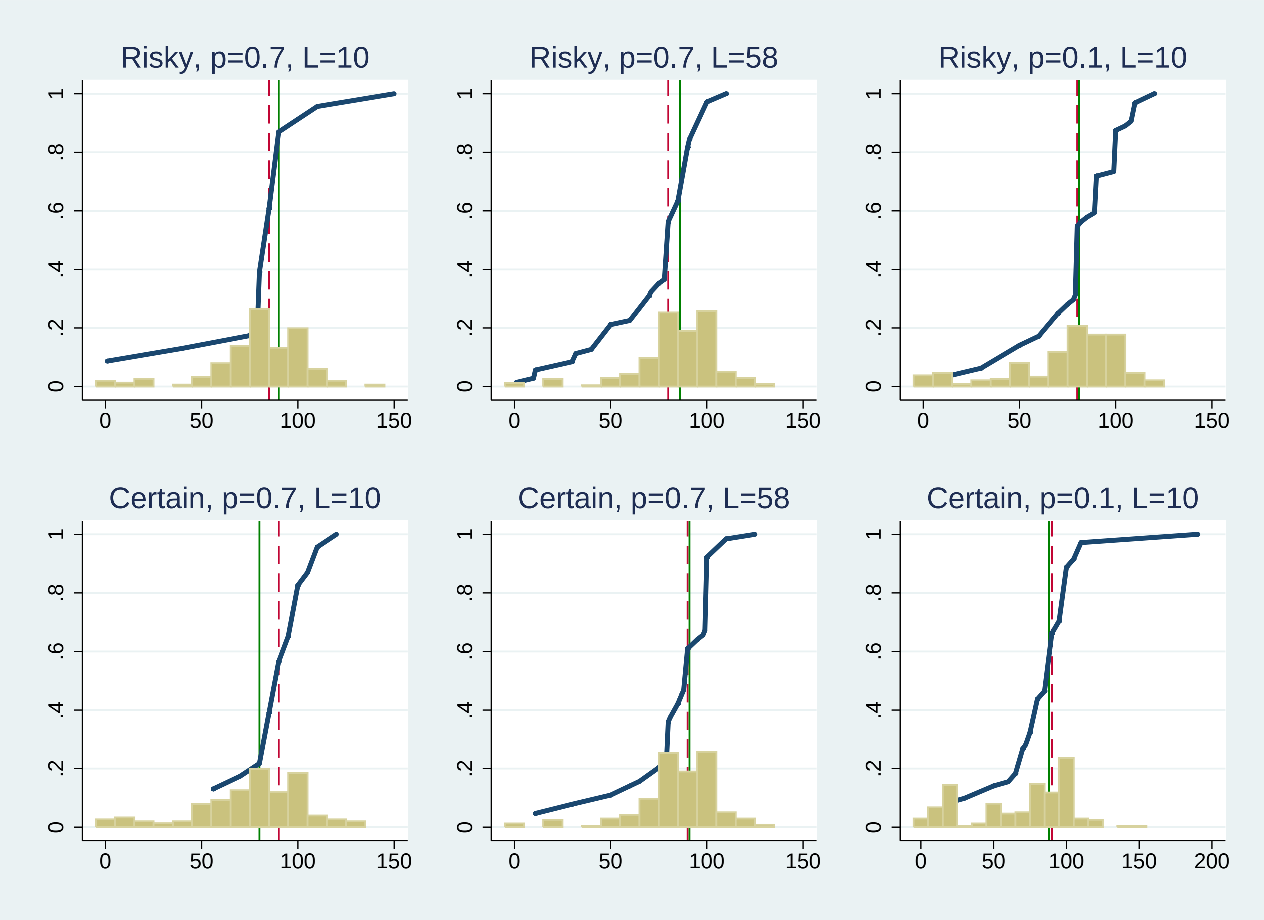

Figure 3: Defendant offers and plaintiff MAOs.

explanation for the fact that the defendants are more aggressive when the court is risky than certain. Yet, this is perfectly in line with the hypothesis advanced by Rachlinski (1996) and Guthrie (2000).

Rachlinski (1996) argued that, for the plaintiffs, any income received in settlement negotiations is a gain whereas defendants only incur losses with respect to their status quo payoff. Rachlinski conjectured that if prospect theory has any explanatory power, then one should expect the defendants in the prospect of making losses to bargain more aggressively than the plaintiffs with a prospect of making money.

To support his conjecture Rachlinski ran experiments with law students. He asked his subjects to consider hypothetical settlement negotiations, half of the subjects were assigned the role of the plaintiff and the other half the role of the defendant. Each role received exact same instructions with publicly known prospects of winning for each side. Subjects were asked whether they would accept a given offer. Participants taking the role of a plaintiff were more likely to accept than those in the defendant role thus supporting his hypothesis.

Guthrie (2000) further extended the set of hypotheses by arguing that the predictions would

Defendant MAO	(1) response	(2) response	(3) respons
RISK	-2.912	6.661	9.620**
	(3.879)	(4.762)	(4.284)
Period	0.746	1.820***	1.831***
	(0.468)	(0.693)	(0.705)
RISK×Period		-2.148**	-2.180**
		(0.882)	(0.919)
BENCH	8.797***	8.777***	9.880***
	(1.802)	(1.815)	(2.874)
LOW	15.79***	15.75***	18.77***
	(2.516)	(2.485)	(3.895)
RISK×BENCH			-2.199
			(3.628)
RISK×LOW			-6.032
			(4.950)
Constant	90.08***	85.31***	83.85*
	(2.830)	(3.036)	(2.784)
Observations	1,250	1,250	1,250
Number of id	158	158	158

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 9: Defendant MAO, linear panel regression

be reveresed in litigation where the winning (losing) probability is small but the reward (loss) conditional on winning is substantial. These reverse patterns in the shadow of frivolous litigation are driven by people's tendency to overweight small probabilities, a feature first bring to light by Kahneman and Tversky (1979).

Our setup may not be ideal for studying the conjecture since subjects may perceive every dollar earned in the lab as a gain and thus behave in a risk-averse manner in ordinary litigation and risk-loving manner in frivolous litigation irrespective of their role.[22] Let us nevertheless summarize our findings of the effect of risk on litigation and negotiation choices.

When it comes to the *litigation decision* at an impasse, the plaintiffs in our experiment litigate more aggressively in the risky case and are surprisingly willing to take negative expected return bets. This is against the ordinary litigation prediction that plaintiffs would be risk averse and, as pointed out in Section 3, the pattern seems not driven by overweighting of small probabilities but rather by a gain-loss-reference associated with social comparison.[23]

Yet, surprisingly, both parties' *bargaining behavior* conforms perfectly well to the Rachlisnki

[22]See Rachlinski (1996, p. 134) expressing such concerns regarding experimental studies of the topic.

[23]In our experiment as opposed to Rachlinski, we use a non-framed controlled laboratory setting where actions are incentivized with actual small stakes. Each of the two experimental designs has its advantages and the settings are different enough to only allow to speculate about the main drivers of differences in behavior.

conjecture. The plaintiffs are less aggressive or risk-seeking at the negotiation table when the court decisions are risky while the defendants are more risk seeking. The reversal of plaintiffs' risk-preferences has a natural explanation: at the negotiation phase expectations about the opponent's negotiation strategies and one's own best-responses to these are mostly congruent with receiving approximately as much as one's opponent receives. Thus there is no need to bet to break even with one's opponent. This reversal of risk-preference asserts that, in our experimental setting, it is indeed social comparison that bears most impact on subjects' neutral reference point, the negotiation may be perceived taking place in a gains domain and behavior should indeed exhibit risk-aversion even under prospect theory. Loss aversion in social comparison favors gambling for the upper hand only when failed negotiations put plaintiffs in a social loss frame in our experiment.

Plaintiff MAO	(1)	(2)	(3)
HIGH	-8.579***	-9.728**	-0.455
	(1.641)	(4.804)	(6.665)
RISK	-2.700	-10.11*	-4.412
	(3.780)	(5.180)	(9.459)
HIGH×RISK		1.387	-16.71*
		(3.369)	(8.956)
Period	-0.463	-1.162	-0.138
	(0.436)	(0.837)	(1.017)
HIGH×Period		0.0757	-1.886
		(0.864)	(1.340)
RISK×Period		1.244	-0.972
		(0.891)	(1.268)
HIGH×RISK×Period			3.914**
			(1.683)
Constant	89.47***	93.55***	97.52***
	(3.183)	(4.639)	(7.469)
Observations	776	756	753
Number of id	158	175	176

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 10: Plaintiff MAO, linear panel regression

An alternative explanation for the risk-preference reversal is suggested by Korobkin (2003). Higher aspirations have been shown to contribute to better negotiation outcomes and shown to be correlated with opening demands (van Poucke at al., 2002), in our setting with the acceptance thresholds. Korobkin asserts that aspirations also coincide or influence the personal reference level in respect to which gains and losses are evaluated. Since in our setup the median MAO set by the plaintiffs is substantially higher than the expected return to the plaintiff from court, Korobkin's theory is in line with our evidence.

Moreover, the defendants set significantly more aggressive MAOs when courts are risky than when they are certain (Table 9 above) further conforming to the patterns observed by Rachlinski and Guthrie (2003, pp. 168): "The defendants are more likely to prefer the risk-seeking option - trial - because they view both settlement and trial as losses." [24]

In Section 4, we found that unusually high share of cases settle in the high cost condition, especially when courts are risky. In Section 3 we found that litigation rate is particularly high with high legal costs and aleatory court outcomes. We suggested that the explanation for the high settlement rate could be driven by more cautious bargaining behavior by both sides triggered by willingness to avoid the implied high litigation costs. What is the lesson we learn from Tables 9 and 10?

In fact the defendants are not cautious at all in the high cost condition in early rounds - they set 10 ECUs higher MAOs when courts are risky than certain. They do learn and become less demanding over time. In the early rounds, yet, it is the modest MAOs set by the plaintiffs in the risky high cost case that explains the high settlement rate. They set an estimated 15 ECU lower MAO in the risky high cost case than when there is no uncertainty to the court outcomes. In combination with the plaintiffs' high litigation rate in the risky high cost condition, this raises a further question: is it the low MAOs in the negotiation table that give rise to the high litigation rate? The plaintiffs perhaps justify the aggressive litigation by making sure the punishment only hits those defendants who make very meager proposals. This is why we ran the additional sessions where pretrial negotiations were excluded and the above described strategy of punishing the greedy is thus excluded. The results reported in Table 5 indicate that the risky high cost condition is conducive of high litigation even without pretrial negotiations and thus when the selection of the defendants who will suffer from litigation cannot be influenced by one's own negotiation choices. Thus a pure outcome-based social comparison loss aversion seems the right explanation for the observed high litigation rate.

A unifying explanation for all the risk-taking patterns we observe is that both the ex-ante expected payoff (Köszegi and Rabin, 2007) and the fair and focal equal split influence the gain-loss reference. Thus the loss reference would be a convex combination of the fair equal split and the ex-ante expected payoff. To gain some insight what this implies, one can calculate an approximation of the expected payoffs in various conditions assuming, for simplicity, that the expected outcome conditional on agreement is approximately the equal split. The expected ex-ante payoff for the defendant, which depends on the treatment condition, is 112 in the high cost condition, 144 in the low probability condition, and 123 in the benchmark condition. That

[24]Notice that the risk profile implied by a MAO also depends on the opponents expected proposal. We tried many alternative logit and linear regressions but found no evidence that the treatment condition would influence the beliefs either about opponents' proposals or about opponents' responses. The defendants' do expect more aggressive litigation behavior by the plaintiffs in the risky high cost condition which render the risk profiles of the higher MAOs set by the defendants all the more riskier.

for the plaintiff amounts to 55 in the low proba condition, 66 in the high cost condition and 73 in the benchmark condition. Notice that the median negotiation strategies of both parties are between 80 and 105 (see Figures 2 and 3) and thus the expected payoff conditional on agreement is not far off from the equal split and certainly between the expected payoff references of the two parties. The reference point difference would thus explain why the defendants in the negotiation table react to the increase in the risk-spread in court rulings in a risk-loving manner; they risk settlement to bet on making at least what they expect ex-ante. The plaintiffs for their part would react to risk in the opposing manner not willing to risk the good negotiation outcome.

5 Conclusion

We study settlement negotiations and the plaintiff's decisions to raise a lawsuit after failed settlement in a controlled non-framed laboratory experiment. In line with subgame-perfect equilibrium, litigation rates are higher when it is optimal to litigate than when not. Yet, contrary to the predictions of risk-aversion, we find that litigation rates are higher when court rulings are uncertain rather than certain.

There are three overlapping explanations to this finding: (i) illusion of control, (ii) loss aversion, (iii) overweighting of small probabilities. We find evidence favoring the second explanation the reference payoff with the gain-loss reference being influenced by the social comparison with the defendant: the plaintiff's expected payoff falls short of that of the defendant; the risky court yet provides a chance of coming in first or at least narrowing the gap. Our incentivized behavioral results thus comply with the findings of Loewenstein et al (1989) in a hypothetical negotiation setting. Notice that in a contextually richer framework, a higher litigation rate under variant decrees could be driven by willingness to delegate the moral judgment to the impartial court. Such "shifting the blame"-argument has been suggested in a general context by Bartling and Fishbacher (2011) and it might be particularly important in the legal context where the court is perceived to have a moral authority. Yet in our non-framed laboratory study the effect should be smaller.

When it comes to the negotiation strategies, impasses are frequent in the initial rounds particularly when courts are risky and the plaintiff has scant chances of winning. The negotiation conflict seems to be driven by the lower opportunity cost of conflict for the defendants which makes them more aggressive in the low proba condition and the failure of the plaintiffs to fully account for this effect. They expect non-aggressive responses by the defendants and this expectation turns out to be untrue.

We also find support for the Rachlinski (1996) conjecture, to our knowledge for the first time in an incentivized laboratory experiment. The plaintiffs' negotiation strategy becomes more cautious when risk is introduced to court rulings while risk triggers a more aggressive response from the defendants. Rachlinski argued that loss-averse plaintiffs in actual settlement negotiations should be risk-averse in the prospect of gaining money while the defendants should be risk-seeking with the prosepct of having to pay. The puzzle that arises is why in our setup the parties should react to risk in this manner when in the laboratory subjects may perceive every dollar earned in the lab as a gain and thus behave in a risk-averse manner.[25] A unifying explanation for all the risk-taking patterns we observe is that both the ex-ante expected payoff (Köszegi and Rabin, 2007) and the fair and focal equal split influence the gain-loss reference. Thus the loss reference would be a convex combination of the fair equal split and the ex-ante expected payoff.

Guthrie (2000) building on the work of Rachlinski (1996) extends Rachlinski's analysis to contexts of frivolous litigation where the chances of winning (or losing) are small but paid damages are substantial. In line with the prediction of prospect theory, the small probability contexts tend to reverse the risky choice patterns implied by mere loss aversion so that choices appear risk-loving (risk-averse) in the gains domain (loss domain) when probability of winning (losing) is small in his study. In our setup, the probability overweighting predicts a negative interaction effect between riskiness and costliness of court rulings when comparing the high cost condition against the low proba condition (where the expected monetary payoffs for the plaintiff are the same) and excluding data from the benchmark condition. We did not detect such an interaction effect. Notice yet, that with a smaller probability of winning, the probability overweighting phenomenon is likely to matter more. Non-framed laboratory replication of Guthrie (2000) is an open challenge for future work.

An intruiging finding is that the settlement rate is significantly higher when legal costs are high. Keeping check of private incentives to litigate can be achieved in two alternative ways, either by raising the costs of going to court or by lowering the chances of winning the case. Our study illustrates how psychological factors and error imply that the two are not perfect substitutes in reducing litigation or increasing settlement rate. The fact that the plaintiffs err in their litigation choices implies that the defendants must be particularly cautious in the settlement stage when legal costs are high. Lowering the odds of winning for the plaintiffs have the opposite incentive effect: the defendants' opportunity cost of settlement is lower and thus they are considerably less cautious in the negotiation table. Thus higher legal costs imply considerably higher settlement rate. Yet one should note that when risk-spread in court rulings increases, the plaintiffs tend to be more willing litigate, though less demanding in the bargaining table. The defendants become more aggressive in the negotiations. Thus the introcution of risk might have a surprising impact on the balance of agreements outside the court and thus cause an unexpected distributional effect.

To study questions of external validity, we also collected a small pilot data with professional patent right lawyers in Finland in December 2009. The data suggests that professionals do not exhibit risk-loving litigation behavior or loss-aversion but rather litigate more when the court

[25]See Rachlinski (1996, p. 134) expressing such concerns regarding experimental studies of the topic.

is deterministic (even when self-interest dictates not to do so). This evidence together with the above mentioned regression results concerning self-serving biases suggest that experienced subjects may learn to get rid of their conflict inducing biases. Interestingly, in the post-experimental debriefing conversations, many lawyer participants pointed out to be extremely aversive of having to call the client to tell about a lost court case. This supports the observation that it is experience, perhaps regret in particular, that makes professionals more risk averse. Yet, the lawyer pilot differs in a crucial way from the experiment run with students: no control questions were posed to the lawyers. Thus given the small sample and differences in designs, we can only speculate about the reasons underlying the appearing differences in behavior. Clearly, both experiments suggest that at least the standard expected utility maximization approach to settlement negotiations may not be warranted. Aspirations may be guided by known damages rules-of-thumb (e.g. Goldscheider rule in patent cases (see Goldscheider et al 2002)), precedents, comparable licenses, or management incentives and goal setting about target outcomes, for instance.

6 Appendix

	Benchmark	*High cost*	*Low Proba*
RISKY			
first period	(90;95)	(90;82.5)	(100;90)*
last period	(96;90)*	(90;92.5)	(97.5;100)
CERTAIN			
first period	(90;100)	(90;90)	(92.5;100)
last period	(95;94.5)	(90;96.5)*	(100;97.5)

Table 11: Plaintiff guesses and actual defendant MAOs, (actual median behavior; median guess). * The guess is significantly different from the actual MAO at 5 %-level.

Plaintiff guess on MAO	(1)	(2)	(3)
RISK	-4.483*	-4.097	-1.552
	(2.294)	(2.968)	(2.875)
LOW	7.245***	7.809***	7.126**
		(2.566)	(3.343)
RISK×LOW		-0.389	-0.993
		(3.581)	(4.855)
Period	0.853***	0.810**	1.283**
	(2.041)	(0.320)	(0.530)
RISK×Period			-0.266
			(0.405)
LOW×Period			0.1405
			(0.722)
RISK×LOW×Period			-0.0523
			(0.907)
BENCH	5.798***	7.065***	12.180**
	(1.491)	(2.376)	(4.989)
RISK×BENCH		-1.524	1.674
		(3.126)	(6.314)
BENCH×Period			-0.958
			(0.956)
RISK×BENCH×Period			-0.928
			(1.126)
Constant	89.40***	88.88***	86.46***
	(2.041)	(2.265)	(2.402)
Observations	1,250	1,250	1,216
Number of id	158	158	188

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 12: Plaintiff guesses on MAO

	Benchmark	*High cost*	*Low Proba*
RISKY			
first period	(85;90)*	(80;89.5)*	(80;90)*
last period	(82;82.5)	(80;80)	(77.5;70)
CERTAIN			
first period	(90;80)*	(87.5;90)	(90;90)
last period	(77.5;77.5)	(84.5;90)	(90;80)*

Table 13: Defendant guesses and actual plaintiff MAOs, (actual median behavior; median guess). * The guess is significantly different from the actual MAO at 5 %-level.

Defendant guess on MAO	(1) guess_response	(2) guess_response	(3) guess_response	(4) guess_response	(5) guess_response
RISK	3.891*	4.078*	3.258	-2.644	3.658
	(2.062)	(2.332)	(2.995)	(3.688)	(3.072)
LOW	-1.101	-1.309	5.548*	5.066*	4.531
	(1.152)	(1.873)	(3.232)	(2.839)	(3.272)
HIGH	-1.059	-0.602	1.906	3.128	-0.289
	(1.125)	(1.632)	(2.900)	(2.863)	(3.157)
Period	-0.950***	-0.949***	-0.454	-0.680	-0.682
	(0.229)	(0.229)	(0.521)	(0.514)	(0.515)
RISK ×HIGH		-0.912			-1.457
		(2.140)			(1.840)
RISK×LOW		0.417		1.726	
		(2.349)		(2.218)	
RISK×Period			0.600	0.902*	0.156
			(0.451)	(0.506)	(0.439)
LOW×Period			-1.440**	-1.570**	-1.185*
			(0.623)	(0.614)	(0.625)
HIGH×Period			-0.503	-0.912	-0.0222
			(0.586)	(0.615)	(0.586)
Constant	85.21***	85.11***	81.07***	85.36***	84.20***
	(1.986)	(2.129)	(2.804)	(3.472)	(2.689)
Observations	1,250	1,250	1,250	1,250	1,250
Number of id	158	158	148	148	149

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 14: Defendant guesses on MAO

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