Legal compliance and litigation spending under the English and American rule: Theory and experimental evidence

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Abstract

We investigate fee-shifting rules in litigation with regard to their impact on legal compliance, settlement, and litigation spending. We develop a model to compare the English rule, in which the winning party is compensated by the losing party, to the American rule, in which parties pay their own expenses independent of the outcome of the trial. We conduct an experiment to put the predictions to an empirical test. In accordance with the model, we find that litigants spend substantially more under the English rule than under the American rule. Defendants are significantly more compliant under the English rule when out-of-court settlement is not possible, but not when settlement is possible. Settlement rates do not significantly differ between the two rules, nor do they differ within the subsets of strong or weak cases.

Keywords: litigation, experiment, American rule, English rule, fee-shifting, loser-pays, legal compliance, settlement, litigation spending
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1 Introduction

The basic function of any legal system is to provide individuals with incentives to avoid causing harm to others. These incentives come at a cost, most obviously in the form of direct costs of the legal disputes. Courts have to decide on damage payments, and defendants and plaintiffs have incentives to spend resources to influence the verdict to their benefit. Many of these expenses are wasteful from a societal perspective and an efficient legal system should keep the welfare loss of these activities minimal (Cooter and Rubinfeld, 1989). One of the parameters of choice is the allocation of litigation costs, i.e., the fee-shifting rule. While each litigant has to bear his own litigation costs in the American rule, the English rule imposes the losing party to reimburse reasonable fees to the winner. Whether one rule dominates the other is the subject of an ongoing debate. An extensive literature discusses the implications of these rules on *settlement rates*, and on the selection of cases that end up in court. The main findings suggest that, relative to the American rule, the English rule can unclog courts, by encouraging the pre-trial settlement of low quality cases (Hughes and Snyder, 1995; Helland and Yoon, 2015).[1]

A more comprehensive comparison of the two rules, however, should at least include two other widely discussed outcomes: legal compliance and litigation spending.[2] With the English rule, a defendant who is proven negligent in court suffers a greater loss. A first benefit of the English rule, advocates argue, is that this high potential cost makes defendants more compliant ex ante. While this argument has intuitive appeal, the theoretical literature has generally found an ambiguous effect of fee-shifting on legal compliance (Gravelle, 1993; Gravelle and Waterson, 1993; Beckner and Katz, 1995; Hylton, 1993).

Furthermore, litigation becomes a riskier business under the English rule since it both increases how much a litigant can win and how much he can lose. These higher stakes, the opponents of the rule argue, make litigants willing to 'fight harder' and thereby increase the cost of litigation. This prediction is in line with many theoretical models of litigation with endogenous effort (Braeutigam et al.,

[1]The theoretical literature usually predicts higher settlement rates under the English rule (Shavell, 1982; Bebchuk, 1984; Katz, 1987). Polinsky and Rubinfeld (1998), however, show that the English rule can encourage low-probability plaintiffs to go to court. The experimental literature finds mixed evidence (Coursey and Stanley, 1988; Main and Park, 2000, 2002; Inglis et al., 2005). For further empirical evidence on fee-shifting rules see Schwab and Eisenberg (1987); Fournier and Zuehlke (1989); Yoon and Baker (2006); Eisenberg and Miller (2013); Eisenberg et al. (2013).

[2]See Shavell (2007) for a survey on legal compliance related to tort, while Crampes and Langinier (2002) and Meurer and Bessen (2006) focus on patent litigation. On endogenous litigation spending see Katz (1988), Farmer and Pecorino (1999), and Hirshleifer and Osborne (2001).

1984; Katz, 1987; Baye et al., 2005; Carbonara and Parisi, 2012).

Putting these theoretical arguments to an empirical test is challenging. Data from real cases usually represent only a selected sample of all disputes. Data on legal compliance and litigation spending are hard to come by. Furthermore, the absence of a proper control group generally makes it difficult to draw causal inference about the effects of fee-shifting rules. In this paper we will avoid these problems by using a controlled laboratory experiment. We define a litigation game in which we exogenously vary the allocation rule of litigation costs and investigate how they affect the decisions of subjects with regard to legal compliance and litigation spending, as well as settlement.

We start by formulating a theoretical model of litigation. The objective is to (i) unify many of the predictions cited above in a single framework, and (ii) provide a simple environment that can be implemented in a laboratory experiment. The main building blocks of the model can be summarized as follows. A defendant can be negligent or careful, and thereby influences the probability that an accident occurs. In case of accident, the two parties first try to find a private agreement on how the plaintiff should be compensated. If they fail, they go to court to solve their dispute. The court stage is modeled as a contest in which parties can increase their chances of winning by spending more. The court outcome also depends on whether the defendant was careful in the first place. If the defendant was negligent, for example, then the plaintiff has a strong case against him. The defendant will then have a harder time convincing the judge. If the defendant was careful, then the plaintiff has a weak case, which makes it more difficult for him to win the case. Within this setting, we compare the American rule, in which each litigant bears his own litigation costs, to the English rule, that imposes the loser of a trial to reimburse the expenses of his opponent up to some amount.

From the model we derive the following predictions: First, litigants spend more under the English than under the American rule. Intuitively, the English rule increases the stakes of the contest and makes the players willing to spend more resources to win the case. Second, the model predicts that defendants will be more careful under the English rule when litigants do not have the opportunity to settle out of court. The overall cost of going to court increases both because the defendant anticipates that he will spend more and because, in case he loses, he will have to reimburse the plaintiff's fees. Consequently, higher expected costs of a lawsuit under the English rule make it more likely that the defendant is careful. On the other hand, if settlement is possible the model predicts no differences in compliance between the two rules.

Our experimental results support the main predictions. Treatments with the English rule are associated with higher litigation spending by both the defendant and the plaintiff. Defendants are more careful under the English rule when settlement is not possible, but the difference is not significant when settlement is possible. Despite the support for the theory on the main outcomes we observe some interesting deviations from the predictions: Litigants spend substantially more after failed settlement compared to the situation when settlement is not possible. Weak cases (when the defendant was careful) are associated with lower litigation spending than strong cases (negligent defendant). Our experiment also allows to investigate the causal effects of the fee-shifting rule on settlement. We observe no significant difference in settlement rates and parties settle for a larger amount in the English rule. Weak cases settle more often in the English rule, but the difference is not significant.

The paper is organized as follows. Section 2 presents the model and derives hypotheses. Section 3 introduces the experimental design. The results are presented in section 4, and section 5 concludes.

2 The Litigation Game

2.1 The Environment

There are two players, a defendant (D) and a plaintiff (P). The defendant chooses whether or not to be careful ($c \in \{0, 1\}$). Being careful ($c = 1$) reduces the probability of causing harm $\delta > 0$ to the plaintiff. The probability of harm is π_1 if the defendant is careful, and $\pi_0 > \pi_1$ if he is negligent. The cost of low care is normalized to zero, high care costs $\gamma > 0$ to the defendant.

The game starts with the defendant choosing between being careful or negligent. Then chance determines whether there is harm δ done to the plaintiff. In case of no harm the game is over and the utility for the plaintiff is $U_P = 0$, while the defendant's utility is either zero or the cost of care ($U_D = -c\gamma,$). In case of harm, the parties first bargain over a settlement. If settlement fails, they go to court.

The settlement stage is modelled as a modified divide-the-dollar game where both players simultaneously choose thresholds for acceptance. The defendant makes a settlement offer of s_D, and the plaintiff chooses a settlement request of s_P. In case of $s_P > s_D$ settlement fails and the game continues to the court stage. In case of $s_P \leqslant s_D$ the two parties settle for a transfer of $\bar{s} = \frac{S_D - S_P}{2}$ and the final payoffs are $U_D = -\delta + \bar{s}$ and $U_P = -\bar{s} - c\gamma$.

The court stage is modelled similar to an all-pay auction.[3] The plaintiff tries

[3] Katz (1987) and Carbonara and Parisi (2012) use a Tullock-type of contest function in which litigation spending continuously increases the probability of winning. In our setting, the litigant wins if he spends more than his opponent. Baye et al. (2005) also use an all-pay auction contest function but they assume private information about the players' types while we assume

to convince the judge to award him damages while the defendant tries to convince the judge not to have to pay. If awarded, damages cover exactly the harm, i.e., are equal to δ. By spending $p \geqslant 0$, the plaintiff produces p arguments. By spending $d \geqslant 0$, the defendant produces d arguments. In addition, the judge produces θ arguments. These arguments work in favor of the plaintiff if he has a strong case (negligent defendant), and the arguments work in favor of the defendant if the plaintiff has a weak case.[4] We further assume that the number of arguments produced by the judge is positive and smaller than the damages ($0 < \theta < \delta$).

Litigants present their arguments to the judge. The judicial decision depends on the number of arguments produced by the two parties and the judge's arguments. The case is won by the party with the higher number of arguments. Ties are resolved at random. We define an indicator variable q for the plaintiff to win the case:

$$q(p,d,c) = \begin{cases} 1 & \text{if } (1-c)\theta + p > d + c\theta, \\ \{0,1\} & \text{if } (1-c)\theta + p = d + c\theta, \\ 0 & \text{if } (1-c)\theta + p < d + c\theta. \end{cases} \tag{1}$$

The party who loses the case has to reimburse the legal expenses to the winning party up to λ. The final payoffs of the litigants are given by:

$$U_D = -q(\delta + \min\{p,\lambda\}) + (1-q)\min\{d,\lambda\}) - d - c\gamma \tag{2}$$

$$U_P = q(\delta + \min\{d,\lambda\}) - (1-q)\min\{p,\lambda\} - p - \delta \tag{3}$$

In case of $q = 1$, the defendant loses the trial and has to pay the damages δ and some of the litigation costs of the plaintiff ($\min\{p,\lambda\}$). In case of $q = 0$, he does not have to compensate the plaintiff and gets reimbursed his litigation costs up to λ ($\min\{d,\lambda\}$). Whatever the outcome of the trial, he has to bear his own litigation costs d and the cost of care. Symmetrically, the plaintiff receives $\delta + \min\{p,\lambda\}$ if $q = 1$, while he has to pay $\min\{d,\lambda\}$ in case of $q = 0$, and always bears his own costs of litigation p and the harm.

The parameter λ is the center of our interest. In case of $\lambda = 0$ the game nests the American rule, according to which each party bears its own litigation costs. For $\lambda > 0$, the model nests the English (or loser-pays) rule of litigation costs allocation according to which the losing party bears some or all of the litigation costs of the winning party. All parameters are common knowledge. Furthermore, the plaintiff knows the level of care of the defendant in the settlement and court stage. In the following we solve this game by backward induction, assuming risk neutral players.

symmetric information. Our specification is closer to Konrad (2002).

[4]The judge is not a strategic player in the game as his behavior is fully deterministic.

2.2 Litigation Spending

For the following we assume that λ is close to zero. We need this assumption to obtain closed-form solutions for litigation spending as this helps us to approximate $\min\{d, \lambda\} \simeq \min\{p, \lambda\} \simeq \lambda$ in the payoff functions above. Below, we resort to numerical simulations and show that our qualitative predictions still hold for a larger λ.

First consider a strong case (negligent defendant). The maximum amount the defendant can lose is $\delta + \lambda$, that is, he pays damages δ and then reimburses the expense of the plaintiff up to λ. If the defendant wins, he can gain up to λ. Thus, the maximum amount the defendant is willing to spend in court is $\delta + 2\lambda$ (the difference between $-\delta - \lambda$ and λ). Assuming the defendant spends this maximum, the plaintiff can win the case by spending $p^* = \delta + 2\lambda - \theta + \epsilon$, with $\epsilon > 0$, and $\epsilon \to 0$. Since this amount is greater than λ under the assumption $\theta < \delta$, fee shifting will be λ. Thus, the payoff of the plaintiff would be $u_P^* = \delta + \lambda - p^* = \theta - \lambda$.[5] The best response of the defendant to this behavior is to spend 0 and to lose $\delta + \lambda$ for sure, that is, $u_D^* = -\delta - \lambda$. But then the plaintiff could win the case by spending ϵ. Thus, as is standard in this class of problems, there exists no pure strategy Nash equilibrium. There exists, however, a mixed strategy equilibrium that delivers these payoffs in expectation.[6]

$$E[u_P] = u_P^* = \theta - \lambda \tag{4}$$

$$E[u_D] = u_D^* = -\lambda - \delta \tag{5}$$

From this we can infer expected litigation spending of the two parties. To do this we add up the expected payoff of the two parties. The payoffs contain potential damage payments from the defendant to the plaintiff, but since this is a transfer, it does not affect the sum. Total expected litigation spending are thus the negative of the total payoff:

$$E[d + p] = \delta + 2\lambda - \theta \tag{6}$$

The aggregate litigation spending is thus decreasing in θ, and increasing in δ and λ. Let us now consider a weak case (careful defendant). Assuming the plaintiff spends the maximum he is willing to pay, that is, $\delta + 2\lambda$, the defendant can win the case by spending $d^* = \delta + 2\lambda - \theta + \epsilon$, which is greater than λ under the assumption $\theta < \delta$. In this case, the payoff of the defendant would be $u_D^* = \lambda - d^* = \theta - \lambda - \delta$.

[5] For notational convenience we define u_i as the utility not including the terms $-c\gamma$ for the defendant, and $-\delta$ for the plaintiff. Since these terms are independent of the outcome of the court phase, they do not affect the strategies of the players.

[6] See Hillman and Riley (1989) for the formal proof.

The best response of the plaintiff to this behavior is to spend zero and to lose λ for sure, that is, $u_P^* = -\lambda$. As before, there exists a mixed strategy equilibrium that delivers these payoffs in expectation:

$$E[u_P] = -\lambda \tag{7}$$

$$E[u_D] = \theta - \lambda - \delta \tag{8}$$

We compute as before the total expected litigation spending:

$$E[d + p] = \delta + 2\lambda - \theta \tag{9}$$

Comparing equation (6) and (9) shows that total expenditures are independent of the whether the litigants face a strong or weak case. In both cases, expected aggregate litigation spending increases with damages δ, decreases with θ, and increases in λ. This gives us our first prediction on the consequence of fee shifting on litigation spending:

Prediction 1 *Litigants spend more under the English rule than under the American rule.*

2.3 Out-of-court Settlement

In case of harm, the parties can bargain over a settlement that includes a transfer from the defendant to the plaintiff. We begin by noting that both players have a threat point, which is given by their expected utility when going to court (as derived in the previous subsection). The threat points depend on the parameters δ, and θ, as well as the fee-shifting rule λ (see Table 1).

	Strong case	Weak case
Defendant pays at most ($\hat{s}_D$)	$\delta + \lambda$	$\delta + \lambda - \theta$
Plaintiff wants at least ($\hat{s}_P$)	$\theta - \lambda$	$-\lambda$

Table 1: Threat points for out-of-court settlement

Our assumption of $\theta < \delta$ ensures that there is always room for a settlement (i.e., $\hat{s}_D > \hat{s}_P$). Since the settlement transfer is defined by the average between settlement claim (s_P) and settlement offer (s_D), a player's best response is simply to match the other player's action as long as it is below (above) the defendant's (plaintiff's) threat point. This stage has an infinite number of Nash equilibria where both players state an identical number in the range of $[\hat{s}_P, \hat{s}_D]$.[7] Predicting outcomes over the entire action space of the players is unsatisfactory. In order to get to a precise prediction we apply the Nash bargaining solution to this problem (Nash, 1953). Assuming risk neutral players leads to an equal split of the surplus in the settlement stage. Thus, in case of care final utilities are $U_D = -\frac{\delta-\theta}{2} - \gamma$ and $U_P = \frac{\delta-\theta}{2} - \delta$. In case the defendant was negligent we have $U_D = -\frac{\delta+\theta}{2}$ and $U_P = \frac{\delta+\theta}{2} - \delta$. Consequently, the fee-shifting rule λ neither affects the likelihood of settlement nor the settlement transfer.

Prediction 2 *The parties always settle and the transfer is independent of the fee-shifting rule.*

We see a number of reasons why the prediction of the Nash bargaining solution might be unrealistic. First, players must assume equal bargaining power. Second, settlement might fail because the outside opportunities are difficult to compute, or because parties are subject to a self-serving bias (Loewenstein et al., 1993). If their perceived outside opportunities include a random term, out-of-court settlement might fail even if both players agree on the equal split of the surplus.

Table 1 shows that the bargaining range increases in λ. If we assume that the settlement stage is subject to some distortion then a higher λ should make settlement more likely. This leads to an alternative prediction for the settlement stage:

Prediction 2a *The parties are more likely to settle out of court under the English rule than under the American rule.*

2.4 Care

In the first stage the defendant decides whether or not to exert care. He is careful if his expected payoff from being negligent is lower than his expected payoff from being careful. We use the expected payoffs of the Nash bargaining solution of the settlement stage to derive predictions for care.

$$\pi_0 \left[-\frac{\delta+\theta}{2}\right] < \pi_1 \left[-\frac{\delta-\theta}{2}\right] - \gamma \tag{10}$$

For the threshold cost level we get

$$\hat{\gamma}^S = \frac{\theta}{2}(\pi_0 + \pi_1) + \frac{\delta}{2}(\pi_0 - \pi_1) \tag{11}$$

[7] Similar to the divide-the-dollar game, the settlement game has additionally an infinite number of Nash equilibria in which settlement fails. These are characterized by the plaintiff asking for $s_P > \hat{s}_D$ and the defendant offering $s_D < \hat{s}_P$.

The threshold level is increasing in the damages δ and the judge's arguments θ, while the fee-shifting rule λ does not affect the care decision.

Prediction 3 *The fee-shifting rule does not affect the care decision if settlement is possible.*

In a next step we want to investigate the care the decision in a slightly modified game, where we remove the settlement stage. In case of harm the two parties directly proceed to the court stage. In this situation the defendant's condition for being careful depends on the expected utilities of the court stage

$$\pi_0 [-\lambda - \delta] < \pi_1 [\theta - \lambda - \delta] - \gamma \tag{12}$$

Which leads us to the critical cost level

$$\hat{\gamma}^{NS}(\lambda) = (\pi_0 - \pi_1)(\lambda + \delta) + \pi_1 \theta \tag{13}$$

The resulting critical cost level is a function of the fee-shifting parameter λ. Switching from American to English rule increases the defendant's willingness to pay for care and consequently leads to higher care levels.

Prediction 3a *The English rule leads to higher care than the American rule if settlement is not possible.*

3 Experimental Design

3.1 The Game

Our experimental game closely follows the model described in the previous section. To facilitate the understanding of the game we use a rich framing and set the game in a medical malpractice context. The defendant is called doctor and the plaintiff is called patient. In the first stage of the game, the doctor chooses whether to be careful or negligent.[8] The second stage is labelled as settlement stage, the third as court stage (see online appendix for the instructions).

During the first stage, the cost of being careful (γ) is randomly drawn from the set $\{20, 30, \ldots, 90\}$, all values with equal probability. The probability of accident is $\pi_0 = .5$ if the doctor is negligent, $\pi_1 = .1$ if he is careful. In case of accident, the

[8]One might worry that such a morally loaded framing influences behavior. While it is certainly possible that the level of care we observe in our experiment is affected by the particular framing (i.e., would be different in an experiment with a neutral framing) it is important to note that the main focus of our investigation are treatment differences induced by the variations in the fee-shifting rule, and not the absolute level.

patient suffers a loss of $\delta = 100$. We implement two fee-shifting treatments, the American rule with no fee shifting ($\lambda = 0$), and an English rule with fee shifting up to $\lambda = 75$.

The game starts with the care decision. Subjects then proceed to the second stage of the game to solve their dispute. While in the game the settlement stage is only invoked in case of accident, we let all subjects proceed to the settlement stage. This is done to avoid losing observations for the games without accident. Subjects take their decision before they know whether an accident happened. In the end of the game they learn the realization of the accident. In case there was no accident, all their entries in the settlement and court stage are irrelevant for their payoff. Subjects are informed about this procedure.

In the settlement stage plaintiffs (patients) learn the care decision of the defendant (doctor). Then both players enter their reservation prices and, dependent on the entries, the case is settled or proceeds to the court stage. If the case is settled the game is over and players are informed about their final payoff. In some treatments we do not offer a settlement stage and players directly proceed to the court stage. In court, both players simultaneously choose the number of arguments (d and p). Because both players know whether the doctor was careful or negligent, they are aware of whether θ works in their favor or not. Ties are resolved at random by the computer.

3.2 Experimental procedures

The experiment was run in z-Tree (Fischbacher, 2007), subjects were recruited by ORSEE (Greiner, 2015). We conducted nine sessions with a total of 172 subjects, who are undergraduate students from the University of Lausanne and the Swiss Federal Institutes of Technology (EPFL).

Each subject participated only in one session and in each session we played two treatments. For each treatment we repeat the basic game 20 times in a stranger matching protocol. Random rematching was done in matching groups of six to eight subjects. In addition, we randomly allocated the role of plaintiff and defendant to the subjects in each period. To avoid overall losses both players start the game with an initial endowment of 300 ECU (Experimental Currency Unit).

At the beginning of each treatment, we handed out written instructions explaining the procedures and the rules of the game. Subjects were informed about the exchange rate ($1000ECU = 3.6CHF$). After the reading of the instructions subjects had to answer control questions. At the end of the session, participants filled in a questionnaire with demographic and other questions. The sessions lasted around two hours. Subjects received a show-up fee of 10 CHF and the average payoff amounted to 37 CHF (Euro 34). Participants received their payoff in cash at the end of the experimental session.

3.3 Numerical solutions

In this section we derive the prediction for the parameterization of our litigation game used in the laboratory. We set damages to $\delta = 100$, judges arguments to $\theta = 20$; probabilities of harm are $\pi_0 = \frac{1}{2}$ and $\pi_1 = \frac{1}{10}$.

Table 2 summarizes the numerical solutions for the Nash equilibria with the parameters used in the experiment. For *American* the equilibrium predictions are straightforward. We start by characterizing the density functions of the number of arguments produced in court. A defendant facing a strong case ($c = 0$) has to produce $\theta + p = 20 + p$ arguments to win the case. Producing $0 < d < 20$ as well as $d > 100$ is dominated by $d = 0$, thus the defendant either produces zero arguments (with prob= .2), or he draws from a uniform distribution with the support $[20, 100]$. If facing a weak case then the defendant produces zero arguments with prob= .2, or draws uniformly from the interval $[0, 80]$.[9] For the plaintiff the strategies are identical, with the reversed sign for weak and strong cases. The first three rows of Table 2 characterize the density function, followed by the expected payoffs and the probability to win the case. The expected payoffs determine the bargaining range for the settlement phase, and finally the thresholds for care.

For the *English* rule we set $\lambda = 75$, which obviously violates the simplifying assumption we made in Section 2 that λ is close to zero. The change affects the density functions of the mixed strategy equilibria. The intuition is the following: The theoretical results derived in Section 2 generally hold for a simpler version of the game, where the transfer from loser to winner is equal to λ, independent of the expenses in court. If the transfer is equal to the expenses up to a maximum of λ, then the transfer received in case of winning has a kink at $d = \lambda$. This is reflected by a kink in the cumulative density function (CDF) of the mixed strategy played in the equilibrium.[10] We derived the CDF's of the mixed strategies of the version used in the experiment numerically. The resulting cumulative densities are shown in Figure 2. The numbers in the right half of Table 2 characterize the density functions for weak and strong cases. We qualitatively confirm the predictions derived in Section 2: Both parties produce in expectation more arguments. This increases the span of outcomes, and thus also the bargaining range. However, because it symmetrically increases the spread of the outcomes for both players, the Nash bargaining solution is still the same as under the *American* rule, and therefore the care threshold ($\hat{\gamma}^S$) remains the same. If settlement is not possible, then the defendant's willingness to exert care increases, as indicated by the higher

[9] The strategic situation in court is discussed in the literature as all-pay auction with a head start. See e.g. Seel (2014).

[10] More precisely, there are two additional values of d and p which produce a regime shift in the CDF: $\lambda - \theta$ and $\lambda + \theta$.

threshold for the cost of care.[11]

Table 2: Numerical results for *American* and *English* in the litigation game.

	American ($\lambda = 0$)		*English* ($\lambda = 75$)	
	Strong case	Weak case	Strong case	Weak case
Court stage				
Support of d	$\{0\} \cup [20, 100]$	$[0, 80]$	$\{0\} \cup [20, 224.6]$	$[0, 204.6]$
$E[d]$	48	32	96.0	83.2
Atom at 0	.2	.2	.220	.167
$E[u_D]$	-100	-80	-149.6	-129.6
$E[u_P]$	20	0	-29.6	-49.6
$P[win]$	.480	.520	.465	.535
Settlement stage				
Bargaining range $[\hat{s}_P, \hat{s}_D]$	$[20, 100]$	$[0, 80]$	$[-29.6, 149.6]$	$[-49.6, 129.6]$
Settlement amount	60	40	60	40
Care threshold				
Settlement	$\hat{\gamma}^S = 26$		$\hat{\gamma}^S = 26$	
NoSettlement	$\hat{\gamma}^{NS}(0) = 42$		$\hat{\gamma}^{NS}(75) = 61.8$	

Note: For the court stage the information about support, expectation and size of the atom refer to the mixed strategy played by the defendant. For the plaintiff the numbers are identical but apply for the opposite situation in terms of weak and strong case, respectively.

4 Results

We organize our analysis of the results similar to the theoretical solution of the litigation game and start by looking at the behavior in court, followed by the outcome of the settlement stage, and we close by reporting the results on care.

4.1 Litigation Spending

We start by analyzing data on arguments produced in court. According to Prediction 1 we should observe more arguments under the English rule than under the American rule. The bars in Figure 1 shows the average number of arguments produced by all plaintiffs and defendants in the two treatments. Spikes indicate standard errors and horizontal lines show the theoretical prediction.[12] The left

[11] To calculate the care threshold we have to adapt equation (13) and solve $-149.6\pi_0 < -129.6\pi_1 - \gamma$.

[12] The standard errors take into account dependency of the observations within matching group (clustering). In equilibrium plaintiffs and defendants draw their arguments from the two mixed

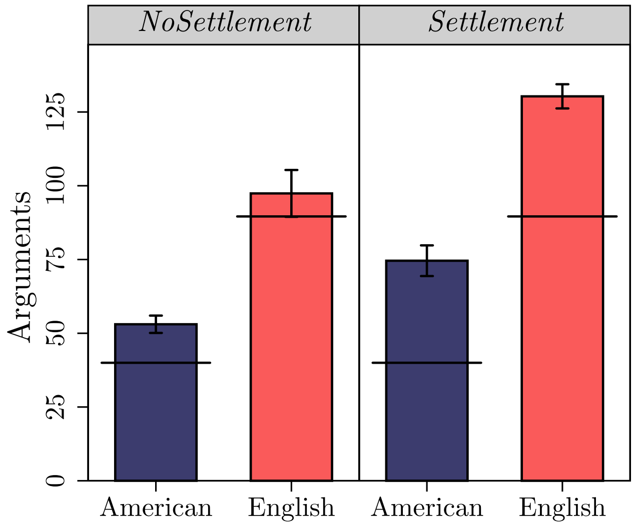

Figure 1: Average number of arguments produced in court by the plaintiffs and the defendants under the American and English rule. Left panel shows the results from the treatments without settlement, right panel shows the results from the treatments with settlement. Spikes indicate standard errors, horizontal lines indicate expected number of arguments in the mixed-strategy equilibria.

panel of Figure 1 shows the results in *NoSettlement*. The results clearly support the treatment effect predicted by the theory. We observe that the average number of arguments increases significantly from 53.1 in *American* to 97.4 in *English* ($p = .000$[13]). This increase is close to the predicted increase of 49.6 arguments. However, in both treatments we observe that litigants are more aggressive in court, that is, they produce more arguments than predicted ($p = .004$ in *American* and $p = .004$ in *English*). The right panel of Figure 1 shows the results of the treatments where settlement was possible, but the two parties failed to settle the case. Like before the treatment effect is close to the prediction with an increase from 74.6 to 130.3, but the number of arguments is much higher than in the treatments without settlement ($p = .001$ for both *American* and *English*). While in theory the settlement should not affect actions in court we have strong evidence that it

strategies described in Table 2. While the strategies depend on whether they face a strong or weak case, we observe both strategies in each and every pair. For the analysis we pool all cases and compare the mean number of arguments observed to the mean expected number of arguments in the two strategies.

[13]We report exact p-values from Wilcoxon rank-sum tests to test for differences in distributions and Wilcoxon signed-ranks tests for comparisons to theoretical benchmarks. Tests use matching group averages as observations.

does in our experiment. We see mainly two explanations for more aggressive behavior in court after settlement has failed. First, a failed settlement might give rise to negative emotions towards the opponent. Second, if there is heterogeneity in the population, then we might observe a selective sample of especially aggressive subjects in court in *Settlement*.

In a next step we use OLS estimates to take a closer look at the determinants of the behavior in court. For this and all following models we estimate robust standard errors using the matching groups as clusters. Table 3 shows the results. We start by looking only at the data of *NoSettlement* (Model 1 and 2) and then look at the combined data set (Model 3 and 4). In Model (1) we explain the number of arguments solely by the determinants identified in the theoretical analysis, most importantly the treatment dummy *English*. Because the mixed strategies of the plaintiffs are a mirror image of the defendants' strategies we introduce a dummy variable *Advantaged*, which affects the mixed strategy of both players the same way (as opposed to whether the case is strong or weak). Advantaged is equal to one for a defendant facing a weak case, and for a plaintiff facing a strong case. To cover all the four cases discussed in Table 2 we add an interaction between the treatment dummy and advantaged. We can compare the coefficients with the predicted expected number of arguments. The baseline case is a disadvantaged subject in *American*, so the prediction for the constant is 48, while we observe 52.2 (F-test: $p = .253$). For *English* we observe a coefficient very close to the predicted coefficient (46.9 vs. 48, $p = .904$). The predicted change in arguments for *Advantaged* in *American* is -16, while we observe a positive coefficient of 1.77 ($p = .011$). Finally, the interaction between *English* and *Advantaged* is predicted to be 3.2 and we observe -5.17 ($p = .198$). While we can clearly confirm the main effect of fee shifting on litigation expenses, there seem to be important deviations from the prediction, notably in how subjects react to being advantaged in court.

In Model (2) we investigate differences between plaintiffs' and defendants' strategies in court. We interact *Advantaged* with dummies for the two players. According to the prediction, both coefficients should be equal to -16. For the defendants we observe a coefficient of -11.6 ($p = .430$), for the plaintiffs 12.5 ($p = .003$). Thus an important part of the deviations from the prediction can be attributed to the plaintiffs' reaction to weak and strong cases. While defendants significantly reduce the number of arguments when advantaged (as predicted), plaintiffs *increase* the number arguments when being advantaged (i.e., when facing a strong case). We also control for time effects with a variable measuring the period and whether the game was played as second sequence. The latter significantly reduces the number of arguments.[14]

[14] A closer examination of the data reveals that this effect is mostly driven by the treatment *English*, in which we observe less aggressive behavior if it is played after *American*.

Table 3: OLS estimates for litigation spending

	Dependent variable: Arguments			
	(1)	(2)	(3)	(4)
English	46.939***	48.720***	53.784***	53.505***
	(8.577)	(8.025)	(6.535)	(6.459)
Advantaged	1.767			
	(5.775)			
Defendant × adv.		−11.624*	−6.350	−4.444
		(5.345)	(5.615)	(5.601)
Plaintiff × adv.		12.531	13.441**	12.225**
		(7.542)	(5.492)	(5.825)
English × adv.	−5.173	−1.812	−7.048	−7.429
	(6.112)	(5.889)	(5.437)	(5.375)
Settlement			29.853***	22.299**
			(5.176)	(8.253)
Defendant × offer				0.100
				(0.101)
Plaintiff × claim				0.110*
				(0.057)
Period		0.448	0.546*	0.553*
		(0.366)	(0.270)	(0.271)
Second sequence		−19.119**	−9.228**	−9.024*
		(7.412)	(4.418)	(4.390)
Constant	52.167***	53.644***	46.101***	45.995***
	(3.452)	(3.567)	(3.581)	(3.578)
F-test	11.3	16.0	37.8	30.4
Prob > F	0.001	0.000	0.000	0.000
R^2	0.121	0.162	0.212	0.214
N	2800	2800	4798	4798

Notes: OLS estimates. Dependent variable is the number of arguments produced in court. Independent variables are the treatment dummies *English* and *Settlement*, a dummy indicating whether the subject is advantaged (strong case for plaintiffs, weak case for defendants), and interaction terms between the subject's role and advantaged. Further controls are the period and a dummy for the second sequence, and the subjects actions in the settlement stage. Baseline case is a plaintiff in *American*, *NoSettlement*, facing a weak case. Models (1) and (2) use only data from the *NoSettlement* treatments, models (3) and (4) use all available data of behavior in court. Robust standard errors, clustered on matching group, in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Model (3) makes use of all the decisions in court, including those cases in the treatment *Settlement* which made it to court. The strong and significant coefficient confirms that litigants produce substantially more arguments if the case follows a failed settlement. The main treatment effect is essentially the same as before, while the reaction to *Advantaged* seems somewhat weaker for defendants. The substantial deviation from the prediction among plaintiffs remains the same.

Finally, in Model (4) we add the decisions in the settlement stage as explanatory variables to the model, i.e., the defendants offer and the plaintiff's claim.[15] Higher plaintiffs' claims in the settlement are associated to more arguments. For the defendants we do not find an effect.

In a next step we look at the distribution of the arguments in court. Figure 2 shows the cumulative density functions of all subjects in *NoSettlement*. As discussed above we should observe two different mixed strategies, depdent on the role of the subjects and on whether it is a strong or weak case. The thin lines show the theoretical predictions for the two cases. In theory, defendants and plaintiffs should have identical mixed strategies (opposite for weak and strong cases), but since we have shown in Table 3 that there are substantial differences between observation and prediction we depict separate cumulative densities for the two types. In the top left panel we depict the defendants under the American rule. Qualitatively the observed distribution follows the predicted but we tend to observe more mass at zero and above the maximum bid predicted by theory. This is in line with Ernst and Thöni (2013) who report mixed-strategies with mass shifted towards the extreme bids in simple all-pay auctions. As predicted, the cumulative distribution of arguments in strong cases is shifted to the right relative to the distribution in weak cases. Furthermore, it is notable that we observe almost no strictly dominated actions ($0 < d < 20$ for strong cases). As already pointed out above, the plaintiff's behavior in strong and weak cases is the opposite of the prediction. The top right panel of Figure 2 shows that, similar to the defendants, the cumulative density shifts to the right when we compare a weak to a strong case.

The two lower panels show the results for *English*, where the theoretical prediction features non-linear parts in the cumulative density function. The observations we made in case of *American* also hold here. The predicted comparative statics between weak and strong case is supported by the defendants but not by the plaintiffs. Almost nobody chooses arguments in the dominated range between zero and twenty, but both small and large numbers of arguments are overrepresented relative to the prediction.

Given that we observe this stark deviation from the predicted mixed strategies

[15]Both are set to zero if settlement was not available. We interact the offer and claim with the dummy for the player because subjects were not informed about their opponent's decision in the settlement phase.

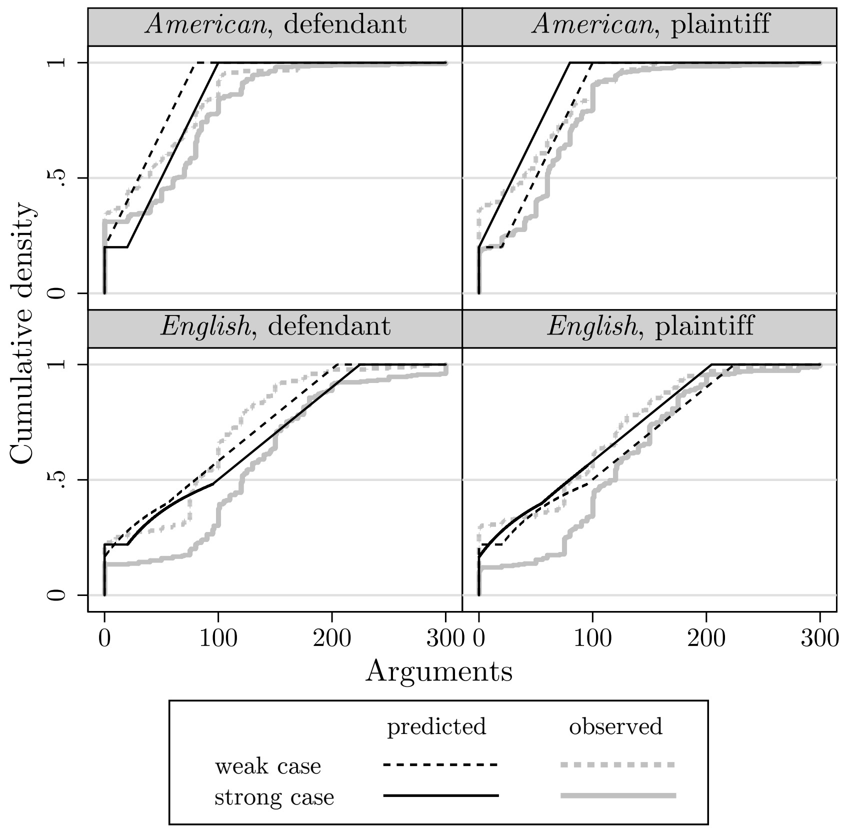

Figure 2: Cumulative densities of observed (bold gray lines) and cumulative distribution of predicted (black thin lines) number of arguments. Top panels for *American*, bottom panels for *English*. Left panels show the defendants, right panels the plaintiffs. Solid lines refer to strong cases, where the defendant was negligent, dashed lines show the results for weak cases. Data from *NoSettlement* only.

by the plaintiffs it is no surprise that the winning probabilities also differ from the predicted values reported in Table 2. Under the American rule, careful defendants (facing a weak case) should win the case with probability $p = .520$. We observe a winning percentage of 72.5 percent in the data. The same holds for English, where the theoretical value is $p = .535$, and we observe 69.5 percent of defendants win the case. On the other hand, defendants facing a strong case win the case with much lower frequency than predicted (20.7 percent in *American* and 27.4 percent in *English*).

4.2 Out-of-court settlement

In the out-of-court settlement stage players could resolve the case without going to court. We observe settlement offers by defendants and settlement claims by plaintiffs. About half of the cases (51.0 percent) are settled in this stage. Settlement is more likely to be reached in strong cases (56.3 percent) than in weak cases (46.2 percent), i.e., chances for a peaceful solution are better in case of a negligent defendant than in case of a careful defendant. The fee-shifting rule does not seem to affect settlement success (51.0 vs. 51.1 percent).

Table 4: Estimates for the settlement stage

	Dependent variable:			
	(1) Offer	(2) Claim	(3) Case settled	(4) Amount
English	13.244***	6.825	0.047	10.875**
	(4.338)	(4.336)	(0.053)	(4.871)
Strong case	26.332***	19.191***	0.145**	21.634***
	(3.533)	(3.451)	(0.054)	(4.143)
English × strong case	−4.219	2.342	−0.092	1.366
	(5.906)	(4.191)	(0.062)	(5.820)
Period	−0.037	−0.298*	0.004*	−0.254
	(0.192)	(0.156)	(0.002)	(0.158)
Second sequence	−1.753	−6.243*	0.051	−4.014
	(4.109)	(3.483)	(0.043)	(3.502)
Constant	51.923***	69.672***	0.362***	63.057***
	(4.823)	(3.503)	(0.064)	(4.670)
F-test	22.7	15.7	2.5	19.9
Prob > F	0.000	0.000	0.073	0.000
R^2	0.131	0.109	0.017	0.218
N	2040	2040	2040	1041

Notes: OLS estimates. Dependent variables are (1) the defendant's offer, (2) the plaintiff's claim, (3) a dummy for whether the case was settled, and (4) the amount in case of settlement. Independent variables are the treatment dummy *English*, a dummy for *Strong case*, period and a dummy for the second sequence. Robust standard errors, clustered on matching group, in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

This does not, however, mean that the fee-shifting rule does not influence the outcome of the settlement. We use OLS estimates to investigate the determinants of settlement. Models (1) and (2) explain the defendants' offers and the plaintiffs' claims, respectively. Settlement offers clearly higher in *English* compared to *American*, which is the baseline case in the regressions. For the plaintiffs claims we do not find a significant effect. A strong case (negligent defendant) significantly increases both the offers and claims by around 20 units. We also allow for interaction between the strength of a case and the treatment variation, but do not

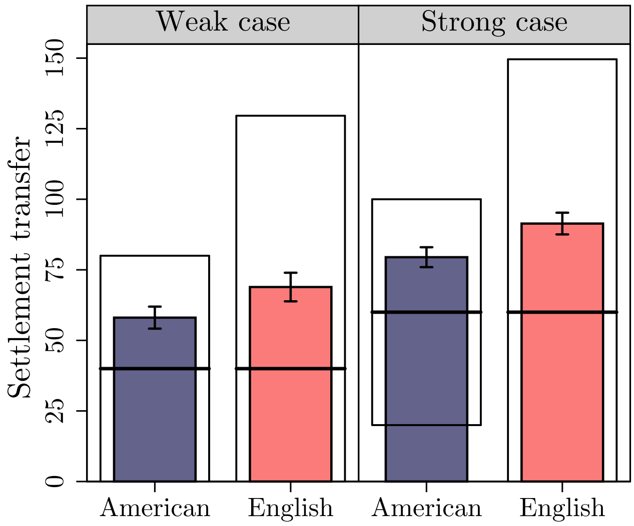

Figure 3: Settlement results. Bars show average transfer agreed upon in successful settlement for the two treatments. Right (left) panel shows the case when the defendant did (not) take care. Spikes indicate standard errors, boxes show the theoretical bargaining range (negative parts not drawn) and bold horizontal lines show the symmetric outcome.

find significant effects for offers and claims. The regressions include period and a dummy for the second sequence as controls. Offers seem to be unaffected, while claims seem to become lower over time and in the second sequence.

In Model (3) we explain settlement success by the fee-shifting rule, a dummy for strong cases, the interaction, and time effects in a linear probability model. We confirm that strong cases lead to more settlement success by about 15 percentage points, while we do not find significant differences between *American* and *English*. Again we do not find a significant interaction between case strength and the treatment. There is some indication that settlement success increases over time, for about eight percentage points over the 20 periods. Given the results before this is likely due to the plaintiffs becoming more modest in their claims over time.

Finally we look at the subset of successful settlement and explain the amount settled for in Model (4). In contrast to our prediction 2 *English* leads to significantly higher payments in settlement than *American*. Very much in line with the prediction is that the difference between strong and weak cases amounts to roughly 20 units.

How is the surplus split in successful settlement? In our theoretical analysis

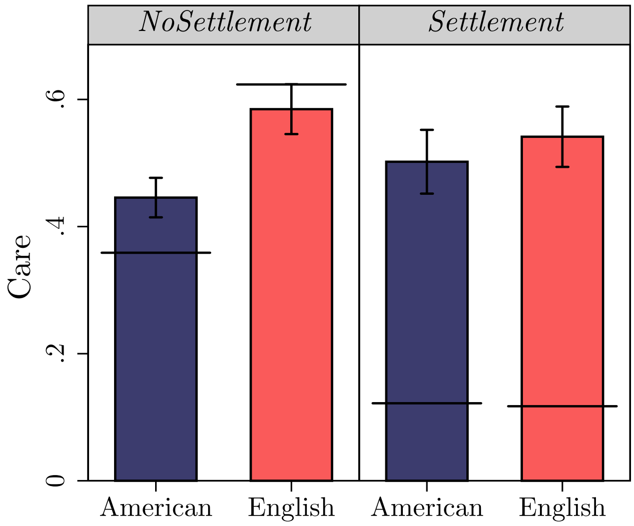

Figure 4: Bars show the frequency of defendants' taking care across the treatments. Spikes indicate standard errors. Horizontal lines indicate predicted levels of care.

we assumed equal bargaining power and, consequently, an equal split of the gains from settlement. Figure 3 shows the transfers after successful settlement in the two treatments and for both care levels. Boxes indicate the bargaining range, bold horizontal lines indicate the equal split. In all four cases average transfers are substantially above the equal split. Consequently, if settlement is successful, plaintiffs manage to acquire a larger share of the surplus than defendants.

4.3 Care

In the first stage of the game defendants decide upon being careful or not. Figure 4 shows the frequency of care depending on the treatment. Horizontal lines indicate the predicted frequencies of care according to the thresholds presented in Table 2. As predicted, we observe that care is significantly higher under the English rule in *NoSettlement* while there is no significant difference in *Settlement*. Furthermore, we observe substantially higher levels than predicted in *Settlement*. The reason for the high levels of care presumably lies in the fact that behavior in the subsequent stages also deviates from the Nash equilibrium. In particular, we have shown that plaintiffs lower their number of arguments in case of care instead of increasing it. Consequently, being careful has a value that goes beyond what is captured by our theoretical solution. We have also seen that the outcome of the settlement stage is skewed towards the plaintiff, also rendering the case of an accident more unfavorable to the defendant.

Table 5: Estimates for Care

	Dependent variable: Care		
	(1)	(2)	(3)
Cost	-0.010^{***}	-0.010^{***}	-0.010^{***}
	(0.001)	(0.001)	(0.001)
English	0.083^{**}	0.141^{***}	0.141^{***}
	(0.037)	(0.038)	(0.038)
Settlement	-0.002	0.048	0.046
	(0.049)	(0.056)	(0.057)
English $\times$ settlement		-0.098^{*}	-0.097^{**}
		(0.048)	(0.047)
Period			-0.002^{*}
			(0.001)
Second sequence			0.006
			(0.028)
Constant	1.051^{***}	1.021^{***}	1.042^{***}
	(0.047)	(0.047)	(0.049)
F-test	115.4	90.3	103.6
Prob $> F$	0.000	0.000	0.000
R^2	0.228	0.230	0.231
N	3440	3440	3440

Notes: OLS estimates. Dependent variable is the defendant's care decision. Independent variables are the cost of effort, the treatment dummies *English* and *Settlement* and interaction, period and a dummy for the second sequence. Robust standard errors, clustered on matching group, in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Next, we use linear probability models to explain individual care decisions by the cost of care and the treatment variables. In Model (1) of Table 5 we show that *English* leads to significantly higher care levels than *American*. On the other hand, settlement does not seem to affect care at all. In Model (2) we add an interaction term between the two treatment variations. The interaction is significantly negative, indicating that the effect of the fee-shifting rule on care is mainly driven by the treatments without settlement. For those we predict a treatment effect of 14 percentage points (highly significant), while for the treatments with settlement the point estimate is down to four percentage points and insignificant. Still the result holds that the mere presence of a settlement stage does not affect the care decision importantly. In Model (3) we add the controls for time effects. We observe a slight negative trend in care across time.

5 Conclusion

A central role of legal systems is to provide incentives to individuals to avoid taking actions that may be harmful to others. This role is fulfilled by imposing tortfeasors to pay compensatory damages. Unfortunately, the evaluation of this responsibility typically involves deadweight losses because of imperfect information and rent-seeking incentives. While some of these inefficiencies might be inevitable, others can be mitigated by choosing optimal legal rules and procedures.

In this paper we study one of the parameters of choice in legal procedures, the fee-shifting rule. We develop a new experimental design that makes it possible to measure causal effects of fee-shifting rules on the frequency of harmful actions, and the costs associated with awarding damages to the victims of these actions. Within this framework, we compare the English rule to the American rule of allocating litigation costs. Our experimental design allows to study the most relevant outcomes of litigation simultaneously: litigation spending, settlement, and compliance.

Our first result is that the English rule is associated with greater legal compliance. This can be explained by the higher cost of going to court under the English rule, which disciplines the defendant to be more careful. This result, however, is not general and depends on the availability of settlement. Similar levels of care are observed in in the two treatments when settlement is possible. The theoretical analysis suggested that the availability of settlement would greatly decrease care, because the symmetric Nash bargaining solution offers the defendant a relatively painless way to handle the situation. In the experiment we find very similar levels of care in the treatments with and without settlement, suggesting that defendants did not get away that easy. In fact across all situations we observe that average settlement transfers are substantially above the equal surplus split. Evidently the setup engenders additional bargaining power for the plaintiffs, not captured by Nash's bargaining model.

Contrary to what is often argued in the literature we do not find that the English rule reduces the case load of courts via more pre-trial settlements. This comes at a surprise, because the English rule clearly increases the bargaining range in the settlement stage, which lead us to expect more successful settlement. Furthermore, this result does not depend on whether cases are strong or weak. This not support the idea that the English rule might especially encourage the settlement of weak cases.

On the court stage we find a treatment effect very close to the prediction: The English rule results in substantially higher litigation spending. Interestingly, the presence of a settlement stage further increases spending. This means that some of the welfare enhancing effects of settlement (no expenses in court) are offset by higher spending among those cases for which settlement fails. Finally, we contrast the observed spending in court to the predictions of the mixed-strategy equilibrium of the court stage. According to the prediction, the reaction to weak and strong case should be mirrored between the two players. The data shows that they react very similar. Both the plaintiffs and the defendants in our experiment increase their litigation spending when they are in a strong case. This leads to the result that the outcomes of the cases are less balanced than predicted, i.e., plaintiffs win most of the strong cases and defendants win most of the weak cases.

Overall, the results do not suggest that one rule clearly dominates the other but rather that each rule is associated with different costs and benefits. The American rule is certainly more efficient in the court stage, but the English rule tends to increase compliance. This might explain why the two rules coexist.

Our framework could easily be extended to study further parameters of the legal framework, like e.g. various limits of fee-shifting, or different levels of judge's involvement in the process. Furthermore, from a policy perspective it might be of particular interest to study the determinants of settlement. The total cost of the legal procedures could be lowered substantially if settlement success could be made more likely by policy interventions. This comes with the caveat that increased settlement rates might come at the cost of lower compliance.

References

Baye, M. R., Kovenock, D., and de Vries, C. G. (2005). Comparative analysis of litigation systems: An auction-theoretic approach. 115(1995):583–601.

Bebchuk, L. A. (1984). Litigation and settlement under imperfect information. 15(3):404–415.

Beckner, C. F. and Katz, A. (1995). The incentive effects of litigation fee shifting when legal standards are uncertain. 15(2):205–224.

Braeutigam, R., Owen, B., and Panzar, J. (1984). An economic analysis of altnative fee shifing systems. 47(1):173–185.

Carbonara, E. and Parisi, F. (2012). Rent-seeking and litigation: The hidden virtues of the loser-pays rule. University of Minnesota Law School, Legal Studies Research Paper Series Research Paper No. 12-39.

Cooter, R. D. and Rubinfeld, D. L. (1989). Economic analysis of legal disputes and their resolution. 27(3):1067–1097.

Coursey, D. L. and Stanley, L. R. (1988). Pretrial bargaining behavior within the shadow of the law: Theory and experimental evidence. 8(2):161–179.

Crampes, C. and Langinier, C. (2002). Litigation and settlement in patent infringement cases. 33(2):258–274.

Eisenberg, T., Fisher, T., and Rosen-Zvi, I. (2013). When courts determine fees in a system with loser pays norm: Fee award denials to winning plaintiffs and defendants. 13-08.

Eisenberg, T. and Miller, G. P. (2013). The English vs. the American rule on attorney fees: An empirical study of public company contracts. 98:327–381.

Ernst, C. and Thöni, C. (2013). Bimodal bidding in experimental all-pay auctions. 4(4):608–623.

Farmer, A. and Pecorino, P. (1999). Legal expenditure as a rent-seeking game. 100(3-4):271–288.

Fischbacher, U. (2007). z-tree: Zurich toolbox for ready-made economic experiments. 10(2):171–178.

Fournier, G. M. and Zuehlke, T. W. (1989). Litigation and settlement: An empirical approach. 71(2):189–195.

Gravelle, H. and Waterson, M. (1993). No win, no fee: Some economics of contingent legal fees. 103(420):1205–1220.

Gravelle, H. S. (1993). The efficiency implications of cost-shifting rules. 13:3–18.

Greiner, B. (2015). Subject pool recruitment procedures: Organizing experiments with ORSEE. 1(1):114–125.

Helland, E. and Yoon, J. (2015). Estimating effects of English rule on litigation outcomes.

Hillman, A. L. and Riley, J. G. (1989). Politically contestable rents and transfers. 1(1):17–39.

Hirshleifer, J. and Osborne, E. (2001). Truth, effort, and the legal battle. 108(1-2):169–195.

Hughes, J. W. and Snyder, E. A. (1995). Litigation and settlement under the English and American rules: Theory and evidence. 38(1):225–250.

Hylton, K. N. (1993). Litigation cost allocation rules and compliance with the negligence standard. 22(2):457–476.

Inglis, L., McCabe, K., Rassenti, S., Simmons, D., and Tallroth, E. (2005). Experiments on the effects of cost-shifting, court costs, and discovery on the efficient settlement of tort claims. 33:89–117.

Katz, A. (1987). Measuring the demand for litigation: Is the English rule really cheaper? 3(2):143–176.

Katz, A. (1988). Judicial decisionmaking and litigation expenditure. 8(2):127–143.

Konrad, K. A. (2002). Investment in the absence of property rights; the role of incumbency advantages. 46(8):1521–1537.

Loewenstein, G., Issacharoff, S., Camerer, C., and Babcock, L. (1993). Self-serving assessments of fairness and pretrial bargaining. 22(1):135–159.

Main, B. G. M. and Park, A. (2000). The British and American rules: An experimental examination of pre-trial bargaining in the shadow of the law. 47(1):37–60.

Main, B. G. M. and Park, A. (2002). The impact of defendant offers into court on negotiation in the shadow of the law: Experimental evidence. 22(2):177–192.

Meurer, M. J. and Bessen, J. E. (2006). Patent litigation with endogenous disputes. 96(2):77–81.

Nash, J. F. (1953). Two-person cooperative games. 21(1):128–140.

Polinsky, A. M. and Rubinfeld, D. L. (1998). Does the English rule discourage low-probability-of-prevailing plaintiffs? 27(2):519–535.

Schwab, S. J. and Eisenberg, T. (1987). Explaining constitutional tort litigation: The influence of the attorney fees statute and the government as defendant. 79:719–784.

Seel, C. (2014). The value of information in asymmetric all-pay auctions. 86:330–338.

Shavell, S. (1982). Suit and settlement vs. trial: A theoretical analysis under alternative methods for the allocation of legal costs. 11(1):55–81.

Shavell, S. (2007). Liability for accidents. In Polinsky, A. M. and Shavell, S., editors, *Handbook of Law and Economics*, volume 1, pages 139–182.

Yoon, A. and Baker, T. (2006). Offer-of-judgment rules and civil litigation: An empirical study of automobile insurance litigation in the east. 59(1):155–196.

A Online appendix

This is a translation of the instructions from the treatment *Settlement* and *English*. The original instructions were in French.

Instructions

Welcome to this experiment!

From now on, it is strictly forbidden to speak to the other participants. If you have a question, please contact the assistants. If you violate this rule, we will be forced to exclude you from the experiment.

During this experiment, you will make decisions that will allow you to earn some money. The rules determining your earnings are explained below. It is therefore very important that you read them attentively.

Description of the Experiment

The experiment is a game that allows you to earn ECU (experimental currency unit). The conversion rate is as follows: 1000 ECU = 3.60 CHF.

The game is played in pairs and each player has a different role. You can be either the doctor or the patient.

The game consists of two stages that are further described below. During the first stage, the doctor treats the patient more or less carefully. During the second stage, the patient who is victim of a medical error can seek compensation in court.

You will play the game 20 times and your role (doctor or patient) will be randomly determined each time. Your partner is another participant of the experiment drawn randomly for each game.

At the beginning of each of the 20 games, you will receive an initial endowment of 300 ECU.

First stage of the game - Medical consultation

The first stage is only played by the doctor.

The doctor treats the patient and decides to be either negligent or careful. If the doctor is negligent, it reduces the risk of medical error but it costs him some ECU.

In case of medical error, the patient loses 100 ECU.

If the doctor is careful:

- The doctor loses a variable number of ECU. This number will be communicated to the doctor at the beginning of each game. This number will not be communicated to the patient.

- The patient has 1 chance in 10 (10 percent) of being victim of a medical error and thus of losing 100 ECU.

If the doctor is negligent:

- The doctor does not lose any ECU.

- The patient has 1 chance in 2 (50 percent) of being victim of a medical error and thus of losing 100 ECU.

Second stage of the game – Trial

The second stage of the game takes place in case a medical error has occurred and is played by both the patient and the doctor.

The patient learns whether the doctor was careful or negligent.

In case of medical error, the patient can take legal action to claim compensation of 100 ECU to the doctor. To avoid this trial, the patient and the doctor can also settle out of court.

Functioning of the trial

In case of trial, the patient tries to convince the judge to grant him a compensation of 100 ECU. By contrast, the doctor tries to convince the judge not to award this compensation. The role of the judge is played by the computer.

To convince the judge, the doctor and the patient must simultaneously spend ECU. The more they spend, the more they convince the judge. If the patient convinces the judge, he receives 100 ECU from the doctor.

Furthermore, the player who managed to convince the judge can be reimbursed by the other player the ECU he has spent, with a maximum of 75 ECU.

If the doctor was careful, the patient must spend at least 20 ECU more than the doctor to convince the judge.

> *Example: The doctor was attentive and a medical error occurred. Assume the doctor spends 120 ECU to convince the judge:*
>
> > *- If the patient spends 130 ECU, he does not convince the judge. He therefore receives no compensation and must repay 75 ECU to the doctor.*
> >
> > *- If the patient spends 150 ECU, he convinces the judge. He therefore receives a compensation of 100 ECU and gets reimbursed 75 ECU from the doctor.*

If the doctor was negligent, the doctor must spend at least 20 ECU more than the patient to convince the judge.

> *Example: The doctor was negligent and a medical error occurred. Assume the doctor spends 40 ECU to convince the judge:*
>
> > *- If the patient spends 10 ECU, he does not convince the judge. He therefore receives no compensation and must repay 40 ECU to the doctor.*
> >
> > *- If the patient spends ECU 30, he convinces the judge. He therefore receives a compensation of 100 ECU and a reimbursement of 30 ECU from the doctor.*

In case of tie, the judge flips a coin to determine if the patient is compensated or not.

Functioning of the out-of-court settlement

The patient and the doctor can avoid the trial by settling their dispute out of court. The procedure works as follows:

- The doctor specifies the maximum amount he is willing to pay to the patient to avoid going to court.

- The patient specifies the minimum amount he is willing to receive from the doctor to avoid going to court.

If the players find an agreement, that is, if the doctor is willing to pay more than what the patient is willing to receive, then we take the mean between these two amounts, and the settlement takes place. The game is finished.

Example: the doctor is willing to pay a maximum of 100 ECU and the patient is willing to receive at least 50 ECU to avoid going to court. In this case, the players find an agreement and the doctor pays 75 ECU to the patient.

If players fail to reach an agreement, that is, if the doctor is willing to pay less than what the patient is willing to receive, the trial described above starts.

Example: the doctor is willing to pay a maximum of 70 ECU and the patient is willing to receive at least 150 ECU to avoid going to court. In this case, players fail to reach a settlement.

Remark

We will ask you at each of 20 rounds what would be your decisions for the settlement and possibly for the legal process before telling you whether a medical error occurred. These decisions will only affect your earnings in case of medical error.