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Spite in Litigation

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Spite in Litigation*

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This paper studies how litigation and settlement behavior is affected by agents motivated by spiteful preferences under the American and the English fee-shifting rule. We conduct an experiment and find that litigation expenditures and settlement requests are higher for more spiteful participants. The relative increase in litigation expenditures due to spite is more pronounced under the American fee-shifting rule. We further find that the expected payoff for more spiteful societies is lower than for less spiteful societies. This effect is particularly pronounced for low-merit cases under the English rule compared to a constant cost under the American rule.

Keywords: Spite; Litigation; Settlement; Experiment; English rule; American rule
JEL: K41, C72, C91, D91

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1. Introduction

It is well known that some plaintiffs sue defendants not only to seek justice but also out of malice, spite, and pure anger. Malicious and spiteful litigants are suing and going to court just to harm and punish the opponent. In particular, spiteful litigants derive utility from the harm inflicted upon others, either because they are inherently spiteful, or because spitefulnes is triggered by the situation.

Such malicious litigation is a very popular and a regularly recurring theme in TV shows about law and medicine. Yet, this pattern is not only fictional but also has a very real match in legal practice: the "Vexatious Litigant". Vexatious litigation is typically defined as follows:

> "[...]Vexatious litigation is meant to bother, embarrass, or cause legal expenses to the defendant.[...]"[1]

Vexatious litigants are people who go to court, mostly malicious and without a good case, to harm and bother the defendant. Very often, vexatious litigants file frivolous lawsuits. Frivolous lawsuits – lawsuits typically filed by a party who is aware that the case is without merit – waste time, money, and in particular judicial resources.[2] Subjects who repeatedly engage in vexatious litigation might, in some jurisdictions, be added to the list of vexatious litigants. In Great Britain, for example, this means that one is forbidden from starting a civil case without court permission.[3]

Malicious and spiteful litigation is not uncommon[4] and often found for example between disputing neighbors, alienated partners, angry siblings, and business rivals.[5] Particularly divorces and malpractice suits are prone to malicious litigation.[6] But malicious litigation can also occur between mere acquaintances.[7] These examples underline that spiteful ligitation can occur either because agents are inherently spiteful, or because their spitefulness is triggered

[1] See Legal Information Institute (2018)

[2] See the argument in Anderson (1997); Post (2011) and Yago (1999).

[3] For a list of vexatious litigants in Great Britain see https://www.gov.uk/guidance/vexatious-litigants

[4] Similar arguments are made by Chen and Rodrigues-Neto (2022); Guha (2016); Kisner (1976); Philippi (1983).

[5] There are several examples of malicious litigation: Singleton v Singleton, 68 Cal. App. 2nd , 699 (1945) represents a case of malicious litigation between siblings; GRAHAM v. GRIFFIN, 66 Cal. App. 2nd, 116 (1944) is a case of malicious litigation between neighbors. Singleton v Perry, 45 Cal. 2nd 492 (1955) and more so Davey v. Dolan, 453 F. Supp. 2d 749 (2006) show cases of spiteful litigation towards estranged partners and their families. Crowley v. Katleman, Cal. P. 2nd 1083 (1994) presents a case of former friends engaging in malicious litigation. CSC (Contemporary Services Corporation) v Staff Pro Inc, 152 Cal. App. 4th 1043 (2007) shows a fascinating case of several rounds of malicious litigation. Silver v. Gold, 211 Cal. App. 3d, 17 (1989) shows a case of malicious prosecution between business rivals and Cantu v. Resolution Trust Corp., 4 Cal. App. 4th, 857 (1992) and Casa Herrera, Inc. v. Beydoun, 32 Cal. 4th, 336 (2004) show cases of malicious prosecution of people in business. Bertero v. National General Corp. , 13 Cal. 3d, 43 (1974) depicts a case of malicious prosecution of employer and employee.

[6] See Kisner (1976) and Philippi (1983). One such example of a malicious malpractice suit is Lackner v Lacroix, 25 Cal 3rd, 747 (1979). Many more examples can be found in Kisner (1976) footnote 11 and footnote 8. See also Philippi (1983) footnote 6 for several examples of malicious litigation in malpractice suits and footnote 11 refers to a study arguing that most medical malpractice suits are without merit.

[7] For example, Drainville v. Vilchez, 2014 ONSC 4060 (CanLII) presents a case of malicious litigation between two truck drivers in Canada.

by the situation, such as one party perceiving the other as unreasonable, or by the behavior of the other party that led to litigation in the first place.

An important question that is still discussed today is which fee-shifting rule should be used in litigation, i.e., the question of who (the defendant or the plaintiff) has to pay for whose legal costs. Lawyers, as well as judges, create substantial costs in the litigation process. It seems plausible that the loser of litigation should at least pay for her own lawyers. Therefore, the core question of the fee-shifting debate is whether and how much the loser has to pay for the winner's lawyer.

Two common approaches are typically discussed in the literature: the American and the English rule. Under the American fee-shifting rule, everybody has to pay their own expenses. Hence, under this rule, there are no additional costs for losing. Under the English rule, the loser has to pay the legal expenditures of the winner – up to a certain amount. This way, frivolous lawsuits are hoped to be discouraged. In the theoretical literature, it was argued that the English rule reduces the number of lawsuits filed by plaintiffs with low-merit cases, with the downside that the total number of lawsuits increases under the English rule (see Spier, 2007).

An important question to be asked is how the predictions of the two fee-shifting rules change if agents are not purely self-interested. More specifically, if agents are motivated by spiteful preferences, how does litigation and settlement behavior change? It is not obvious how spite impacts litigation under both rules. On the one hand, it seems plausible that spite increases litigation, however only up to a certain point dependent on the merit of the case. Under the American rule, there is a trade-off between harming the opponent and harming oneself as for very high-merit cases any additional dollar has to be bared by the "attacker" and does not improve the own chances (similarly under low-merit cases). Under the English rule, it seems plausible to harm the other especially if the merit is high (as the chances of harming are high), but for low merit, any spite would almost inevitably backfire as winning chances are low. Hence, spite might have different effects on the litigation behavior dependent on the merit of the case and the rule. In this paper, we even go one step further and additionally study how spite affects settlement requests under the shadow of litigation dependent on the merit and the rule.

The goal of this paper is to study how litigants with spiteful preferences differ in their litigation effort and settlement request from non-spiteful litigants and how spitefulness interacts with the fee-shifting rule. The paper aims to provide evidence supporting the theoretical predictions with the help of an experiment.

We show theoretically that litigation expenditures are higher under the English rule compared to the American rule and higher for spiteful agents compared to non-spiteful agents. We also show that spiteful preferences only affect the settlement behavior under the American but not under the English rule.

We test the theoretical predictions by using an experiment. We confirm part of the predictions. In particular, we show that 1) litigation costs and settlement requests are significantly

higher under the English fee-shifting rule, 2) subjects exhibiting more spiteful preferences spend more on litigation and request higher settlement amounts than those with lower spiteful preferences (especially for low-merit cases) under both rules, and 3) spite has a stronger influence on litigation expenditures under the American compared to the English fee-shifting rule (especially for high-merit cases).

The contribution of this paper is threefold. First, it extends the current theoretical litigation and settlement predictions to account for spiteful preferences under both fee-shifting rules. Second, it compares the English and American fee-shifting rule experimentally, and third, and most importantly, it provides consistent evidence that litigation and settlement behavior is sensitive to spiteful preferences.

The remainder of the paper is structured as follows: In Section 2, we briefly summarize the relevant literature. Section 3 presents the model. In Section 4, we explain the design of the experiment. Section 5 shows the results of the experiment. In Section 6, we conclude.

2. Literature

This current paper is related to several strands of literature. In particular, it relates to the literature on litigation and settlement in the theoretical and experimental law and economics literature. It also links to the literature on social preferences.

2.1. Litigation literature

A core issue in the theoretical law and economics literature is to model litigation and to compare different legal systems. Several approaches have been discussed. Baye et al. (2005), and even more generally Baye et al. (2012), have modeled litigation as an all-pay auction. They assumed, as is very often done in the litigation literature, that those who present the best arguments win the dispute. Arguments are modeled just as a function of effort, which can be considered investing time and money in the search for the best arguments but also an investment into better lawyers and other resources. Their particular approach is to assume that the best argument wins with certainty and that effort invested has to be paid. In their rather general approach, they modeled not only the American and the English rule but also intermediate rules like the Marshall rule – where the winner is paying all legal costs – and the Quayle rule – where the loser has to pay the costs of the winner, but only up to the same amount spend by the loser.

The alternative approach, most commonly used in the literature, is to model the litigation process as a Tullock contest. Here – different from the all-pay approach – the best argument wins with a certain probability. One of the earliest approaches to do so was by Plott (1987) who suggested a very basic success function of the Tullock contest. Over the years, the contest success function was refined to include the merit of the case and to allow weighting of arguments (see for example Hirshleifer and Osborne, 2001). Other extensions include, for

example, incorporating the benefits (Choi and Sanchirico, 2004) and comparing the adversarial and inquisitorial systems (Parisi, 2002). For an informative overview of the litigation literature see Spier (2007) and Katz and Sanchirico (2010) for an overview of the literature on fee-shifting in litigation.

However, the question in the literature is not only how to model and design litigation. The literature also asks what conditions result in litigants going to court at all. To tackle this question, the literature has intensely studied models of settlement. One of the first who studied litigation and settlement under two-sided incomplete information was Schweizer (1989). Spier (1994, 1992) extended the model to dynamic pretrial negotiation models and also discussed how settlement changes under different legal rules. Similarly Reinganum and Wilde (1986) and Hause (1989) studied how settlement changes under different litigation costs (fee-shifting). For a good overview of the settlement literature see Spier (2007, pp. 268-282).

The first to study fee-shifting in litigation in a general framework are Braeutigam et al. (1984). Similarly, Carbonara et al. (2015) studied limited fee-shifting – the loser only has to pay up to a certain threshold – Chen and Wang (2007) studied fee-shifting and contingency fees and Baumann and Friehe (2012a) extended the framework of Braeutigam et al. (1984) to a more general model.

The overall findings in the theoretical examinations, in particular concerning fee-shifting, are threefold: the English rule compared to the American changes 1) filing decisions, 2) litigation expenditures and, 3) settlement rates (see Spier, 2007, pp.300-303). Firstly, under the English rule, plaintiffs with low-merit cases (presented as a contest success function in their opponent's favor) are less likely to file a lawsuit, while plaintiffs with high-merit cases are more likely to file. Second, under the English rule, legal expenditures are higher as the marginal benefits have increased, and the marginal costs have decreased compared to the American rule. Third, under the English rule litigation rates are rising.

Several papers use public data to evaluate these theoretical predictions empirically. For example Eisenberg et al. (2013) examine empirically Israel's legal system – where it is up to a judge's discretion to decide upon the fee-shifting rule – and they found a quasi-preference for the English rule which, however, is applied in only 52 percent of cases if individuals lose against corporations. Similarly, Eisenberg and Miller (2013) study contracting parties with an opt-out clause from the American rule and find that the American and English rules are chosen equally often.

More importantly, Hughes and Snyder (1995) (and very similarly Snyder and Hughes, 1990; Hughes and Snyder, 1995; Yoon and Baker, 2006) used a change in legislation in Florida. In most of the US, the American rule is used. Florida, however, adopted from 1980 till 1985 the English rule for medical malpractice cases. The mentioned papers studied the plaintiff's probability to win, jury awards, and out-of-court settlements. Similarly, Fenn et al. (2014) studied litigation expenditures in England and Wales after a fee-shifting reform in 2000. Overall they found that the English rule increases plaintiff success rates, average jury awards, and out-of-court settlements. Hence, the empirical results partially confirm the theoretical literature.

In addition to the sparse empirical papers studying fee-shifting, there have been a few experimental approaches to study fee-shifting. For example Dechenaux and Mancini (2008) conducted an experimental test of the all-pay auction model of litigation by Baye et al. (2005). Main and Park (2000) investigated pretrial bargaining under the American and English rules, and most recently Massenot et al. (2021) experimentally compared the English and the American rule directly.[8] For a literature overview see Camerer and Talley (2007). Overall the experimental literature found mixed evidence for the theoretical predictions. As predicted by theory, legal expenditures are higher under the English rule, whereas the proportion of cases filed for litigation is lower under the English rule than under the American rule – contrary to theory.

Notably, most theoretical papers assume plaintiffs and defendants to be self-interested and without any biases.[9] These assumptions, however, are strongly contrary to the findings in experimental economics as outlined below.

2.2. Literature on social preferences

The assumption of payoff-maximizing self-interested agents has widely been shown not to represent actual behavior in the lab or the field. In particular, it has been shown that subjects exhibit social preferences.

Two well-known theoretical accounts for other-regarding preferences are by Bolton and Ockenfels (2000) and Fehr and Schmidt (1999). Both papers develop a theoretical framework allowing agents to have preferences over the outcomes of other agents. Fehr and Schmidt (1999), in particular, developed a model where agents have inequality concerns, meaning that agents have preferences – in addition to the preferences over their own payoff – to reduce the inequality between their own payoff and other agent's payoff.

An extensive experimental literature has provided evidence that subjects indeed exhibit such preferences (for an overview see Cooper and Kagel, 2016).

However, not only positive (Andreoni, 1989) but also negative social preferences have been shown to influence behavior. For example Morgan et al. (2003), Mill (2017), Bartling et al. (2017), and Kirchkamp and Mill (2021) used theoretical means to show that spiteful preferences lead to overbidding in auction settings. Further, Guha (2018) and Montero (2008) study malicious preferences in standard bargaining models, however not under the threat of litigation. Kimbrough and Reiss (2012), Cooper and Fang (2008), Bartling et al. (2017), Andreoni et al. (2007), and Kirchkamp and Mill (2021) also used experiments to provide empirical evidence, that subjects indeed have spiteful preferences and that these lead to more competitive behavior, also in contest settings (Herrmann and Orzen, 2008). Similarly, Abbink and Sadrieh (2009) and Abbink and Herrmann (2011) show in experiments that subjects display nasty and antisocial

[8] Other papers study the 50 percent rule in the lab (Thomas, 1995), pretrial bargaining with a shadow of the future (Coursey and Stanley, 1988), and negotiations and conflict under the shadow of the future (Main and Park, 2002; McBride and Skaperdas, 2014; McBride et al., 2017)

[9] For an exception see Heyes et al. (2004), who assume agents to be risk-averse, Baumann and Friehe (2012b) model agents to have emotions and Guha (2016, 2019) and Chen and Rodrigues-Neto (2022) who assume malicious agents.

behavior. Furthermore, Fehr et al. (2008) show that a surprising amount of spiteful behavior can be found in one of the least developed regions in India.

A key insight from this literature is that other-regarding preferences have been shown to influence behavior in many economic settings. In this paper we (mostly experimentally) study whether other-regarding preferences also play a role in litigation and settlement behavior. In particular, we focus on spiteful preferences.

This paper relates particularly to four theoretical papers: Baumann and Friehe (2012b), Guha (2016), Guha (2019) and Chen and Rodrigues-Neto (2022).

Baumann and Friehe (2012b) discuss litigation behavior in case agents experience emotions, in particular, if actors gain additional utility of winning and additional disutility of losing. They show that emotions might impact litigation behavior. Similar to Baumann and Friehe (2012b) we also build on the model of Hirshleifer and Osborne (2001). However, very different from Baumann and Friehe (2012b) we focus only on negative social preferences. Moreover, we study the effect of spite under different fee-shifting rules, while Baumann and Friehe (2012b) focus on the American rule only.

Guha (2016) studies the effect of malicious preferences on litigation behavior. She develops a model of litigation and models malicious preferences as a factor times the payment endured by the defendant. Different from Guha (2016) we use a rather standard model of litigation (Hirshleifer and Osborne, 2001). More importantly, we do not only study the American rule but also the English fee-shifting rule. In a later study, Guha (2019) incorporates spitefulness in dynamic pretrial settlement under the threat of litigation. Specifically, she introduces malice as utility coming from the opponent's litigation costs and costs of waiting for a resolution. However, the author does not incorporate malice into the litigation outcome but introduces an exogenous payoff. We focus on a static pretrial bargaining model under the threat of litigation with endogenous expected outcomes. Different to the model of malicious preferences of Guha (2016) and Guha (2019), our model of spiteful preferences focuses on the final payoff of all agents and not only on the costs endured.

Finally, Chen and Rodrigues-Neto (2022) study the interaction of emotions and the fee-shifting rule in litigation settings. Litigants obtain additional emotion-based utility depending on the final payoff of the opponent, which can be either positive or negative. They define a generic model that captures, among several others, the Tullock contest success function. They find that negative emotions amplify the costs of fee-shifting - this implies that the increase in litigation costs due to negative emotions is higher under the English rule compared to the American. Different than Chen and Rodrigues-Neto (2022), we also study spiteful preferences and the interaction with the fee-shifting rule for pretrial bargaining under the threat of litigation.

3. Model

In this section, we build a theoretical model to derive predictions in order to guide the interpretation of our experimental results. Our aim is not to present an all-encompassing model of litigation but rather to provide some intuition for what could be expected in our experiment. Despite this modest aim, the model generally provides valuable insights into litigation and settlement behavior when agents have spiteful preferences.

We model both litigation and settlement behavior under the American and English fee-shifting rules. We incorporate spiteful preferences and derive theoretical predictions both for litigation expenditures (in section 3.1) and settlement requests (in section 3.2).

3.1. Litigation model

To model litigation, we use a model similar to Hirshleifer and Osborne (2001). To model spiteful preferences, we build on Morgan et al. (2003).[10]

We assume two litigants, i and j, who denote the defendant and the plaintiff, respectively. Both litigants make a decision upon their effort for litigation $e_k \in [0, \overline{e}]$ with $k \in \{i, j\}$. The litigation effort represents the cumulative effort invested in the litigation process and aims to reflect the quality of the argument brought forward in court. The litigation effort includes – among other things – the personal effort in finding and providing evidence, the cost for the lawyer, and the time invested in making the arguments.

Both i and j litigate for a prize of common value $W \in \mathbb{R}$. We further assume that $\overline{e} = W$, i.e., litigants are spending at most the value of the prize.[11] We assume risk-neutral and spiteful agents.

In court, the judge makes a decision to whom to assign the prize, based on the arguments and also based on the commonly known merit of the plaintiff's case $q \in [0, 1]$. The merit of the case can be interpreted as the general tendency of a particular judge to rule in favor of the plaintiff. It can also be considered as argument weighting due to fairness and it might be construed to reflect who "truly" deserves the object (in a world with perfect information).

In particular, we use the following contest success function for player i, which is a special case of the contest success function suggested by Hirshleifer and Osborne (2001):

$$p_i(e_i, e_j, q) := \frac{(1-q) \cdot e_i}{q \cdot e_j + (1-q) \cdot e_i}$$

and correspondingly the probability of player j to win the argument is denoted by $1 - p_i(e_i, e_j, q)$. Several aspects of this simple contest success function are worth pointing out:

[10] See also Mill (2017); Bartling et al. (2017); Kirchkamp and Mill (2021); Mill and Morgan (2018) for the use of this model.

[11] Introducing this upper bound guarantees the existence of a Nash equilibrium under the English fee-shifting rule. Constraining the litigant's expenditures also reflects reality in that they cannot spend infinite resources.

- If either one of both players drops out of litigation (i.e., $e_k = 0$), the probability to win will be 1 for the other player
- If both players provide equally good arguments (i.e., $e_i = e_j$), the probability to win for player j depends solely on the merit of the plaintiff's case q.
- If the merit of the plaintiff's case is zero (i.e., there is absolutely no merit to the case), player i (the defendant) wins with certainty.
- Correspondingly, if the merit of the defendant's case is zero (i.e., the judge is purely in favor of the plaintiff), player j wins with certainty.

After the judge's ruling, the winner obtains the prize W and the loser does not. Under the American rule, the winner and loser each have to pay their effort costs. Under the English rule, the loser has to pay his own costs and compensate for the entire effort costs of the winner.

Moreover, we assume that agents exhibit external preferences, i.e., their utility is influenced by the payoff of the other litigant. We use a model suggested by Morgan et al. (2003), where agents receive additional disutility from the opponent's payoff and hence additional utility from the opponent's negative payoff (i.e. costs).[12] We define $\alpha \in (0, 1)$ and the opponent's payoff ϕ_j, which results in the agent's additional utility $v_i(\alpha_i, \phi_j) = -\alpha_i \cdot \phi_j$. For simplicity, we assume that $\alpha_i = \alpha_j$. Hence, the overall utility (u_i) of litigation of agent i can be written as:

$$u_i(e_i, e_j, q, \alpha) = \underbrace{p_i(e_i, e_j, q)}_{\text{Probability of winning}} \cdot \underbrace{\left(\underbrace{W - \mathbb{1}_{American} e_i}_{\text{Payoff}} \underbrace{-\alpha \cdot (-e_j - \mathbb{1}_{English} e_i)}_{\text{Disutility due to spite}} \right)}_{\text{Utility in case of winning the case}} \tag{1}$$

$$+ \underbrace{(1 - p_i(e_i, e_j, q))}_{\text{Probability of losing}} \cdot \underbrace{\left(\underbrace{-e_i - \mathbb{1}_{English} e_j}_{\text{Payoff}} \underbrace{-\alpha \cdot (W - \mathbb{1}_{American} e_j)}_{\text{Disutility due to spite}} \right)}_{\text{Utility in case of losing the case}}$$

Similarly, the utility (u_j) of litigation of agent j is $u_j(e_j, e_i, q, \alpha) = u_i(e_j, e_i, 1 - q, \alpha)$

We assume that both litigants simultaneously maximize their utility and simultaneously decide on their litigation expenditures conditional on their opponent's best response (Nash equilibrium).[13] The equilibrium litigation expenditures under the American fee-shifting rule are given below.

[12] Note that this definition of the spite motive builds on the absolute payoff of the opponent and not on the payoff differences. Hence, it is distinct from disutility coming from inequality aversion.

[13] The utility function (including the spillover parameters) under the American rule satisfies the conditions Chowdhury and Sheremeta (2011b) lay out for the existence of a unique symmetric equilibrium. We show the existence of a unique equilibrium under the English rule in Appendix A.1.2.

Proposition 1. *The symmetric litigation expenditures under the American fee-shifting rule for spiteful agents are given by:*

$$e^{*(\mathrm{Am})}(W, q, \alpha) = (1 - q) \cdot q \cdot W \cdot (\alpha + 1)$$

The proof of Proposition 1 is shown in Appendix A.1.1. Figure 1a shows the litigation expenditures for j under the American rule.

In the following, we refer to the plaintiff (player j). Hence, we speak of low merit when q is small and of high merit when q is high. When the case is lost with certainty ($q = 0$), the optimal litigation expenditures are 0. With higher merit, expenditures increase and have their peak at $q = 0.5$, where both agents have the same merit. From this point on, expenditures decrease until they are at 0 when the case is won with certainty ($q = 1$). More spiteful agents (higher values of α) have higher expenditures, but the functional form remains the same.

A rough interpretation is the following. For low-merit cases, there is only a small chance to win. Therefore, agents do not want to spend money on litigation since they have to carry their own costs. For high-merit cases, the probability to win is high, even with lower expenditures. This results in lower expenditures since they would have to carry their own costs, even when winning the case. At $q = 0.5$, there is the most ex-ante uncertainty about who wins. Hence the incentives to exert expenditures are the highest.

If agents are spiteful, they obtain additional disutility from losing since the opponent receives the prize (and the opponent's positive payoff negatively affects their own utility). Hence, spiteful agents have higher incentives to win and spend more in the litigation process. Their litigation expenditures increase relative to the equilibrium expenditures and result in "overbidding". In absolute terms, this overbidding behavior is most pronounced at $q = 0.5$ and decreases at low and high-merits levels because spite relatively augments the initial equilibrium spendings.

The equilibrium litigation expenditures under the English fee-shifting rule are given below.

Proposition 2. *The litigation expenditures under the English fee-shifting rule for spiteful agents are given by:*

$$e_i^* = \begin{cases} W & \text{if } q \leq \overline{q}(\alpha) \\ 0 & \text{else} \end{cases}$$

$$e_j^* = \begin{cases} 0 & \text{if } q \leq (1 - \overline{q}(\alpha)) \\ W & \text{else} \end{cases}$$

$$\text{with } \overline{q}(\alpha) = \tfrac{1}{3}\tfrac{3\alpha+2}{(\alpha+1)},$$
$$\text{and } (1 - \overline{q}(\alpha)) = \tfrac{1}{3}\tfrac{1}{(\alpha+1)}$$

The proof of Proposition 2 is shown in Appendix A.1.2. Figure 1b shows the equilibrium behavior for player j for different levels of α.

Litigation expenditures under the English fee-shifting rule are characterized by the bang-bang property. For low merits, it is optimal to incur no expenditures, and after a certain threshold, it is optimal to incur full expenditures. For more spiteful agents, this threshold is

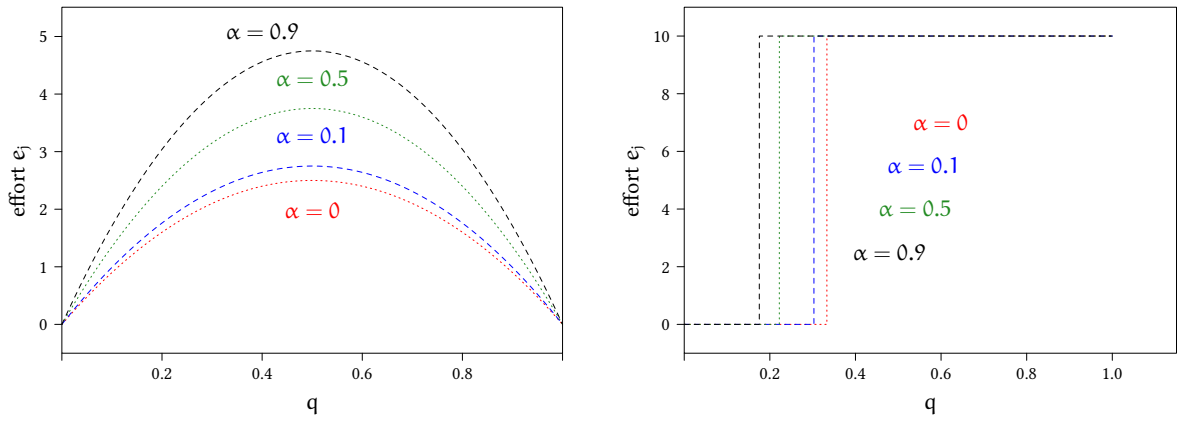
shifted towards lower merit levels. More spiteful agents, thus, incur full expenditures at lower merit levels than less spiteful agents.

A rough interpretation is the following: Under the English fee-shifting rule, the loser has to carry the costs from both parties. Therefore, the disutility from losing and the utility of winning is augmented compared to the American rule. Hence, for high-merit cases, it is optimal to incur full expenditures because they very likely do not have to be paid by the winning party. This decreases the winning probabilities for low-merit cases further and hence it is optimal to reduce the own expenditures to the minimum since they have to be carried almost certainly by oneself. At the threshold, the augmented incentives to win outweighs the costs of potentially paying the own expenditures.[14] After the threshold, it is optimal to incur full expenditures.[15]

More spiteful agents have even more augmented incentives to win since they receive additional disutility from losing (since the opponent has a positive payoff) and additional utility from winning (since the opponent has to carry all the costs). Therefore, the threshold to switch from no expenditures to full expenditures moves to lower merit levels. Note that for small enough merit levels $q < (1 - \overline{q}(\alpha))$ the expected utility of a player is negative since losing means carrying both costs (either W or 2W) and winning means receiving W. Therefore, having to litigate under the English fee-shifting rule is bad news if the own merit is not high enough.

[14] Due to the convex form of the utility function, which has the minimum utility level in between 0 and W expenditures, only a switch to full expenditures maximizes the expected utility. A partial increase in the expenditures would not increase the probability of winning enough to counterbalance the increased costs

[15] This bang-bang property can be illustrated best with an example: Suppose that $q = \frac{1}{3}$ and $W = 10$. At this merit level, a non-spiteful player ($\alpha = 0$) is indifferent between spending 0 and 10 because the expected payoff is the same. For exerting 0, the player loses with certainty, and the utility is $u_j = -10$ because of the opponent's expenditures of 10. Spending 10, while the opponent also spends 10, leads to a winning probability of $\frac{1}{3}$ for the prize of 10. Hence, the expected utility is $E[u_j] = \frac{1}{3} * 10 - \frac{2}{3} * (-20) = -10$. If the merit level is slightly below $\frac{1}{3}$, spending 0 maximizes the expected utility. If it is slightly above $\frac{2}{3}$, spending 10 maximizes the expected utility.



(a):
Equilibrium litigation expenditures under the American fee-shifting rule for spiteful litigants.

(b):
Equilibrium litigation expenditures under the English fee-shifting rule for spiteful litigants.

Figure 1: Equilibrium predictions.
Equilibrium litigation expenditures (e) under the American (left) and English (right) fee-shifting rule with $W = 10$ for different merits q and different spite levels α (see Proposition (1) and (2)). Note that the vertical lines in the right panel are presented just for illustration purposes (i.e., 0 and 10 are optimal but not the values in between).

3.2. Settlement model

In some cases, agents may not want to litigate.[16] To avoid litigation, agents can also settle the dispute. We model settlement behavior as a standard Nash-Demand game: Two agents make a suggestion of how to split a good W by requesting a certain amount of this good (s_k with $k \in \{i, j\}$). If both the requests of i and j sum to W, i.e., $s_i + s_j = W$, the requests are granted. If both the requests are in sum less than W, i.e., $s_i + s_j < W$, both obtain their request plus half of the leftover as their payoff, i.e., $\Phi_i = s_i + \frac{W - s_i - s_j}{2}$. If, however, the sum of both the requests exceeds W, i.e., $s_i + s_j > W$, then no settlement is reached, and agents have to litigate for W.

Spiteful preferences affect the utility function both in case the settlement is successful and when it is not. When settlement is successful, player i receives utility from her share s_i of the pie. Additionally, due to spite, she receives disutility from player j's share of the pie. This settlement utility is described by $u_i^{settlement}(s_i, s_j, \alpha) = s_i - \alpha s_j$ and for player j by $u_j^{settlement}(s_i, s_j, \alpha) = s_j - \alpha s_i$. If the settlement is not successful, agents have to litigate for W. The expected payoffs from the litigation stage are called the disagreement values $d_i(e_i^*, e_j^*, q, \alpha)$ and $d_j(e_i^*, e_j^*, q, \alpha)$.

We rely on the Nash-Demand solution (Nash, 1950), and more specifically, on the efficient pure-strategy Nash equilibrium, where we maximize the function $f = (u_i^{settlement} - d_i)(u_j^{settlement} - d_j)$ under the constraints that $s_i + s_j = W$ and $s_i, s_j \in (0, W)$.

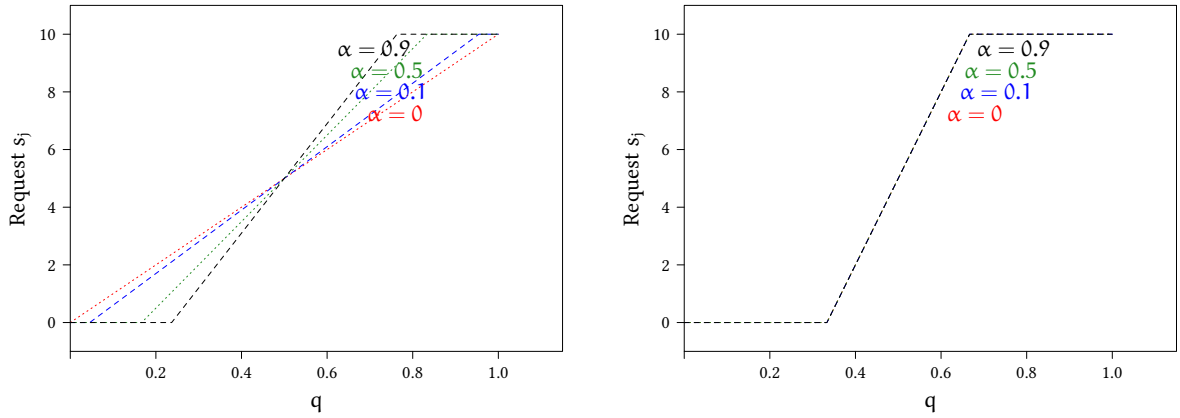
Spite shapes this equilibrium outcome simultaneously through the settlement stage and the litigation stage. There are two countervailing forces. First, in the litigation stage, spite influences the disagreement values (i.e., the expected payoffs). If one of the players wins the

[16] For instance, under the English fee-shifting rule, litigation leads to negative payoffs for not high enough merit levels for one of the parties.

litigation, spite increases her utility of litigation. If this player loses, spite lowers her utility. In the equilibrium outcome, for low-merit levels ($q < 0.5$), player j has a winning probability of less than 0.5. Therefore, spite decreases player j's expected utility further compared to player i's. Subsequently, a spiteful player j is less eager to litigate than a spiteful player i in the low-merit case, and hence, player j's bargaining power decreases. More spiteful agents then request less in the settlement stage for low-merit casesthan less spiteful agents. Due to symmetry, requests are higher for high-merit cases ($q > 0.5$).

Second, in the settlement stage, spite interacts with the opponent's demands and creates a countervailing force. For low-merit levels ($q < 0.5$), player j's expected utility of the litigation stage is smaller than player i's, and hence she has a smaller bargaining power than player i. Subsequently, player i's demands are higher than player j's. Higher demands of the opponent are associated with a higher disutility due to spite. Hence, a more spiteful player j has a higher disutility due to spite for low-merit cases than a less spiteful player. Therefore, player j is less eager for settling at these conditions and her bargaining power increases compared to player i's. Subsequently, requests in the settlement stage are higher for more spiteful agents for low-merit levels ($q < 0.5$). Correspondingly, requests are lower for high-merit levels ($q > 0.5$) because of symmetry.

Whether the first or second effect prevails depends on the payoff structure and environment that is determined either by the American or English fee-shifting rule.



(a):
Equilibrium settlement requests under the American fee-shifting rule for spiteful litigants.

(b):
Equilibrium settlement requests under the English fee-shifting rule for spiteful litigants.

Figure 2: Equilibrium predictions.
Equilibrium settlement requests (s) under the American (left) and English (right) fee-shifting rule with $W = 10$ for different merits q and different spite levels α (see Proposition (3) and (4)).

The equilibrium settlement requests under the American fee-shifting rule are given below:

Proposition 3. *Under the American fee-shifting rule, the requests of players* i *and* j *are characterized by the following functions:*

$$s_i^* = W - s_j^* = \begin{cases} W & \text{if } q \leq \frac{1}{2}\frac{\alpha}{\alpha+1} \\ W(\alpha(\frac{1}{2} - q) + (1 - q)) & \text{if } \frac{1}{2}\frac{\alpha}{\alpha+1} < q < \frac{1}{2}\frac{\alpha+2}{\alpha+1} \\ 0 & \text{if } q \geq \frac{1}{2}\frac{\alpha+2}{\alpha+1} \end{cases}$$

The proof can be found in Appendix A.1.3. Figure 2a shows the equilibrium settlement requests for player j under the American rule. For non-spiteful agents, there is a linear and constant increase in the requests with increasing merit of the case ($\lim_{\alpha \to 0} s_j^* = Wq$) since the outside value and hence the bargaining power increases. For relative lower merit levels ($q < 0.5$), more spiteful agents request less, whereas, for higher merit levels ($q > 0.5$), more spiteful agents request more. This is because more spiteful agents want to prevent litigation if their merit is low and wouldn't mind litigating when their merit is high since the outside values are augmented. Therefore, under the American rule, spite in the disagreement values outweighs the effect of spite in the settlement requests.

Proposition 4. *Under the English fee-shifting rule, the requests of player* i *and* j *are characterized by the following functions:*

$$s_i^* = W - s_j^* = \begin{cases} W & \text{if } q \leq \frac{1}{3} \\ (2 - 3q)W & \text{if } \frac{1}{3} < q < \frac{2}{3} \\ 0 & \text{if } q \geq \frac{2}{3} \end{cases}$$

The proof can be found in appendix A.1.4. Figure 2b depicts the equilibrium settlement requests under the English fee-shifting rule. Requests start at 0 for low-merit cases, then increase after the merit is at $q = \frac{1}{3}$ until $q = \frac{2}{3}$, where they stay at the maximum request W. Notice that requests are the same for all spite levels. This is because the opposing effects of spite in the disagreement values and spite in the settlement requests cancel each other out.

3.3. American vs. English fee-shifting

In the following, we compare equilibrium expenditures and settlement requests under the American and the English fee-shifting rule. Formal proofs of the hypotheses can be found in Appendix A.1.5

We start by analyzing the differences in litigation expenditures. The benefit of winning is higher under the English rule compared to the American since the loser has to pay all the costs. Hence, agents spend more resources to win under the English fee-shifting rule:

Hypothesis 1.1. *The average litigation expenditures of all merit levels* q *are higher under the English fee-shifting rule than under the American fee-shifting rule.*

There are no differences in the average settlement requests under the American and the English fee-shifting rule. This holds because the optimal solution to the Nash-Demand game allocates all resources without waste among the two players.

Hypothesis 1.2. *There is no difference in the average settlement requests over the merit between the American and the English fee-shifting rule.*

3.4. Spite in Litigation and Settlement

Next, we study how spiteful preferences influence litigation expenditures and settlement requests under both rules. Formal proofs of the hypotheses, where necessary, can be found in Appendix A.1.6.[17]

Under the American rule the litigation expenditures are given by: $e_i^* = e_j^* = (1-q)qW(\alpha+1)$. Hence, both individual and average expenditures are higher for a higher value of α. Under the English rule, figure 1b illustrates that the threshold to switch from 0 to W shifts more to lower merit levels q, the more spiteful an agent is. Thus, average litigation expenditures over all merit levels q are higher for more spiteful agents.

Hypothesis 2.1. *Under the American fee-shifting rule, litigation expenditures are higher for more spiteful agents at every merit level.*

Hypothesis 2.2. *Under the English fee-shifting rule, average litigation expenditures of all merit levels* q *are higher for more spiteful agents.*

Next, we theoretically analyze the effect of spite on settlement behavior. Figure 2a reveals that the influence of spite on settlement requests under the American fee-shifting rule depends on the merit of the case. For low-merit cases ($q < 0.5$), more spiteful agents request less, whereas, for high-merit cases ($q > 0.5$), more spiteful agents request more. Therefore, we hypothesize the following:

Hypothesis 2.3. *Under the American fee-shifting rule, the average settlement requests of low merits (*$q < 0.5$*) are lower for more spiteful agents.*

Hypothesis 2.4. *Under the American fee-shifting rule, the average settlement requests of high merits (*$q > 0.5$*) are higher for more spiteful agents.*

Proposition 4 shows that under the English fee-shifting rule, settlement requests are independent of spite (α). This is because the spite effect on the bargaining power in the disagreement values and the settlement request cancel each other out. Hence, we hypothesize the following:

Hypothesis 2.5. *Settlement requests under the English fee-shifting rule are the same for more spiteful and less spiteful agents.*

4. Experiment

In this section, we describe the design of the litigation experiment (in section 4.1), our measures of social preferences (in section 4.2), subject recruitment (in section 4.3), payment (in section 4.4) and the procedure of the experiment (in section 4.5).

[17] Note again, that we refer to the behavior of the plaintiff (player j) and use the term low merit when q is small and high merit when q is high. The hypotheses also apply to the defendant (player i), where low merit corresponds to $(1-q)$ being small and high merit corresponds to $(1-q)$ being high.

4.1. Litigation experiment

To test the theoretical predictions, we conducted an experiment. We manipulated the fee-shifting rule, which was either *American* or *English*. We further elicited spite via two different methods.[18] The fee-shifting factor was implemented in a within-subjects design, i.e., every subject made all decisions both for the American and the English fee-shifting rule. To cope with order effects, we counterbalanced the order of the fee-shifting rule, i.e., half the participants made decisions under the American regime first and then under the English one whereas the other half of participants made decisions under the English regime first and then under the American one.[19]

To have a clear design and to exclude effects of winning/losing (e.g., hedging effects or retaliative motives), the experiment was conducted as a one-shot game. This means that subjects made all their decisions only once and that there was no feedback between any decision.

In addition to the litigation decisions, we also elicited settlement behavior. Thus, subjects had to make two decisions: the litigation and the settlement decision. The litigation stage was played under each regime first, and only then subjects were instructed and asked to make the decision for the settlement stage. This has three advantages: 1) it ensures that subjects do indeed follow backward inductions, 2) it ensures that litigation behavior is not impacted by the mere failure of the settlement stage, i.e., subjects are not driven by anger due to a failed settlement and more importantly 3) it ensures the experiment not to have a selection bias – i.e., all subjects litigate and not only those who fail settlement. So, subjects made a litigation decision first and then they were asked to settle the dispute under the shadow of litigation –i.e., if the settlement stage was payoff-relevant and they settled successfully, this settlement represented their payoff. However, if they failed to settle, the outcome of the litigation stage would be payoff-relevant. No information regarding the other players' choices was provided between the two stages. Thus, all observations are statistically independent.

The settlement was designed as a standard two-player Nash-Demand game as described in the model section 3.2. The litigation stage was played as a standard two-player Tullock-contest. To ensure that subjects do not end up with a negative payoff, they were always endowed with 10 tokens. In addition, subjects competed in the litigation stage for a prize of 10 tokens and no subject was endowed with the litigated object to reduce biases due to loss-aversion (Kahneman and Tversky, 1984; Tversky and Kahneman, 1992), an endowment effect (Kahneman et al., 1990; Plott and Zeiler, 2007) and more generally reference-dependent preferences (Kőszegi and Rabin, 2006).

Furthermore, all subjects had to make five decisions in each stage – settlement and litigation

[18] Additionally, we aimed to manipulate the extent of spite by excluding social preferences altogether. For this purpose, participants were either matched with a computer or another human participant. The manipulation, however, seems not to have worked as the manipulation was too weak. We present the results of the manipulation in Appendix B.3 and provide a detailed discussion on why we believe the manipulation failed.

[19] Appendix B.2.1 provides evidence of the absence of an order effect.

– under each regime – English and American. The decisions differed only by the parameter q – representing the merit of the case from the plaintiff's point of view, i.e., where low merit corresponds to a low q and high merit to a high q. The five chosen levels of q were $q \in \{0.1, 0.3, 0.5, 0.7, 0.9\}$. To cope with order effects, the order of the presented qs was randomized by subject. Figure 11 and 12 in Appendix B.4 show the interface for the litigation and settlement decision under the English rule for q of .5, respectively. As subjects did not get any feedback between the decisions – in fact subjects were informed about the outcome of all tasks only after a day – the decisions represent a strategy method approach (Selten, 1967). Overall, subjects made 2 (Regime: English, American) x 2 (Stage: Settlement, Litigation) x 5 (Merit $q \in \{0.1, 0.3, 0.5, 0.7, 0.9\}$) = 20 decisions.[20]

To reduce experimenter demand effects, we instructed subjects on an abstract level, i.e., we did not use words like litigation, settlement, court, American, English, plaintiff, defendant, etc. Instead, the litigation stage was presented as "Task A," and the settlement stage was presented as "Task B". Subjects were instructed in the litigation stage as typically done in contest experiments and in the settlement stage, they were instructed as usually done in Nash-Demand experiments (see also the instructions in Appendix C.1).

4.2. Social-preferences measures

To be able to speak to the effect of spite and prosocial preferences on behavior we also used several social-preferences measures after the experiment: the *Spite-Task* (Mill and Morgan, 2021; Kirchkamp and Mill, 2021), the *Spite-Questionnaire* (Marcus et al., 2014), and the *SVO-Task* (Murphy et al., 2011; Murphy and Ackerman, 2014).

Spite-Task: Our main measurement of spite was meant to measure spiteful preferences towards the opponent in the experiment. This measure consists of three money distribution decisions. These distributions are shown in Table 1. We call this the Spite-Task. We asked the participants to make three allocation decisions with each nine possibilities, similar to the SVO-Slider measure by Murphy et al. (2011). Participants were told that either their decision or their opponent's decision would be implemented, depending on a computerized random draw.

In all sets, the allocation with the highest payoff for the other player also maximizes the own payoff. However, any deviation from this allocation reduces the payoff of the other player and never increases the own payoff. In contrast to a standard dictator game – where there is a trade-off between the own payoff and the payoff of the opponent – in this game, the participants who do not choose the Pareto-efficient outcome do this because they want to harm the other player. Therefore, any deviation from the Pareto-efficient outcome can be

[20] Our setting encourages cold decision-making rather than hot decision-making, which may make it more difficult to identify emotion-based spite effects. However, we argue that we can still identify inherent preference-based spitefulness in our setting. Further, the cold-decision making makes our design cleaner as other factors associated with hot decision-making could have confounded our results (such as other emotion-based social preferences).

interpreted as spite or joy-of-destruction.

Table 1: Spite measure.

You receive	70	70	70	70	70	70	70	70	70
	○	○	○	○	○	○	○	○	○
Other receives	100	98	96	94	92	91	89	87	85
You receive	70	68	65	62	60	58	55	52	50
	○	○	○	○	○	○	○	○	○
Other receives	100	96	92	89	85	81	78	74	70
You receive	100	100	100	100	100	100	100	100	100
	○	○	○	○	○	○	○	○	○
Other receives	100	98	96	94	92	91	89	87	85

The table depicts the nine allocation choices in each of the three decisions of participants in the Spite-Task. For each choice, the upper row denotes the payoff in experimental currency units for the deciding participants, while the bottom rows each denote the payoff for the other player.

In the Spite-Task, the *spite score* is the amount taken away relative to the maximally possible amount. The amount taken away can range between 0 and 60 points (reducing the payoff of the opponent in all three distributions) and, therefore, the spite score ranges between 0 and 1.

Spite-Questionnaire: The additional measure of spitefulness is a non-behavioral questionnaire. In the questionnaire by Marcus et al. (2014) participants are asked to rate 17 statements. Here are two examples:[21]

- I would be willing to take a punch if it meant that someone I did not like would receive two punches.
- I would be willing to pay more for some goods and services if other people I did not like had to pay even more.

Participants were asked to indicate their agreement on a scale between 1 and 5. Higher scores on the scale indicate more spitefulness. This task's measure of spitefulness is the average agreement with the statements.

SVO-Task: To measure prosocial preferences, we used the 6-items primary scale of the SVO Slider Task (Murphy et al., 2011; Murphy and Ackerman, 2014). The primary scale of the SVO-task consists of six distribution-decisions among nine possible allocations. Table 2 shows these six decisions with all the possible allocations per decision. Based on these answers, a continuous variable is calculated (i.e., the SVO-angle). This variable represents a participant's prosocial preference and ranges from -16.26° to 61.39°, where a higher value represents more prosocialness.

[21] All questions are shown in Appendix C.4.

Table 2: SVO-Task.

You receive	85	85	85	85	85	85	85	85	85
	○	○	○	○	○	○	○	○	○
Other receives	85	76	68	59	50	41	32	24	15
You receive	85	87	89	91	92	94	96	98	100
	○	○	○	○	○	○	○	○	○
Other receives	15	19	24	28	32	37	41	46	50
You receive	50	54	59	63	68	72	76	81	85
	○	○	○	○	○	○	○	○	○
Other receives	100	98	96	94	92	91	89	87	85
You receive	50	54	59	63	68	72	76	81	85
	○	○	○	○	○	○	○	○	○
Other receives	100	89	79	68	58	47	36	26	15
You receive	100	94	88	81	75	69	62	56	50
	○	○	○	○	○	○	○	○	○
Other receives	50	56	62	69	75	81	88	94	100
You receive	100	98	96	94	92	91	89	87	85
	○	○	○	○	○	○	○	○	○
Other receives	50	54	59	63	68	72	76	81	85

The table depicts the nine allocation choices in each of the six decisions of participants in the primary scale of the social value orientation (SVO) measure by Murphy et al. (2011). For each choice, the upper row denotes the payoff in experimental currency units for the deciding participants, while the bottom rows each denote the payoff for the other player.

4.3. Subject recruitment and selection

The experiment was conducted online and subjects were recruited via Amazon's Mechanical Turk (mTurk).[22] Registered individuals can choose from human intelligence tasks (HITs) and are paid by the requester after performing the task. Most of the time, these assignments are relatively simple and quick tasks (e.g., answering surveys, transcribing data, classifying images, etc).[23]

One reason for recruiting subjects via mTurk is that the samples tend to be more representative of the US population than convenient student samples (Buhrmester et al., 2011; Berinsky et al., 2012; Paolacci et al., 2010) and are usually more diverse in terms of age, ethnicity, education, and geographical location (Buhrmester et al., 2011; Berinsky et al., 2012; Paolacci et al., 2010). Several studies show that the data obtained in mTurk is very reliable and very similar to data typically obtained in laboratory experiments (Buhrmester et al., 2011; Horton et al., 2011; Berinsky et al., 2012; Paolacci et al., 2010). In particular, Arechar et al. (2018) show that even interactive experiments can be conducted very reliably online and that behavioral patterns observed in the lab can be replicated using an online experiment with a mTurk sample.

In addition to the more diverse sample, there are several advantages of using an online design for our experiment. First, participants' anonymity can be sufficiently ensured, as we

[22]The platform is frequently used by economists (e.g., DellaVigna and Pope, 2018; Horton et al., 2011) and other social scientists (e.g., Jordan et al., 2016, 2017; Peysakhovich et al., 2014; Rand et al., 2014; Suri and Watts, 2011; Mao et al., 2017).

[23]See for example Horton et al. (2011); Berinsky et al. (2012); Paolacci et al. (2010); Mason and Suri (2012).

merely know our participants' mTurk-ID. This anonymity might yield more reliable results concerning subjects' litigation efforts. Second, reciprocity concerns are minimized because participants cannot meet the other participants and also cannot figure out who was assigned as their partner. Finally, for the same reason, we can exclude peer effects by conducting the experiment online.

To ensure a qualitative sample, we restrict eligibility criteria. We restrict recruitment to US-based individuals with an approval rate of 97% or higher.[24] Moreover, we restrict recruiting to individuals with approved HITs of more than 500.[25]

4.4. Payment

To ensure that all decisions are incentive-compatible we paid out one decision only.[26] Subjects were told that only one scenario (q) of one stage – i.e., either the litigation or the settlement stage – under one fee-shifting rule would be paid out. The matching of players was randomly performed after all decisions were made. As all subjects had to indicate their decisions for all scenarios (q), we assigned each randomly matched pair one q, and each subject was randomly assigned the role of either the plaintiff (i.e., the decision for q was payoff-relevant) or the defendant (i.e., the decision for $1 - q$ was payoff-relevant). The payment was executed a day after all subjects had made their decisions.

4.5. Procedure

Subjects were recruited to this experiment via Amazon Mechanical Turk and were directed to an external survey-link. As soon as subjects arrived at our platform, they were asked for their individual MTurk-ID to ensure payment at the end of the experiment. After giving consent to participating in the experiment, subjects were asked to answer several socio-demographic questions, i.e., age, gender, education, ethnicity. Thereafter, subjects were instructed with the experimental task and had to answer incentivized control questions (each control question gave additional 5 dollar-cents). After making all decisions of the litigation experiment, subjects were instructed for the SVO-Task and the Spite-Task. They stayed in the same pairs as in the litigation-experiment. Some participants also took part in the risk-task (which we explain and discuss in Appendix B.2.4). After answering the Spite-Questionnaire, subjects were directed back to Amazon Mechanical Turk. The procedure is depicted in figure 13 in the appendix.

[24] Subjects' location is verified through their IP addresses. Requesters can review the work done by mTurkers and decide to approve or reject the work. Approved work is paid as indicated in the contract, and rejected work is not paid. Hence, higher approval rates of workers indicate a higher quality of work.

[25] In a second wave, we further excluded subjects who used a VPN from outside the US, subjects on mobile devices, and bots. Additionally, every participant had to answer the control questions correctly before being able to proceed with the experiment. In the second wave, we also elicited risk aversion (discussed in Appendix B.2.4) and find that it does not interact with the influence of spiteful preferences. The overall results of the two waves are qualitatively comparable (see Appendix B.2.3).

[26] See Azrieli et al. (2018) for a detailed argument.

5. Results

We conducted the experiment in two waves: The first wave took place in November 2017, and the second wave in January 2021. We recruited 1635 participants and the experiment was implemented using the online survey tool Qualtrics. The entire experiment lasted for about 30 ($SD = 17.96$) minutes. Median earnings of participants were $ 2.90 (including a show-up fee of $1) resulting in an average hourly wage of $ 7.13, which is more than the median hourly income of a typical MTurker. We had 51 % female participants. Participants' age ranged from 18 to 81. 78 % of participants reported to have at least a college degree.

Throughout this entire results section, we present the results based on the plaintiff's view of merit, where low merit corresponds to a low q and high merit to a high q. Since all subjects had to indicate their decision based on this view, we can classify all subjects using the same merit classification. To derive the observed behavior from the defendant's view of merit, q can be swapped with $(1 - q)$ in all the results and figures.

5.1. American vs. English fee-shifting

In this subsection, we study differences in litigation and settlement behavior between the American (Am) and English (Eng) fee-shifting rules. The right part of Figure 3 shows the average litigation expenditures and the average settlement requests in each of the two treatments.

As a first step, we compare how the litigation expenditures, on average, differ between the English and American fee-shifting rule (Hypothesis 1.1). We find that subjects invest on average 4.87 tokens in litigation under the American regime and 5.64 tokens under the English regime. Subjects invest significantly more under the English regime compared to the American regime, using a paired t-test: t(1634)= -13.2, $p < 0.001$, as hypothesis 1.1 suggests.

Similarly, we compare how settlement requests, on average, differ under the threat of litigation between the English and American fee-shifting rule. We find that subjects request on average 5.06 tokens for settlement under the American regime and 5.10 tokens under the English regime. Subjects' requests did not differ significantly between the English and the American regime, using a paired t-test: t(1634)= -1.3, $p \geq 0.05$. The lack of a meaningful statistical difference can be interpreted as supportive evidence of hypothesis 1.2, denoting that there is no difference in the average settlement requests between the American and the English fee-shifting rule.

Result 1.1. *Aggregate litigation expenditures are significantly higher under the English rule compared to the American rule.*

Result 1.2. *Aggregate settlement requests are not significantly different under the American rule compared to the English rule.*

As a next step, we compare how the litigation expenditures and settlement requests differ between the American and the English fee-shifting rule as a function of merit q. Figure 3 shows litigation expenditures and settlement requests for both regimes.

We observe that the behavioral patterns in figure 3 only partially follow the functional theoretical predictions in figure 1b. Neither the theoretical predictions of the American nor the English rule are fully born out by the behavior of subjects in the experiment. Even though there is an apparent increase in litigation effort for the American rule from low to medium merit, there is no decrease from medium to high merit. The absence of this decrease might be explained by joy of winning (Cooper and Fang, 2008) or anticipated regret (Filiz-Ozbay and Ozbay, 2007, 2010; March and Sahm, 2017), i.e., subjects anticipating to regret not having invested more if they could have won. Similarly, the litigation effort under the English rule does not follow the functional form as predicted in Figure 1b. However, we do find that for higher merits, the efforts increase. Nonetheless, the efforts do not reach the maximum value as predicted.

We report a more formal study of the differences between the English and American rule as a function of the merit q in Appendix B.1.1.

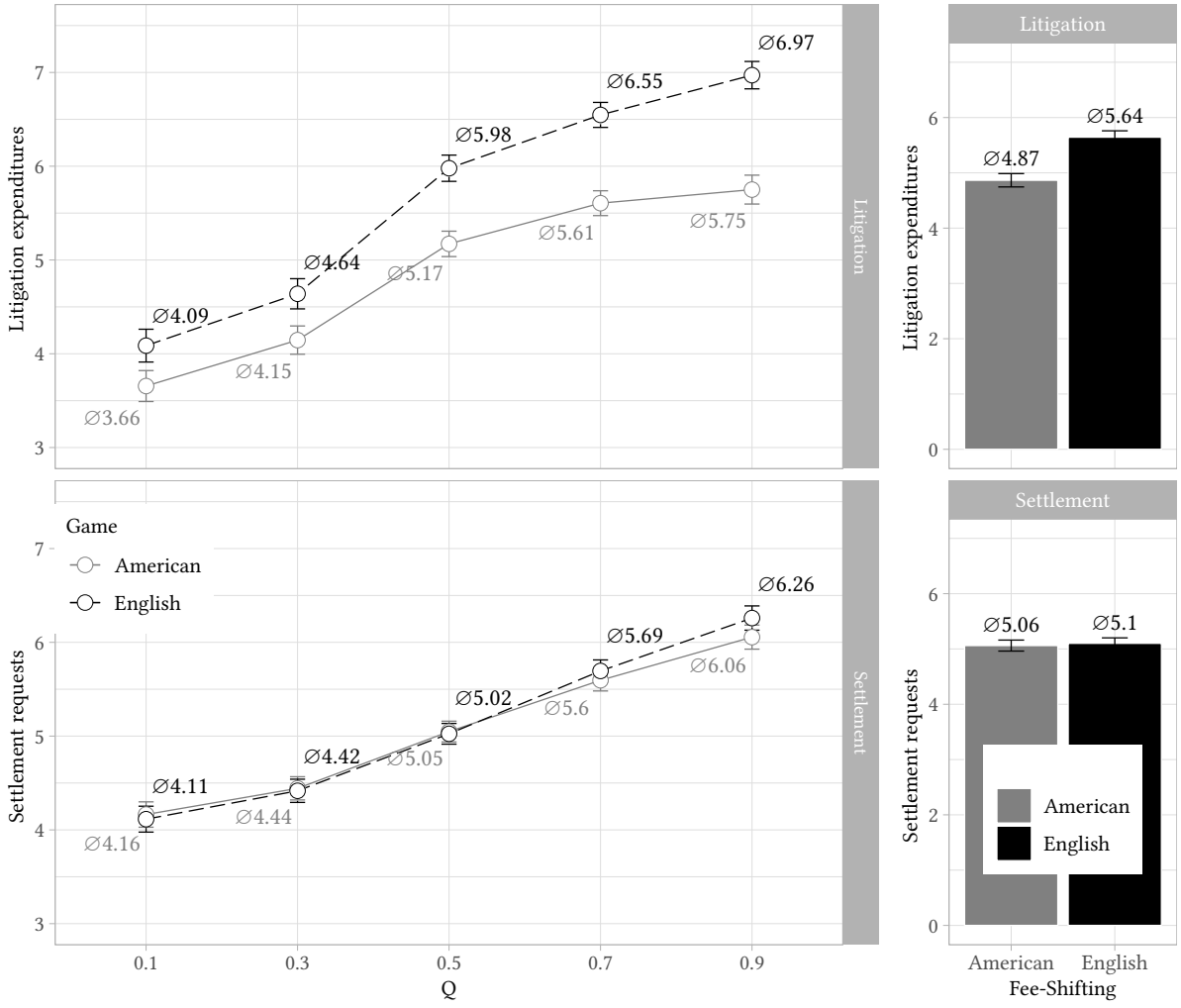


Figure 3: Litigation expenditures and settlement requests.
The figures to the left depict the litigation expenditures and settlement requests by fee-shifting rule as a function of q, while the figures to the right depict the aggregates. The panels on the top depict the litigation effort, while the panels on the bottom illustrate the settlement requests. Grey solid lines depict the behavior under the English fee-shifting rule, while black dashed lines indicate the response under the American fee-shifting rule in each panel. The error bars indicate the 95% confidence intervals.

Result 2.1. *Litigation expenditures are increasing significantly in* q *for both rules and increasing significantly steeper in* q *under the English rule compared to the American rule.*

5.2. The effect of spite

5.2.1. Our measures of spiteful and prosocial attitudes

First, we take a look at our measures of spiteful and prosocial attitudes. For the two spite measures, we find a Cronbach α of 0.364 (CI $= [0.34, 0.387]$), and we find that they are correlated positively and significantly ($r = 0.524$, $p<0.001$). Further, we see that our measure of prosocial behavior (SVO-Measure) is negatively correlated with our spite measure ($r = -0.132$, $p<0.001$) and with the Spite-Questionnaire ($r = -0.13$, $p<0.001$), providing plausibility for our social preferences measures.

5.2.2. Measures of spiteful and prosocial behavior

Now we study the effect of spite on both litigation expenditures and settlement requests. As a first step, we correlate our measures of spite and prosocial behavior with litigation expenditures and settlement requests. Table 3 shows how litigation expenditures and settlement requests are changing with increased social value orientation (SVO), increased spite behavior (Spite-Task), and increased scores on the Spite-Questionnaire (SpiteQ). Higher scores on the social value orientation scale indicate more prosocial behavior, and increased values on the Spite-Task indicate stronger preferences for destruction of wealth of the opponent. Higher scores on the Spite-Questionnaire indicate more spitefulness. All independent variables are z-scored.

It can be seen that increasing spite scores (Spite-Task), as well as increasing spitefulness on the Spite-Questionnaire, are associated with higher legal expenditures and higher settlement requests. We also see that higher prosociality (SVO) is associated with lower settlement requests. An increase in the spite measures by one standard deviation influences legal expenditures and settlement requests more than a one standard deviation increase in prosociality. This indicates that antisocial preferences play a more prominent role in describing behavior than prosocial preferences.[27]

Result 3.1. *Litigation expenditures and settlement requests are significantly higher for more spiteful subjects compared to less spiteful subjects (measured by both the Spite-Questionnaire and the Spite-Task). More prosocial subjects do not substantially differ in their litigation and settlement behavior from less prosocial subjects.*

[27] Note that the SVO measure also contains aspects of antisocial preferences. To deal with this issue, we can also use only a subset of the SVO task to obtain a measure of efficiency preferences. However, efficiency preferences are highly correlated with the SVO measure (>0.9). Further, all the results presented for the SVO-Measure also hold for the efficiency-preference-measure. Specifically, efficiency preferences have – similar to the SVO measure – little predictive power for both the litigation as well as the settlement behavior.

Table 3: Regression of the average litigation expenditures and settlement requests by social-preferences measures.

	Litigation / Settlement					
	L	S	L	S	L	S
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	5.26^{***}	5.08^{***}	5.26^{***}	5.08^{***}	5.26^{***}	5.08^{***}
	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)
Spite-Task	0.65^{***}	0.68^{***}				
	(0.05)	(0.05)				
SpiteQ			0.71^{***}	0.83^{***}		
			(0.05)	(0.04)		
SVO					-0.03	-0.11^{**}
					(0.05)	(0.05)
Litigation	✓	×	✓	×	✓	×
Observations	1,635	1,635	1,635	1,635	1,635	1,635
R^2	0.09	0.12	0.11	0.18	0.0002	0.003
Adjusted R^2	0.09	0.12	0.11	0.18	-0.0004	0.003
Residual Std. Error (df = 1633)	2.03	1.83	2.01	1.76	2.13	1.95
F Statistic (df = 1; 1633)	167.07^{***}	223.63^{***}	202.54^{***}	366.95^{***}	0.39	5.28^{**}
Note:						$^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Standard errors are shown in parenthesis.

5.2.3. Aggregate results

In the following, we classify subjects as spiteful if their spite score is higher than the median spite score and as non-spiteful otherwise,[28] to obtain a deeper insight into the relationship between spite and litigation and settlement behavior.[29]

Table 5 in Appendix B.1.2 reports on the OLS regression for the aggregate legal expenditures and settlement requests by the median splits of the social preference measure and the fee-shifting rule. We find that using median splits on the aggregate legal expenditures and settlement requests yield insights similar to the ones obtained from Table 3.

Moreover, we study the relationship of spite and litigation and settlement behavior in relation to the fee-shifting rule. We observe that in both regimes subjects with above-median spite scores (on both spite measures) invest more into litigation and have higher settlement request. This confirms Hypothesis 2.1 (litigation expenditures are higher for more spiteful agents under the American fee-shifting rule) and Hypothesis 2.2 (average litigation expenditures are higher for more spiteful agents under the English fee-shifting rule).

[28] We caution that having a higher score than the median does not necessarily make a subject spiteful in absolute terms. However, we decided for this classification to have two balanced sets of subjects: one with subjects with rather spiteful preferences and one with subjects with less spiteful preferences.

[29] We also present the main results with continuous measures of social preferences in Appendix B.1.3. The results are essentially identical.

For subjects with above-median scores on the SVO-Measure, we find only a slight decrease in settlement requests under the American fee-shifting rule. Litigation expenditures in both rules and settlement requests under the English rule seem to be very little associated with prosocial attitudes.

Interestingly, we see no interaction effect between measures of social preferences and the fee-shifting rule for settlement requests. This indicates that social preferences play roughly the same role under both fee-shifting rules with regard to settlement requests. With regard to litigation expenditures, however, we see that subjects with above-median spite scores (on both spite measures) invest relatively more into litigation under the American fee-shifting rule compared to the relative increase under the English fee-shifting rule. Thus, it appears that the American fee-shifting rule is more prone to distortions driven by spiteful preferences.

Result 3.2. *The relative increase in litigation expenditures for more spiteful subjects relative to less spiteful subjects is higher under the American fee-shifting rule than under the English fee-shifting rule.*

5.2.4. Results as a function of merit

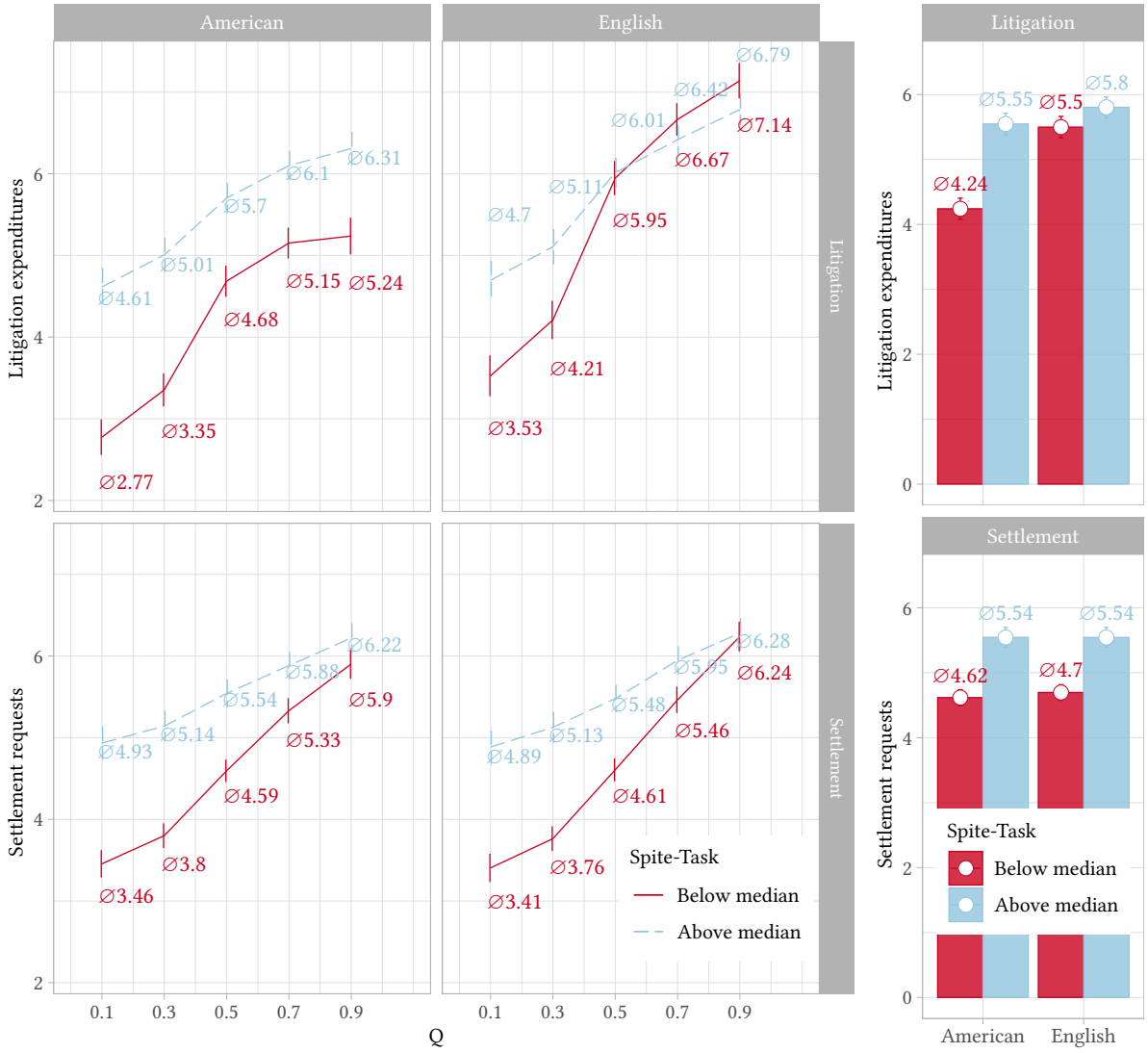


Figure 4: Litigation effort and settlement request under the American and English fee-shifting rule as a function of q for more/less spiteful subjects.

The figures to the left depict the litigation expenditures and settlement request by fee-shifting rule for more and less spiteful subjects as a function of q, while the figures to the right depict the aggregates. The panels on the top depict the litigation effort, while the panels on the bottom illustrate the settlement requests. Red solid lines depict the behavior of less spiteful subjects (i.e., subjects with below-median spite scores on the Spite-Task), while blue dashed lines indicate the response of more spiteful subjects. The error bars indicate the 95% confidence intervals.

Next, we examine the effect of spite and prosocial preferences on litigation expenditures and settlement requests as a function of merit q. Figure 4 shows the settlement requests and the litigation expenditures for more/less spiteful subjects by the fee-shifting rule.[30] We see that more spiteful subjects exhibit substantially higher litigation expenditures under the American rule, which is more or less constant for all merit levels. Under the English fee-shifting rule, however, it appears that more spiteful subjects exhibit substantially higher litigation

[30] In Appendix B.1.2 and B.1.3, we also show the settlement requests and the litigation expenditures for more/less spiteful subjects identified through the Spite-Questionnaire in Figure 6 and for more/less prosocial subjects in Figure 7.

expenditures only for low-merit levels. For high-merit levels, more and less spiteful subjects exhibit about the same litigation expenditures. Concerning settlement requests, we see that more spiteful subjects request substantially more than less spiteful subjects for low merits, and this difference decreases as the merit of the case increases. This pattern is found for both fee-shifting rules alike.

These behavioral patterns only partially follow the functional predictions (see figure 4), where we would expect a relative increase in litigation expenditures for more spiteful subjects under the American rule, and a shift from the bang-bang threshold to lower merit levels under the English rule. For settlement request, theory predicts no influence of spite under the English rule and an increase in litigation expenditures for high-merit cases and a decrease for low-merit cases. However, we find an overall increase for all merit levels for more spiteful subjects. One explanation is that participants under-exploit their bargaining position, that is, that they are insensitive to changes in the merit-level induced differences in the disagreement outcomes. This argument goes in line with the literature, who find that participants are relatively insensitive to changes in their disagreement values in the Nash-Demand game (Fischer et al., 2007; Anbarci and Feltovich, 2013), even if the bargaining position is earned through a preceding real-effort task (Anbarci and Feltovich, 2018). This effect can even be stronger in our setup since participants might fail to correctly execute backwards induction, and hence are not even aware of their differing disagreement values and bargaining powers.

To study these behavioral patterns more formally we use a mixed-effects model reported in Appendix B.1.3. The deductions from the figure are also supported by the econometric analysis as reported in Appendix B.1.3.

Result 4.1. *Litigation expenditures are significantly higher for more spiteful subjects relative to less spiteful subjects. However, the difference in litigation expenditures reduces with merit.*

Result 4.2. *Settlement requests are significantly higher for more spiteful subjects relative to less spiteful subjects. However, the difference in settlement requests reduces with merit.*

Result 4.3. *The difference in litigation expenditures between more and less spiteful subjects is more pronounced under the American fee-shifting rule relative to the English fee-shifting rule. We find little evidence for such an effect in settlement requests.*

What can be taken from this subsection is that both litigation expenditures and settlement requests are substantially and significantly higher for more spiteful subjects. However, these differences decrease in merit.

Furthermore, and importantly, the difference between more and less spiteful subjects in litigation expenditures is more pronounced under the American fee-shifting rule. The reason for this difference is that the English rule generates significantly higher litigation expenditure for less spiteful subjects, while both fee-shifting rules generate roughly the same expenditures for more spiteful subjects. This leaves less room for an increase due to spite under the English rule, especially for high-merit cases. Indeed, we observe that under the English rule, there

is no substantive difference between more and less spiteful subjects for high-merit cases. Under the American rule, this difference is relatively constant for all merits. Subsequently, the American fee-shifting rule is overall more susceptible to expenditure increases due to spite. This interaction effect does not apply to settlement requests: The American fee-shifting rule generates higher settlement requests independent of the level of spite subjects exhibit.

5.3. Welfare

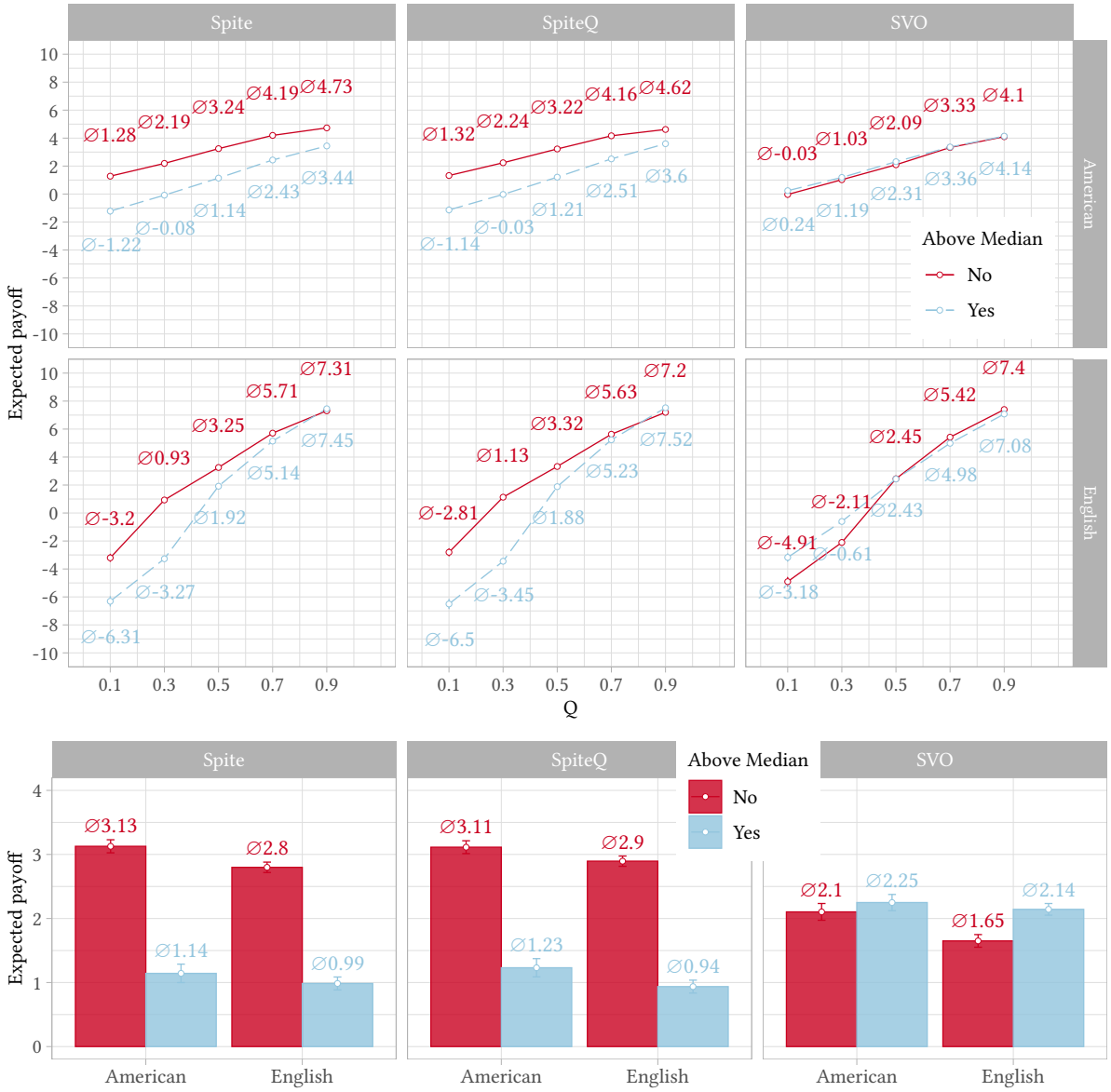


Figure 5: Expected payoff by fee-shifting rule as a function of q.
The panels on the top depict the expected payoff by fee-shifting rule as a function of q, while the panels on the bottom show the aggregates. The panels in the first and second columns show the expected payoff of less and more spiteful societies (i.e., where less (more) spiteful subjects were matched with other less (more) spiteful subjects), according to the Spite-Task and the Spite-Questionnaire, respectively. Red solid lines depict the behavior of less spiteful societies, while blue dashed lines indicate the behavior of more spiteful societies. The panels in the third column show the expected payoff of less (red solid lines) and more (blue dashed lines) prosocial societies according to the SVO-Measure. The error bars indicate the 95% confidence intervals.

So far, we have seen that litigation expenditures are higher under the English fee-shifting rule and that settlement behavior is roughly the same between both fee-shifting rules. We also have seen that more spiteful subjects exhibit substantially higher litigation expenditures, make substantially higher requests, and that the difference between more and less spiteful subjects is more pronounced under the American fee-shifting rule. In this section, we want to focus on the welfare implications of these results.

Therefore, we look at the expected payoffs, i.e., the payoff a subject with a given merit q is expected to obtain prior to bargaining and litigation. We focus on the expected payoff and not on expected utility to measure the monetary costs that spitefulness bears to society.[31] To obtain the most illustrative insight, we artificially match more spiteful subjects with more spiteful subjects and match less spiteful subjects with less spiteful subjects. Thus, we focus on the expected payoffs if society consists of rather spiteful subjects or rather if society consists of rather unspiteful subjects.

Figure 5 reports the empirical ex-ante expected payoff under both fee-shifting rules for more and less spiteful societies. We find a considerable difference in the expected payoff between more and less spiteful societies. Prior to litigation, more spiteful societies are expected to have an average payoff of 1.14 and 0.99 tokens under the American and English fee-shifting rule, respectively, compared to less spiteful societies who are expected to obtain 3.13 and 2.80 tokens under the American and English fee-shifting rule. Both differences are highly significant using t-tests: $t(1633)= 22.4$, $p < 0.001$ and $t(1633)= 27.7$, $p < 0.001$, for the American and English fee-shifting rule, respectively. Again, these differences are almost identical using either measure of spite.

On the aggregate, the decrease in expected payoffs for more spiteful societies compared to less spiteful societies is not substantially different between the two fee-shifting rules. There are, however, differences between the rules when looking at the expected payoff as a function of merit. Under the American fee-shifting rule, more spiteful societies have a substantially lower expected payoff compared to less spiteful societies for all merit levels. In contrast, under the English fee-shifting rule, more spiteful societies have a lower expected payoff only for low-merit cases and are almost identical for high-merit cases. Compared to the American rule, the penalty to more spiteful societies is relatively high for low-merit cases. We conclude that spiteful societies are detrimental to subjects with any merit level under the American rule while spiteful societies are especially harmful to subjects with low-merit cases under the English fee-shifting rule.

Result 5.1. *The expected payoff is substantially lower if more spiteful subjects interact with more spiteful subjects.*

Result 5.2. *The expected payoff is constantly lower if more spiteful subjects interact with more spiteful subjects under the America rule for all levels of merit.*

[31] Additionally, we deem it weird to speak of welfare, when it would incorporate subjects' additional utility that comes from their spiteful preferences.

Result 5.3. *The expected payoff is lower if more spiteful subjects interact with more spiteful subjects under the English rule mostly for low levels of merit.*

To summarize, we find that the behavioral functional forms only partially follow the theoretical predictions. However, we find supportive evidence for multiple benchmark hypotheses. As predicted, we find that aggregate litigation expenditures are higher under the English fee-shifting rule, while we observe no significant difference for aggregate settlement requests. Other than predicted, both litigation expenditures and settlement requests are increasing in the merit of a case under both rules and this increase is more pronounced under the English fee-shifting rule. Importantly, we find that both litigation expenditures and settlement requests are substantially higher for more spiteful subjects compared to less spiteful subjects. These differences caused by spite reduce with merit for litigation expenditures under the English rule and for settlement requests under both rules. The increase in litigation expenditures for more spiteful subjects is more pronounced under the American fee-shifting rule especially for high-merit cases, where there are no substantial differences under the English rule. These findings directly translate into the expected payoffs. We see that spiteful preferences are associated with a substantial gap in expected payoffs. Whereas this gap remains constant for all merit levels under the American rule, under the English rule, we observe a high gap for low-merit cases, and almost identical expected payoffs for high-merit cases. That means that in a spiteful society, litigants are severely punished under the English rule, if their merit is low and not punished if their merit is high. The penalty for spiteful societies is relatively constant for all merit levels under the American rule.

6. Discussion and Conclusion

In this paper, we study how spiteful preferences change theoretical and actual behavior in litigation settings under the American and English fee-shifting rules. We show theoretically that spiteful preferences lead to higher litigation expenditures under both rules. For settlement requests, spite matters only under the American fee-shifting rule and increases requests for low-merit cases and decreases requests for high-merit cases.

Using an online experiment, we provide empirical evidence for some of these predictions. In the experiment, subjects had to make litigation and settlement decisions under the American and English fee-shifting rules. We elicited spiteful preferences via two measurements, namely through 1) a behavioral incentivized distribution-decision task and 2) a non-behavioral questionnaire.

We show that litigation expenditures are higher under the English fee-shifting rule than under the American fee-shifting rule. This goes in line with the experimental results of Massenot et al. (2021) and Dechenaux and Mancini (2008). Similar to Massenot et al. (2021) we find no difference in settlement requests between the two fee-shifting rules, yet other than the authors we find an increase in settlement requests with higher merit levels.

Most importantly, we also provide evidence that litigation and settlement expenditures under both fee-shifting rules are higher if the subject exhibits spiteful preferences. These results complement the experimental literature (Kimbrough and Reiss, 2012; Cooper and Fang, 2008; Bartling et al., 2017; Andreoni et al., 2007; Kirchkamp and Mill, 2021), which shows that spiteful preferences lead to more competitive behavior. The results adds to the results of Eisenkopf et al. (2019), who do not find any impact of emotions on litigation expenditures. This could indicate that in the case of litigation, antisocial preferences matter more than 'hot' negative emotions. Our results also provide empirical support for the theoretical literature on malicious litigation (Guha, 2016; Chen and Rodrigues-Neto, 2022) and pretrial bargaining (Guha, 2019). Further, the results add to the contest literature with spillovers (Chowdhury and Sheremeta, 2011a,b) and provide experimental evidence that spillovers due to spiteful preferences influence equilibrium expenditures in litigation contests.

Furthermore, we observe that the increase in litigation expenditures due to spite is stronger under the American compared to the English rule. This result goes in contrast to the theoretical results of Chen and Rodrigues-Neto (2022), who show that negative relational emotions amplify the cost-shifting effect. Additionally, we find a stronger increase under the American rule especially for high-merit cases, where under the English rule, there is no substantial difference between spiteful and non-spiteful subjects. This goes in line with our theoretical model, which predicts no difference for more spiteful agents for high-merit levels. For settlement requests, spite seems to not have a stronger influence on any of the two fee-shifting rules.

We also compare the welfare of artificially constructed societies that consist of more or less spiteful subjects. The expected payoff of more spiteful societies is substantially lower than for societies that consist of less spiteful subjects. On the aggregate, the difference in the expected payoff for more spiteful societies is not substantially different between the English and the American rule. However, there are differences in the expected payoff depending on the merit of the case. Under the English rule, the expected payoff is especially low for more spiteful societies for low-merit cases, while there are no differences for high-merit cases. Under the American rule, the difference is relatively constant for all merit levels.

We conclude that spiteful preferences are shown to be bad news. The increase in litigation expenditures for more spiteful subjects is more pronounced under the American rule, making the English rule more robust towards spiteful preferences – especially for high-merit cases. Additionally, whereas spiteful societies are detrimental for subjects of all merit levels under the American fee-shifting rule, it is only - but more severely - detrimental for subjects of low-merit cases under the English rule. There is no penalty for more spiteful societies for high-merit cases under the English rule. Therefore, whenever environments are known for spiteful behavior — for instance between disputing neighbors, alienated partners, angry siblings, and business rivals — the English rule punishes subjects with low-merit cases severely while subjects with high-merit cases receive no penalty. From a welfare point of view, punishing low-merit cases may prevent them to go to court and thus saves time, money, and judicial resources. Many frivolous lawsuits are low-merit cases, filed by a spiteful litigant to raise the defendant's costs.

This makes the English rule potentially more apt for deterring these malicious litigants in spiteful societies. At the same time, subjects with high-merit cases are not deterred from claiming their (in many cases) lawful rights. Under the American rule, any subject independent of the merit of the case is disincentivized to go to court in an environment known to be spiteful. However, we do not find substantial differences in the settlement requests between the rules for spiteful societies, indicating that we do not find evidence for a higher deterrence effect of the English rule. What we can conclude, however, is that even though the aggregate penalty is similar between the two fee-shifting rules, under the English rule, low-merit cases are punished more severely.

As usual, there are some limitations of the study, which the reader should take into account. First of all, we choose a specific simplified version of spite in our theoretical model. While we rely mostly on the existing literature to formulate spiteful preferences, there are many possible alternative ways of modeling spite. Future research might want to tackle this limitation by focusing on broader models of spiteful preferences.

Second, we rely on one-shot interactions in our experiment setting. This approach does not leave room for learning. In many experimental contest settings, learning plays a crucial role in behavior changes over time (see e.g. March and Sahm (2017)). At the same time, experiments with repeated interactions might fail to attribute changes in behavior to preferences. We cannot answer how participants would learn and how this learning would interact with spite. We can, however, show that participants with higher spiteful preferences differ already substantially from participants with less spiteful preferences in a one-shot setting. Thus, it would seem plausible that our results would even exacerbate over time.

Third, we elicit litigation expenditures for all subjects independent of whether they settle or actually have to litigate. Hence, we shut down selection effects for the litigation stage. In reality, there exists a selection effect, in the sense that only subjects that fail (or don't want) to settle, litigate. We purposefully excluded this selection effect to keep our results clean. A selection effect most likely would even magnify our results (as the more spiteful litigants would be less likely to settle) and thus, it seems plausible that the effect of spite is even stronger in real settings of litigation.

Finally, even though the comparison between the American and English rules is causal (due to an exogenous treatment manipulation), we do not exogenously manipulate spite. We, instead, rely on correlational evidence on the influence of spite on behavior. The main reason for not exogenously varying spiteful preferences is that we are not aware of any manipulation which cleanly targets only spiteful preferences while keeping other preferences and beliefs constant. Thus, our experimental design delivers only second-best results. However, we tackle this issue throughout the paper.[32] To prevent the results from being driven by measurement error, we elicit spiteful preferences via two different methods. Throughout the paper, we consistently show that all our results prevail using either measure of spiteful preferences (see also Appendix

[32] See Appendix B.3 for a discussion of causality.

B.1.2 and B.1.3). Further, we tackle a potential omitted-variable bias problem by running robustness checks with risk preferences, social value orientation, and other controls that may be correlated both with the spite measurement and litigation expenditures and settlement requests (see Appendix B.2). The results remain robust for these additional model specifications. Even though all these results make us rather confident that spiteful preferences indeed change litigation and settlement behavior, we cannot exclude the possibility of reversed-causality or omitted-variable bias. Thus, future research might want to find ways of cleanly manipulating only spiteful preferences to be able to provide causal evidence to our research question.

All in all, we consistently find that spiteful preferences are associated with higher litigation expenditure and settlement requests, which results in welfare losses. We find that the English fee-shifting rule is more robust towards spiteful preferences for high-merit cases. At the same time, it only punishes low-merit cases, which makes it the better rule to disincentive frivolous low-merit lawsuits that may be especially present in spiteful societies. Future research might want to find mechanisms robust to spiteful preferences in the litigation setting. Future research will also need to figure out whether the negative effects of spiteful preferences on litigation and settlement can be mitigated by lawyers and potentially cool-off periods.

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A. Appendix

A.1. Proofs

A.1.1. Proof of Proposition 1

Proof of Proposition 1 Differentiating the Equations 1 with respect to e_i gives:

$$\frac{d\,u_i(e_i,e_j,q,\alpha)}{d\,e_i} = \frac{\left(((\alpha+1)\beta-1)\,{e_i}^2 - 2e_j\,((\alpha+1)\,\beta-1)\,e_i - e_j\,\left((1+(\alpha+1)\,\beta)\,e_j + W(\alpha+1)\right)\right)q^2}{\left((e_i-e_j)q-e_i\right)^2} + \frac{\left(2\,((\alpha+1)\,\beta-1)\,e_i(e_j-e_i) + e_j\,(\alpha+1)\,\left(\beta e_j+W\right)\right)q + ((\alpha+1)\,\beta-1)\,{e_i}^2}{\left((e_i-e_j)q-e_i\right)^2} \tag{2}$$

The second derivative is given by:

$$\frac{d\,\frac{d\,u_i(e_i,e_j,q,\alpha)}{d\,e_i}}{d\,e_i} = 2\frac{(\alpha+1)e_j(q-1)q\,((2\beta e_j+W)q-\beta e_j-W)}{\left((e_i-e_j)q-e_i\right)^3} \tag{3}$$

Rearranging yields the best response for agent i given a merit q, a good W, spite α and the litigation expenditures of j:

$$e_i^*(e_j,q,\alpha,\beta,W) = \frac{1}{1-q}\left(-qe_j \pm \sqrt{\frac{qe_j\;(\alpha+1)\,((-1+q)\,W+(2\,q-1)\,e_j\,\beta)}{-1+(\alpha+1)\,\beta}}\right) \tag{4}$$

Again $e_j^*(e_i,q,\alpha,\beta,W) = e_i^*(e_i,1-q,\alpha,\beta,W)$

From the best response function, we can derive the equilibrium behavior. As we know that the best response of j is given by $e_j^*(e_i,q,\alpha,\beta,W) = e_i^*(e_i,1-q,\alpha,\beta,W)$, we insert the best response of j into the best response of i.

We obtain

$$e_i^{*(\mathrm{Am})}(e_j,q,\alpha,\beta,W) = (1-q)\cdot q\cdot W\cdot(\alpha+1)$$

The second derivative (Equation 3) yields:

$$\frac{d\,\frac{d\,u_i((1-q)\cdot q\cdot W\cdot(\alpha+1),(1-q)\cdot q\cdot W\cdot(\alpha+1),q,\alpha)}{d\,e_i}}{d\,e_i} = \frac{-2}{W(\alpha+1)q}$$

which is obviously negative and hence, the solution is maximizing the utility of i. ■

A.1.2. Proof of Proposition 2

Proof of Proposition 2 The utility function can be rewritten as follows:

$$U_i = \frac{(1-q)e_i}{(1-q)e_i+qe_j}[(1+\alpha)e_i+(1+\alpha)e_j+(1+\alpha)W] - e_i - e_j - \alpha W \tag{5}$$

Other than in the American fee-shifting rule, there are self-generated spillovers in the sense that own expenses increase the own winning prize through the spite parameter α. In an unconstrained optimization and best response equilibrium, both infinite expenses and negative expenses are employed.

Therefore, we employ a constrained optimization. With the constraints, we restrict the possible resources spent and prevent the agents to spend infinite and negative resources. Note that other than guaranteeing the mathematical solvability, constraining the effort level also reflects reality since agents do not have infinite resources and cannot spend negative effort. We set $\bar{e} = W$, i.e., agents are spending at most the value of the prize.

The constrained optimization problem looks as follows:

$$\max_{e_i} U_i \tag{6a}$$

$$\text{s.t. } e_i \leq W \tag{6b}$$

$$e_i \geq 0 \tag{6c}$$

The point (e_i^*, μ^*) is called a Karush-Kuhn-Tucker (KKT) point if the following equations hold:

$$\frac{\partial U_i(e_i^*)}{\partial e_i} - \mu_1(\frac{\partial g_1(e_i^*)}{\partial e_i^*}) - \mu_2(\frac{\partial g_2(e_i^*)}{\partial e_i^*}) = 0 \tag{7a}$$

$$g_1(e_i^*) = -e_i^* \leq 0 \tag{7b}$$

$$g_2(e_i^*) = e_i^* - W \leq 0 \tag{7c}$$

$$\mu_1 \geq 0 \tag{7d}$$

$$\mu_2 \geq 0 \tag{7e}$$

$$\mu_1 g_1(e_i^*) = 0 \tag{7f}$$

$$\mu_2 g_2(e_i^*) = 0 \tag{7g}$$

We obtain the following points that may satisfy the KKT conditions for specific values of the parameters.

$$(e_i^* = 0, \mu_1 = \frac{e_j q - e_j(1-q)(1+\alpha) - W(1-q)(1+\alpha)}{q e_j}, \mu_2 = 0) \tag{8}$$

$$(e_i^* = W, \mu_1 = 0, \mu_2 = \frac{e_j^2 q(1-q)(1+\alpha) - e_j^2 q^2 + e_j q W(3\alpha+1)(1-q) + W^2\alpha(1-q)^2}{((1-q)10 + q e_j)^2}) \tag{9}$$

$$(e_i^* = \frac{1}{1-q}(-e_j q + \sqrt{\frac{q e_j(\alpha+1)[(-1+q)W + (-1+2q)e_j]}{\alpha}}), \mu_1 = \mu_2 = 0) \tag{10}$$

$$(e_i^* = \frac{1}{1-q}(-e_j q - \sqrt{\frac{q e_j(\alpha+1)[(-1+q)W + (-1+2q)e_j]}{\alpha}}), \mu_1 = \mu_2 = 0) \tag{11}$$

The optimization problem $e_j(q)$ equals the optimization problem for $e_i(1-q)$ and all the following conditions also apply to the optimization problem for player j. The sets $e_i \in [0, W]$ described by $g_1(e_i^*)$ and $g_2(e_i^*)$ are convex. Furthermore, the functions $g_1(e_i^*)$ and $g_2(e_i^*)$ are linear and affine. Therefore, they satisfy the linearity constraint qualification and thus all regularity conditions. The parameters are defined as before as $\alpha \in (0,1)$, $q \in [0,1]$, $W \in (0,\infty)$ and $e_j \in [0, W]$. There is a region for a specific range of q, α and W, where the points (8) and (9) are feasible, since both $\mu_1, \mu_2 \geq 0$ in (8) and $\mu_1, \mu_2 \geq 0$ in (9). Points (10) and (11) always satisfy $\mu_1, \mu_2 \geq 0$, yet there are some conditions on the

parameters for the squareroot to be non-negative and e_i to be non-negative.

First, note that for $q = 0$, only points (10) and (11) are feasible and yield the optimal solution of $e_i = 0$. In the following, we analyze the optimal solution for $q \in (0, 1]$.

For $q \leq 0.5$, the maximum is at $e_i^* = W$. Point (8) is not feasible, since $\mu_1 < 0$ for $q \in (0, 0.5]$ and hence the necessary condition for an extreme point is not met. For $q \leq 0.5$ point (9) is feasible, since $\mu_1, \mu_2 \geq 0$ for $q \in (0, 0.5]$ and all the other parameters in their domain. Additionally, $\frac{\partial U_i}{\partial e_i} > 0$, $\forall q \in (0, 0.5]$ and all the other parameters in their domain and $\forall e_i \in [0, W]$, giving a sufficient condition for $e_i = W$ to be a maximizer for $q \leq 0.5$. This can be seen by the following;

$$\frac{\partial U_i}{\partial e_i} = \frac{(1-q)((1+\alpha)e_i + (1+\alpha)e_j + (1+\alpha)W)}{(1-q)e_i + qe_j} -$$
$$\frac{(1-q)^2 e_i((1+\alpha)e_i + (1+\alpha)e_j + (1+\alpha)W)}{((1-q)e_i + qe_j)^2} + \frac{(1-q)e_i(1+\alpha)}{((1-q)e_i + qe_j)} - 1 > 0$$

After some algebra it becomes:

$$qe_j(1-q)[2e_i\alpha + (1+\alpha)e_j + (1+\alpha)W] + (1-q)^2 e_i^2 \alpha - q^2 e_j^2 > 0 \tag{12}$$

Note that the first and second term are always positive and the third term always negative. Further, the third term is always smaller than the first one for $q \in (0, 0.5]$. Therefore, for $q \leq 0.5$, more effort is always better and hence, the maximum effort possible, $e_i = W$, the optimal solution.

Since $e_j^*(q) = e_j^*(1-q)$, the best response from player j is always W independent of player i's action for $q \geq 0.5$. With that knowledge, we now describe the best responses of player i for $q > 0.5$, knowing that player j always exerts effort of W.

With that knowledge, point (11) is never feasible, since for $q < \frac{2}{3}$, the square root is negative, and further the point always yields $e_i < 0$ for $q > 0.5$ and the respective $e_j^* = W$. Similarly, Point (10) is also not feasible for $q < \frac{2}{3}$, however, for $q \geq \frac{2}{3}$, there exist combinations of the parameters that yield a feasible solution.

The first region is for $q \in (0, \overline{q}_{\mu_1}(\alpha))$, where the point (9) is feasible and where the point (8) is just not feasible yet. $\overline{q}_{\mu_1}(\alpha)$ follows from setting $\mu_1 = 0$ from the point (8):

$$\overline{q}_{\mu_1}(\alpha) = \frac{2(\alpha+1)}{2\alpha+3} \in (\frac{2}{3}, \frac{4}{5})_{|\alpha \in (0,1)}$$

In this region both point (9) and (10) are feasible. Since $\frac{\partial U_i}{\partial e_i} > 0$, $\forall q \in (0, \overline{q}_{\mu_1}(\alpha)]$, $\forall e_i \in [0, W]$ and $e_j^* = W_{|q \geq 0.5}$, $e_i^* = W$ is the local maximizer for the whole first region.

The second region is for values of $q \in [\overline{q}_{\mu_1}(\alpha), \overline{q}_{\mu_2}(\alpha)]$, where the points (8),(9) and (10) are feasible. $\overline{q}_{\mu_2}(\alpha)$ is the threshold where the point (9) is just still feasible, so where $\mu_2 = 0$ from the point (5):

$$\overline{q}_{\mu_2}(\alpha) = \frac{1}{3}\frac{(\alpha+1) + \sqrt{4\alpha^2 + 5\alpha + 1}}{(\alpha+1)} \in (\frac{2}{3}, 0.86)_{|\alpha \in (0,1)}$$

At this region, the utility function is convex in e_i. We compare the utility of the feasible points to get the local maximum of the region. Note, that by the convexity of the function in this region, one of

the points is the minimum. By comparing the values, we find that point (10) is the minimum in this region. Further, $U_i(e_i = W, e_j = W, \alpha, q = \overline{q}_{\mu_1}(\alpha), W) > U_i(e_i = 0, e_j = W, \alpha, q = \overline{q}_{\mu_1}(\alpha), W)$ and $U_i(e_i = W, e_j = W, \alpha, q = \overline{q}_{\mu_2}(\alpha), W) < U_i(e_i = 0, e_j = W, \alpha, q = \overline{q}_{\mu_2}(\alpha), W)$, indicating that throughout the region the best response changes from $e_i^* = W$ to $e_i^* = 0$. Because of the convexity of the utility function in this region, we find the bang-bang property, meaning that there exists a threshold $\overline{q}(\alpha)$, where the best response jumps from W to 0. We compute this threshold by equalizing the utilities from the two points: $U_i(e_i = W, e_j = W, \alpha, q, W) = U_i(e_i = 0, e_j = W, \alpha, q, W)$ and receive:

$$\overline{q}(\alpha) = \frac{1}{3}\frac{3\alpha + 2}{\alpha + 1} \in (\frac{2}{3}, \frac{5}{6})_{|\alpha \in (0,1)}$$

We therefore showed that $e_i^* = W$ for $q \in (0, \overline{q}(\alpha)]$ and $e_i^* = 0$ for $q \in [\overline{q}(\alpha), \overline{q}_{\mu_2}(\alpha)]$ are local maximizers.

For the third region, $q \in (\overline{q}_{\mu_2}(\alpha), 1]$, it remains to show that $e_i^* = 0$ is a local maximizer. Note that for this region, the points (9) and (10) are feasible. Since, $\frac{\partial U_i}{\partial e_i} < 0, \forall q > \overline{q}_{\mu_2}(\alpha), \forall e_i \in [0, W]$, $e_j^* = W$ and all parameters in their domain, $e_i^* = 0$ is the optimum. Hence, $e_i^* = 0$ for $q \in [\overline{q}(\alpha), 1]$ is a local maximizer.

Since for $q \leq 0.5$, the best response of player i is always W, independent of the effort level of player j and when $q \geq 0.5$, the best response of player j is always W, independent of the effort level of player i, there exists an equilibrium $\forall a, q, W$. The equilibrium can be described by the following two best responses:

$$e_i^* = \begin{cases} W & \text{if } q \leq \overline{q}(\alpha) \\ 0 & \text{else} \end{cases}$$

$$e_j^* = \begin{cases} 0 & \text{if } q \leq (1 - \overline{q}(\alpha)) \\ W & \text{else} \end{cases}$$

■

A.1.3. Proof of Proposition 3

Proof of Proposition 3 We assume risk-neutral and spiteful players. Hence, the utilities from a successful settlement are the following: $U_i^{settlement} = s_i - \alpha s_j$ and $U_j^{settlement} = s_j - \alpha s_i$ and $d_i = U_i^{litigation}(e_i^*, e_j^*, q, \alpha)$ and $d_j = U_j^{litigation}(e_j^*, e_i^*, q, \alpha)$. We find the Nash bargaining solution by maximizing the function $f(s_i, s_j) = [(U_i^{settlement} - d_i)(U_j^{settlement} - d_j)]$ and solving the following optimization problem:

$$\max_{s_i, s_j} [(U_i^{settlement} - d_i)(U_j^{settlement} - d_j)] \tag{13a}$$

$$\text{s.t. } s_i + s_j = W \tag{13b}$$

$$s_i, s_j \geq 0 \tag{13c}$$

$$s_i, s_j \leq W \tag{13d}$$

In the following, we use the KKT conditions to solve the optimization problem. The following KKT conditions have to be satisfied for a maximum. Note that $f(s_i, s_j)$ is concave, the inequality constraints

convex and the equality constraint affine, such that the KKT conditions are both necessary and sufficient. Let $h(s_i, s_j)$ denote the equality constraint and g_l the inequality constraints.

$$\frac{\partial f(s_i, s_j)}{\partial s_i} - \lambda \frac{\partial h(s_i, s_j)}{\partial s_i} - \sum_{l=1}^{4} \mu_l \frac{\partial (g_l)}{\partial s_i} = 0 \tag{14a}$$

$$\frac{\partial f(s_i, s_j)}{\partial s_j} - \lambda \frac{\partial h(s_i, s_j)}{\partial s_j} - \sum_{l=1}^{4} \mu_l \frac{\partial (g_l)}{\partial s_j} = 0 \tag{14b}$$

$$h(s_i, s_j) = s_i + s_j - W = 0 \tag{14c}$$

$$\mu_l(g_l(s_i, s_j)) = 0, \forall l = 1, ..., 4 \tag{14d}$$

$$g_l(s_i, s_j) \leq 0, \forall l = 1, ..., 4 \tag{14e}$$

$$\mu_l \geq 0, \forall l = 1, ..., 4 \tag{14f}$$

To determine the optimal requests, we first calculate the disagreement values. The equilibrium litigation behavior under the American fee-shifting rule is symmetric and is described by the following: $e_i^* = e_j^* = (1-q)qW(\alpha+1)$. Inserting these in the utility functions yields the expected utility of the respective players and hence the respective disagreement values:
$d_i = U_i^{litigation}(e_i^*, e_j^*, q, \alpha) = (1 + (1-\alpha^2)q^2 - (2-\alpha^2+\alpha)q)W$ and
$d_j = U_j^{litigation}(e_j^*, e_i^*, q, \alpha) = ((1-q)(q\alpha^2 - \alpha) + q^2)W$.

We solve the optimization problem and find the following three points:

$$(s_i^* = W, s_j^* = 0, \lambda = W\alpha^2q^2 - W\alpha^2q + W\alpha q - Wq^2 + 2Wq + \mu_3,$$
$$\mu_1 = 0, \mu_2 = -2W\alpha q + W\alpha - 2Wq - \mu_3, \mu_3 = \mu_3, \mu_4 = 0,)$$

$$(s_i^* = -W\alpha q + \frac{1}{2}W\alpha - qW + W, s_j^* = W\alpha q - \frac{1}{2}W\alpha + qW,$$
$$\lambda = W\alpha^2q^2 - W\alpha^2q - Wq^2 + qW + \frac{1}{2}W\alpha, \mu_1 = 0, \mu_2 = 0, \mu_3 = 0, \mu_4 = 0)$$

$$(s_i^* = 0, s_j^* = W, \lambda = W\alpha^2q^2 - W\alpha^2q + W\alpha q - Wq^2 + 2Wq - W - \mu_4,$$
$$\mu_1 = 2W\alpha q - W\alpha + 2Wq - 2W - \mu_4, \mu_2 = 0, \mu_3 = 0, \mu_4 = \mu_4)$$

The solutions are feasible within a specific region of q. First, we analyze the first point. Note that the solution allows for any value of $\mu_3 \geq 0$. Therefore, we put $\mu_3 = 0$ to get the threshold, where the first point is either just feasible or just not feasible anymore. We need to find the region where μ_2 is non-negative. Since $\frac{\partial \mu_2}{\partial q} = -2W\alpha - 2W \leq 0, \forall \alpha, W$ and $\mu_{2|q=0,\mu_3=0} > 0$, the first point is feasbile until a certain threshold. We find this threshold by finding the root of μ_2. Hence, we put $-2W\alpha q + W\alpha - 2Wq = 0$ and solve it for q which yields: $q = \frac{1}{2}\frac{\alpha}{\alpha+1}$.

The analysis of the third point follows the same pattern. The third point is feasible after the threshold of $q = \frac{1}{2}\frac{\alpha+2}{\alpha+1}$.

Finally, we analyze point 2. Note that for this point all conditions $g_l(s_i, s_j) \leq 0$ are met for $q \in (\frac{1}{2}\frac{\alpha}{\alpha+1}, \frac{1}{2}\frac{\alpha+2}{\alpha+1})$.

Hence, the Nash bargaining solution in the American case can be described by the following function:

$$s_i^* = \begin{cases} W & \text{if } q \leq \frac{1}{2}\frac{\alpha}{\alpha+1} \\ W(a(\frac{1}{2}-q)+(1-q)) & \text{if } \frac{1}{2}\frac{\alpha}{\alpha+1} < q < \frac{1}{2}\frac{\alpha+2}{\alpha+1} \\ 0 & \text{if } q \geq \frac{1}{2}\frac{\alpha+2}{\alpha+1} \end{cases}$$ ■

A.1.4. Proof of Proposition 4

Proof of Proposition 4 We find the Nash bargaining solution by maximizing the function

$$f(s_i, s_j) = [(U_i^{settlement} - d_i)(U_j^{settlement} - d_j)]$$

and solving the optimization problem described in Appendix A.1.3. The equilibrium litigation behavior is described by three zones:

1) $q < (1 - \overline{q}(\alpha))$ with $\overline{q}(\alpha) = \frac{1}{3}\frac{3\alpha+2}{\alpha+1} \in (\frac{2}{3}, \frac{5}{6})_{|\alpha\in(0,1)}$ from the litigation solution: In this region, $e_i^* = W$ and $e_j^* = 0$, which yield the following utilities: $d_i = U_i^{litigation} = (1+\alpha)W$ and $d_j = U_j^{litigation} = -(1+\alpha)W$. Solving the optimization problem yields the following KKT point:

$$(s_i^* = W, s_j^* = 0, \lambda = W\alpha^2 + W - \mu_2, \mu_1 = 0, \mu_2 = \mu_2, \mu_3 = W\alpha^2 + 2W\alpha + W - \mu_2, \mu_4 = 0)$$

This point is always feasible, because we can find a positive μ_2 for which μ_3 also becomes positive. Thus, in this region ($s_i^* = W$, $s_j^* = 0$).

2) $(1 - \overline{q}(\alpha)) < q < \overline{q}(\alpha)$: In this region: $e_i^* = e_j^* = W$ and the following utilities: $d_i = U_i^{litigation} = 3(1-q)(1+\alpha)W - 2W - \alpha W$ and $d_j = U_j^{litigation} = 3q(1+\alpha)W - 2W - \alpha W$. Solving the optimization problem (9) yields the three following points:

$$(s_i^* = W, s_j^* = 0, \lambda = 3W\alpha^2 q + 6W\alpha q - 4W\alpha + 3Wq + \mu_3,$$
$$\mu_1 = 0, \mu_2 = -6W\alpha^2 q + 2Wa^2 - 12W\alpha q + 4W\alpha - 6Wq + 2W - \mu_3, \mu_3 = \mu_3, \mu_4 = 0)$$

$$(s_i^* = (2-3q)W, s_j^* = (3q-1)W, \lambda = W\alpha^2 - 2W\alpha + W, \mu_1 = 0, \mu_2 = 0, \mu_3 = 0, \mu_4 = 0)$$

$$(s_i^* = 0, s_j^* = W, \lambda = 3W\alpha^2 q - W\alpha^2 + 6W\alpha q - 6W\alpha + 3Wq - W - \mu_4,$$
$$\mu_1 = 6W\alpha^2 q - 4W\alpha^2 + 12W\alpha q - 8W\alpha + 6Wq - 4W - \mu_4, \mu_2 = 0, \mu_3 = 0, \mu_4 = \mu_4)$$

We check the KKT conditions for the three points. We start with the first point. Note that the solution allows for any value of $\mu_3 \geq 0$. Therefore, we put $\mu_3 = 0$ to get the threshold where the first point is either just feasible or just not feasible anymore. Since $\frac{\partial \mu_2}{\partial q} < 0, \forall \alpha, W$ and $\mu_{2|q=0,\mu_3=0} > 0$, we find the root of μ_2, which is the threshold $q = \frac{1}{3}$ until which the first point is feasible.

Now, we analyze point 2. All conditions and the condition $g_l(s_i, s_j) \leq 0$ are met for $q \in [\frac{1}{3}, \frac{2}{3}]$. Finally, we consider the third point. First, we set $\mu_4 = 0$. Since $\frac{\partial \mu_1}{\partial q} > 0, \forall a, W$ and $\mu_{1|q=1,\mu_4=0=0} > 0$,

we find the root of μ_1, which is the threshold $q = \frac{2}{3}$ from which on the third point is feasible.

3) $q > \overline{q}(\alpha)$: In this region $e_i^* = 0$ and $e_j^* = W$, which yields disagreement values of $d_i = U_i^{litigation} = -(1+\alpha)W$ and $d_j = U_j^{litigation} = (1+\alpha)W$. Note that by symmetry of the Nash Bargaining solution, solving the optimization problem and checking the KKT conditions yield the same but mirrored solution as in region 1): $(s_i^* = 0, s_j^* = W)$

Hence, we get the following solution:

$$s_i^* = \begin{cases} W & \text{if } q \leq \frac{1}{3} \\ (2-3q)W & \text{if } \frac{1}{3} < q < \frac{2}{3} \\ 0 & \text{if } q \geq \frac{2}{3} \end{cases}$$

■

A.1.5. Formal Proofs Hypotheses American vs. English fee-shifting

Hypothesis 1.1: The average litigation expenditures of all merit levels q are higher under the English fee-shifting rule than under the American fee-shifting rule.

Proof In order to compare the average litigation expenditures, it suffices to compare the aggregate expenditures. First, we calculate the aggregate litigation expenditures under the American rule:
$\int_0^1 e_j^{Am} dq = \int_0^1 q(1-q)(W(\alpha)+1)dq = \frac{1}{6}W(\alpha+1)$
The aggregate litigation expenditures under the English rule are as follows:
$\int_0^1 e_j^{Eng} dq = \int_0^{1-\overline{q}(\alpha)} 0 dq + \int_{1-\overline{q}(\alpha)}^1 W dq = \frac{1}{3}\frac{3\alpha+2}{\alpha+1}W$
Now, suppose the English expenditures are higher:

$$\begin{aligned} &\frac{1}{3}\frac{3\alpha+2}{\alpha+1}W > \frac{1}{6}W(\alpha+1) \\ \iff &3\alpha+2 > \frac{1}{2}(\alpha+1)^2 \\ \iff &4\alpha+3 > \alpha^2 \end{aligned}$$

which always holds true for $\alpha \in (0,1)$. ■

Hypothesis 1.2: There is no difference in the average settlement requests between the American and the English fee-shifting rule.

Proof In order to compare the average settlement requests, it suffices to compare the aggregate requests.

The aggregate settlement requests under the American rule are given by:

$$\int_0^1 s_j^{Am} dq = \int_0^{\frac{1}{2}\frac{\alpha}{\alpha+1}} 0 dq + \int_{\frac{1}{2}\frac{\alpha}{\alpha+1}}^{\frac{1}{2}\frac{\alpha+2}{\alpha+1}} W(a(q-\frac{1}{2})+q)dq + \int_{\frac{1}{2}\frac{\alpha+2}{\alpha+1}}^1 W dq$$

$$= [\frac{1}{2}Wq^2(\alpha+1) - \frac{1}{2}W\alpha q]\Big|_{\frac{1}{2}\frac{\alpha}{\alpha+1}}^{\frac{1}{2}\frac{\alpha+2}{\alpha+1}} + [Wq]\Big|_{\frac{1}{2}\frac{\alpha+2}{\alpha+1}}^1$$

$$= [\frac{1}{2}W(\frac{1}{2}\frac{\alpha+2}{\alpha+1})^2(\alpha+1) - \frac{1}{2}W\alpha\frac{1}{2}\frac{\alpha+2}{\alpha+1}] - [\frac{1}{2}W(\frac{1}{2}\frac{\alpha}{\alpha+1})^2(\alpha+1) - \frac{1}{2}W\alpha\frac{1}{2}\frac{\alpha}{\alpha+1}]$$

$$+W - \frac{1}{2}\frac{\alpha+2}{\alpha+1}W$$

$$= \frac{1}{8}W\frac{\alpha^2+4\alpha+4}{\alpha+1} - \frac{1}{4}W\frac{\alpha^2+2\alpha}{\alpha+1} - \frac{1}{8}W\frac{\alpha^2}{\alpha+1} + \frac{1}{4}W\frac{\alpha^2}{\alpha+1} + W - \frac{1}{2}W\frac{\alpha+2}{\alpha+1}$$

$$= \frac{1}{8}W\frac{4\alpha+4}{\alpha+1} - \frac{1}{4}W\frac{2\alpha}{\alpha+1} + W - \frac{1}{2}\frac{\alpha+2}{\alpha+1}$$

$$= \frac{1}{4}W\frac{2}{\alpha+1} + W - \frac{1}{4}W\frac{2\alpha+4}{\alpha+1}$$

$$= W - \frac{1}{4}W\frac{2\alpha+2}{\alpha+1}$$

$$= \frac{1}{2}W$$

The aggregate settlement requests under the English rule are given by:

$$\int_0^1 s_j^{Eng} dq = \int_0^{\frac{1}{3}} 0 dq + \int_{\frac{1}{3}}^{\frac{2}{3}} (3q-1)W dq + \int_{\frac{2}{3}}^1 W dq$$

$$= [\frac{3}{2}q^2W - qW]\Big|_{\frac{1}{3}}^{\frac{2}{3}} + [Wq]\Big|_{\frac{2}{3}}^1$$

$$= \frac{2}{3}W - \frac{2}{3}W - \frac{1}{6}W + \frac{1}{3}W + W - \frac{2}{3}W$$

$$= \frac{1}{2}W$$

■

A.1.6. Formal Proofs Hypotheses Spite in Litigation and Settlement

Hypothesis 2.2: Under the English fee-shifting rule, average litigation expenditures of all merit levels q are higher for more spiteful agents.

Proof In order to compare average litigation expenditures, it suffices to compare aggregate litigation expenditures. Since $\frac{\partial(1-\overline{q}(\alpha))}{\partial a} = -\frac{1}{(3\alpha+3)^2} < 0$, the threshold $(1-\overline{q}(\alpha))$ to switch from spending 0 to W decreases for more spiteful litigants. Aggregated over all merit levels, litigation expenditures are the following:

$$\int_0^1 e_j^{*Eng} dq = \int_0^{1-\overline{q}(\alpha)} 0 dq + \int_{1-\overline{q}(\alpha)}^1 W dq$$

$$= W - \frac{1}{3(\alpha+1)W}$$

Further, the aggregated expenditures increase in the spite level since

$$\frac{\partial(W - \frac{1}{3(\alpha+1)W})}{\partial\alpha} = \frac{3}{(3\alpha+3)^2}W > 0$$

.

■

Hypothesis 2.3 and 2.4: Under the American fee-shifting rule, the average settlement requests of low merits ($q < 0.5$) are lower for more spiteful agents. The average settlement requests of high merits ($q > 0.5$) are higher for more spiteful agents.

Proof First, note that $s_j^{*Am} = \begin{cases} 0 & \text{if } q \leq \frac{1}{2}\frac{\alpha}{\alpha+1} \\ W(\alpha(q-\frac{1}{2})+q) & \text{if } \frac{1}{2}\frac{\alpha}{\alpha+1} < q < \frac{1}{2}\frac{\alpha+2}{\alpha+1} \\ W & \text{if } q \geq \frac{1}{2}\frac{\alpha+2}{\alpha+1} \end{cases}$
First of all, for $q < \frac{1}{2}$, $s_j^* \in \{0, W(\alpha(q-\frac{1}{2})+q)\}$ and for $q > \frac{1}{2}$, $s_j^* \in \{W(\alpha(q-\frac{1}{2})+q), W\}$

Since $\frac{\partial \frac{1}{2}\frac{\alpha}{\alpha+1}}{\partial\alpha} = \frac{1}{2}\frac{1}{(\alpha+1)^2} > 0$, the threshold to switch from requesting 0 to $W(\alpha(q-\frac{1}{2})+q)$ increases for more spiteful agents for $q < 0.5$. Additionally, requests are lower after this threshold since $\frac{\partial W(\alpha(q-\frac{1}{2})+q)}{\partial\alpha} = W(q-\frac{1}{2}) < 0$ for $q < 0.5$. Hence, more spiteful agents, on average over low merits $q < 0.5$, request less for $q < 0.5$.

Since $\frac{\partial \frac{1}{2}\frac{\alpha+2}{\alpha+1}}{\partial\alpha} = -\frac{1}{2}\frac{1}{(\alpha+1)^2} < 0$, the threshold to switch from requesting $W(\alpha(q-\frac{1}{2})+q)$ to W decreases for more spiteful agents. Additionally, request are higher before that threshold since $\frac{\partial W(\alpha(q-\frac{1}{2})+q)}{\partial\alpha} = W(q-\frac{1}{2}) > 0$ for $q > 0.5$. Hence, for $q > 0.5$, more spiteful agents, on average over high merits $q > 0.5$, request more. ■

B. Additional analyses

B.1. Main regressions

B.1.1. American vs. English fee-shifting rule

To formally study the differences between the English and American rule, we use the following mixed-effects model with controls C_1 and C_2:[33]

$$\begin{aligned} D_{i,q} &= \beta_0 + \beta_1 q + \nu_i + \epsilon_{i,q} + C_M \\ C_1 &= 0 \\ C_2 &= \beta_3 \mathbb{1}_{Fee=Eng} + \beta_4 \mathbb{1}_{Fee=Eng} \times q \end{aligned} \tag{15}$$

where ν_i is a random effect for subject i, and $\epsilon_{i,q}$ is the residual. D is the dependent variable, which is either the litigation expenditure e or the settlement request s. $\mathbb{1}_{Fee=Eng}$ denotes a dummy with value one if the fee-shifting rule is English and zero otherwise. Table 4 shows the estimation results. Models (1) and (3) estimate the litigation expenditures under the American and English fee-shifting rules, respectively. Models (2) and (4) estimate the settlement requests under the American and English fee-shifting rule, respectively. Models (5) and (6) estimate Equation 15 with Control C_2, i.e., the effect of fee-shifting on litigation expenditures and settlement requests, respectively.

It can be seen that both litigation expenditures and settlement requests are increasing significantly in merit q, giving support for the theory-derived functional form of the settlement request. For litigation expenditures, the observed behavior only follows tentatively the theoretical functional form. It can also be seen that under the English fee-shifting regime, both settlement requests and litigation expenditures are increasing significantly more compared to the American fee-shifting rule.

[33] We use a simple linear model assuming linearity in q. A look at Figure 3 confirms the assumption of linearity to be plausible.

Table 4: Mixed-effects regression of the litigation expenditures and settlement requests by fee-shifting rule as a function of q.

	American		English		Comparison	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.74^{***}	4.07^{***}	4.11^{***}	3.99^{***}	3.74^{***}	4.07^{***}
	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)	(0.06)
Q	2.26^{***}	1.97^{***}	3.07^{***}	2.23^{***}	2.26^{***}	1.97^{***}
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
Eng					0.37^{***}	-0.09^{*}
					(0.06)	(0.05)
Q x Eng					0.81^{***}	0.25^{***}
					(0.10)	(0.08)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Log Likelihood	−18,909.75	−17,378.36	−19,707.34	−17,700.21	−39,030.08	−34,235.02
Akaike Inf. Crit.	37,827.50	34,764.72	39,422.68	35,408.43	78,072.17	68,482.04
Bayesian Inf. Crit.	37,855.54	34,792.75	39,450.72	35,436.46	78,118.38	68,528.26
Note:					$^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;	

Models (1), (3), and (5) estimate the litigation expenditures following Equation 15. Models (2), (4), and (6) estimate the settlement requests following Equation 15. Models (1), (2), (3) and (4) estimate Equation 15 with C_1. Models (5) and (6) estimate Equation 15 with C_2. Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *Eng* denotes a dummy with value one for the English rule and zero for the American rule.

B.1.2. Spiteful preferences

Table 5 reports on the OLS regression for the aggregate legal expenditures and settlement requests by measure of social preference.

Table 5: Mixed-effects regression of the litigation expenditures and settlement requests by measure of social-preferences.

	Litigation/Settlment					
	American		English		Both	
Panel A: Above/below median spiteful subjects (via Spite-Task)						
Constant	4.24***	4.62***	5.50***	4.70***	5.50***	4.70***
	(0.08)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
MedianSpite	1.31***	0.93***	0.31***	0.85***	0.31***	0.85***
	(0.12)	(0.10)	(0.12)	(0.10)	(0.11)	(0.10)
American					−1.26***	−0.08*
					(0.06)	(0.04)
American:MedianSpite					1.00***	0.08
					(0.08)	(0.06)
Panel B: Above/below median spiteful subjects (via Spite-Questionnaire)						
Constant	4.40***	4.58***	5.39***	4.64***	5.39***	4.64***
	(0.08)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
MedianSpiteQ	0.95***	0.98***	0.53***	0.94***	0.53***	0.94***
	(0.12)	(0.10)	(0.12)	(0.10)	(0.11)	(0.10)
American					−0.99***	−0.06
					(0.06)	(0.04)
American:MedianSpiteQ					0.43***	0.04
					(0.08)	(0.06)
Panel C: Above/below median prosocial subjects (via SVO-Measure)						
Constant	4.83***	5.15***	5.73***	5.17***	5.73***	5.17***
	(0.09)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
MedianSVO	0.07	−0.18*	−0.16	−0.14	−0.16	−0.14
	(0.12)	(0.10)	(0.12)	(0.10)	(0.11)	(0.10)
American					−0.90***	−0.02
					(0.06)	(0.04)
American:MedianSVO					0.24***	−0.04
					(0.08)	(0.06)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Note:						+p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. *American* denotes a dummy with value one for the American rule and zero for the English rule. *MedianSpite*/*MedianSpiteQ*/*MedianSVO* denotes a dummy with value one if the subject displays above-median preferences in the respective measure of social preferences.

Table 6 reports on the OLS regression for the aggregate legal expenditures and settlement requests by a continuous measure of social preference.

Table 6: Mixed-effects regression of the litigation expenditures and settlement requests by a continuous measure of social-preferences.

	Litigation/Settlment					
	American		English		Both	
Panel A: Spiteful subjects (via Spite-Task)						
Constant	4.87***	5.06***	5.64***	5.10***	5.64***	5.10***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
ContinuousSpite	0.88***	0.69***	0.42***	0.66***	0.42***	0.66***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
American					−0.78***	−0.04
					(0.04)	(0.03)
American:ContinuousSpite					0.46***	0.03
					(0.04)	(0.03)
Panel B: Spiteful subjects (via Spite-Questionnaire)						
Constant	4.87***	5.06***	5.64***	5.10***	5.64***	5.10***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
ContinuousSpiteQ	0.87***	0.85***	0.54***	0.82***	0.54***	0.82***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
American					−0.78***	−0.04
					(0.04)	(0.03)
American:ContinuousSpiteQ					0.33***	0.03
					(0.04)	(0.03)
Panel C: Prosocial subjects (via SVO-Measure)						
Constant	4.87***	5.06***	5.64***	5.10***	5.64***	5.10***
	(0.06)	(0.05)	(0.06)	(0.05)	(0.06)	(0.05)
ContinuousSVOMeasure	−0.005	−0.12**	−0.06	−0.10**	−0.06	−0.10**
	(0.06)	(0.05)	(0.06)	(0.05)	(0.06)	(0.05)
American					−0.78***	−0.04
					(0.04)	(0.03)
American:ContinuousSVOMeasure					0.06	−0.02
					(0.04)	(0.03)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Note:						+p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. *American* denotes a dummy with value one for the American rule and zero for the English rule. *ContinuousSpite*/*ContinuousSpiteQ*/*ContinuousSVOMeasure* denotes the z-scored preferences in the respective measure of social preferences.

B.1.3. The effect of spite as a function of merit

To study the effect of spite as a function of merit more formally we use the following mixed-effects model with controls C_1, C_2, and C_3:

$$
\begin{aligned}
D_{i,q} =& \beta_0 + \beta_1 \mathbb{1}_{\text{spite>median}} + \nu_i + \epsilon_{i,q} + C_M \\
C_1 =& 0 \\
C_2 =& \beta_3 q + \beta_4 \mathbb{1}_{\text{spite>median}} \times q \\
C_3 =& C_2 + \beta_5 \mathbb{1}_{\text{Fee=Am}} + \beta_6 \mathbb{1}_{\text{Fee=Am}} \times q + \beta_7 \mathbb{1}_{\text{Fee=Am}} \times \mathbb{1}_{\text{spite>median}} \\
& + \beta_8 \mathbb{1}_{\text{Fee=Am}} \times q \times \mathbb{1}_{\text{spite>median}}
\end{aligned}
\tag{16}
$$

where ν_i is a random effect for subject i, and $\epsilon_{i,q}$ is the residual. D is the dependent variable, which is either the litigation expenditure e or the settlement request s. $\mathbb{1}_{Fee=Am}$ denotes a dummy with value one if the fee-shifting rule is American and zero otherwise. $\mathbb{1}_{spite>median}$ denotes a dummy with value one if the subject is more spiteful, i.e., if the subject scored higher than the median in the spite measurement. Table 5 shows the estimation for litigation expenditures and settlement requests of Equation 16 with control C_1, i.e, the effect of more spiteful vs. less spiteful subjects. Table 7 shows the estimation of Equation 16 with control C_2 and C_3, i.e the effect of more spiteful vs. less spiteful subjects as function of merit q. Furthermore, Table 8 replicates the result by using continuous measures of social preferences.

Table 7: Mixed-effects regression of the litigation expenditures and settlement requests by measure of social-preferences as a function of q.

	Litigation/Settlment					
	American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Above/below median spiteful subjects (via Spite-Task)						
Constant	2.90***	3.33***	3.56***	3.22***	3.56***	3.22***
	(0.09)	(0.08)	(0.10)	(0.08)	(0.09)	(0.08)
NumQ	2.69***	2.57***	3.87***	2.95***	3.87***	2.95***
	(0.09)	(0.07)	(0.10)	(0.07)	(0.10)	(0.07)
MedianSpite	1.75***	1.55***	1.14***	1.60***	1.14***	1.60***
	(0.13)	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)
NumQ:MedianSpite	−0.90***	−1.24***	−1.68***	−1.50***	−1.68***	−1.50***
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)
American					−0.67***	0.11*
					(0.09)	(0.06)
NumQ:American					−1.18***	−0.38***
					(0.14)	(0.10)
American:MedianSpite					0.61***	−0.05
					(0.13)	(0.09)
NumQ:American:MedianSpite					0.78***	0.26*
					(0.21)	(0.15)
Panel B: Above/below median spiteful subjects (via Spite-Questionnaire)						
Constant	3.03***	3.38***	3.53***	3.32***	3.53***	3.32***
	(0.09)	(0.08)	(0.10)	(0.08)	(0.09)	(0.08)
NumQ	2.75***	2.41***	3.71***	2.66***	3.71***	2.66***
	(0.09)	(0.07)	(0.10)	(0.08)	(0.10)	(0.08)
MedianSpiteQ	1.46***	1.43***	1.18***	1.38***	1.18***	1.38***
	(0.14)	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)
NumQ:MedianSpiteQ	−1.01***	−0.89***	−1.31***	−0.88***	−1.31***	−0.88***
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)
American					−0.51***	0.06
					(0.09)	(0.07)
NumQ:American					−0.96***	−0.25**
					(0.15)	(0.11)
American:MedianSpiteQ					0.27**	0.04
					(0.13)	(0.09)
NumQ:American:MedianSpiteQ					0.31	−0.01
					(0.21)	(0.15)
Panel C: Above/below median prosocial subjects (via SVO-Measure)						
Constant	3.78***	4.12***	4.28***	4.03***	4.28***	4.03***
	(0.10)	(0.08)	(0.10)	(0.08)	(0.09)	(0.08)
NumQ	2.10***	2.07***	2.89***	2.28***	2.89***	2.28***
	(0.09)	(0.07)	(0.10)	(0.08)	(0.10)	(0.08)
MedianSVO	−0.09	−0.09	−0.34**	−0.09	−0.34**	−0.09
	(0.14)	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)
NumQ:MedianSVO	0.32**	−0.19*	0.35**	−0.10	0.35**	−0.10
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)
American					−0.50***	0.08
					(0.09)	(0.07)
NumQ:American					−0.79***	−0.21*
					(0.15)	(0.11)
American:MedianSVO					0.25**	0.004
					(0.13)	(0.09)
NumQ:American:MedianSVO					−0.03	−0.09
					(0.21)	(0.15)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Note:						+p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *American* denotes a dummy with value one for the English rule and zero for the American rule. *MedianSpite*/*MedianSpiteQ*/*MedianSVO* denotes a dummy with value one if the subject displays above-median preferences in the respective measure of social preferences.

Table 8: Mixed-effects regression of the litigation expenditures and settlement requests by a continuous measure of social-preferences as a function of q.

	Litigation/Settlment					
	American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Above/below median spiteful subjects (via Spite-Task)						
Constant	3.74***	4.07***	4.11***	3.99***	4.11***	3.99***
	(0.07)	(0.05)	(0.07)	(0.05)	(0.06)	(0.05)
NumQ	2.26***	1.97***	3.07***	2.23***	3.07***	2.23***
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
ContinuousSpite	1.18***	1.05***	0.95***	1.06***	0.95***	1.06***
	(0.07)	(0.05)	(0.07)	(0.05)	(0.06)	(0.05)
NumQ:ContinuousSpite	−0.60***	−0.72***	−1.06***	−0.81***	−1.06***	−0.81***
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
American					−0.37***	0.09*
					(0.06)	(0.05)
NumQ:American					−0.81***	−0.25***
					(0.10)	(0.08)
American:ContinuousSpite					0.23***	−0.01
					(0.06)	(0.05)
NumQ:American:ContinuousSpite					0.46***	0.09
					(0.10)	(0.08)
Panel B: Above/below median spiteful subjects (via Spite-Questionnaire)						
Constant	3.74***	4.07***	4.11***	3.99***	4.11***	3.99***
	(0.07)	(0.05)	(0.07)	(0.05)	(0.06)	(0.05)
NumQ	2.26***	1.97***	3.07***	2.23***	3.07***	2.23***
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
ContinuousSpiteQ	1.24***	1.16***	1.04***	1.15***	1.04***	1.15***
	(0.07)	(0.05)	(0.07)	(0.05)	(0.06)	(0.05)
NumQ:ContinuousSpiteQ	−0.74***	−0.63***	−1.00***	−0.65***	−1.00***	−0.65***
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
American					−0.37***	0.09*
					(0.06)	(0.05)
NumQ:American					−0.81***	−0.25***
					(0.10)	(0.08)
American:ContinuousSpiteQ					0.20***	0.01
					(0.06)	(0.05)
NumQ:American:ContinuousSpiteQ					0.26**	0.02
					(0.10)	(0.08)
Panel C: Above/below median prosocial subjects (via SVO-Measure)						
Constant	3.74***	4.07***	4.11***	3.99***	4.11***	3.99***
	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)	(0.06)
NumQ	2.26***	1.97***	3.07***	2.23***	3.07***	2.23***
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
ContinuousSVOMeasure	−0.10	−0.11*	−0.18**	−0.12**	−0.18***	−0.12**
	(0.07)	(0.06)	(0.07)	(0.06)	(0.07)	(0.06)
NumQ:ContinuousSVOMeasure	0.19***	−0.02	0.23***	0.04	0.23***	0.04
	(0.06)	(0.05)	(0.07)	(0.05)	(0.07)	(0.05)
American					−0.37***	0.09*
					(0.06)	(0.05)
NumQ:American					−0.81***	−0.25***
					(0.10)	(0.08)
American:ContinuousSVOMeasure					0.08	0.02
					(0.06)	(0.05)
NumQ:American:ContinuousSVOMeasure					−0.04	−0.07
					(0.10)	(0.08)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Note:						+p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *American* denotes a dummy with value one for the English rule and zero for the American rule. *ContinuousSpite*/*ContinuousSpiteQ*/*ContinuousSVOMeasure* denotes the z-scored preferences in the respective measure of social preferences.

The econometric estimations roughly confirm our visual inspections. Litigation expenditures and settlement requests increase with merit.

More spiteful subjects (measures by both measures of spite) start off with a substantially higher settlement request and substantially higher litigation expenditures. However, with increasing merit, the difference between more and less spiteful subjects in litigation expenditures and settlement requests decreases (as β_4 is significantly negative). Yet, the difference remains always positive under the American fee-shifting rule. Thus, we find further support for Hypothesis 2.1, stating that under the American fee-shifting rule, litigation expenditures

are higher for more spiteful agents at every level of merit. Further, we see that more spiteful subjects request more than less spiteful subjects for all merit levels (under both fee-shifting rules). Thus, we find no support for Hypothesis 2.3 – stating that under the American fee-shifting rule, more spiteful subjects request less than less spiteful subjects for low-merit cases – no support for Hypothesis 2.5 – claiming no difference in settlement requests under the English fee-shifting rule between more and less spiteful subjects – and some support for Hypothesis 2.4 – stating that under the American fee-shifting rule, more spiteful subjects request more than less spiteful subjects for high-merit cases.

We further find that the difference between more and less spiteful subjects is more pronounced under the American fee-shifting rule compared to the English fee-shifting rule (as β_7 is significantly positive and β_8 is also positive). We find only little evidence for such a difference in the fee-shifting rules for the settlement request between more and less spiteful subjects.

The following figures illustrate the effect of spite as a function of merit and fee-shifting rule for the Spite-Questionnaire and the SVO-Measure.

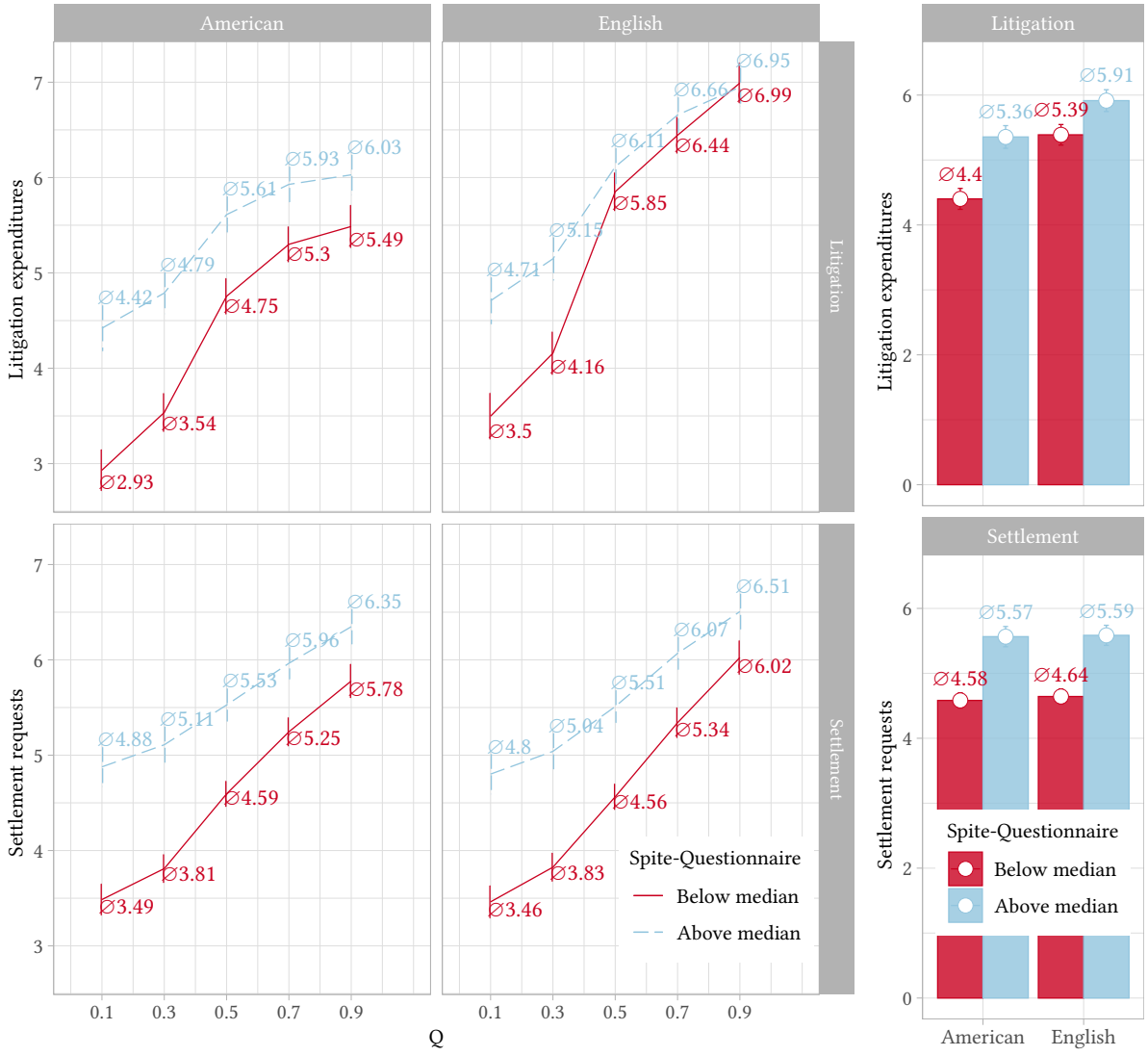


Figure 6: Litigation effort and settlement request under the American and English fee-shifting rule as a function of q for more/less spiteful subjects.

The figures to the left depict the litigation expenditures and settlement request by fee-shifting rule for more and less spiteful subjects as a function of q, while the figures to the right depict the aggregates. The panels on the top depict the litigation effort, while the panels on the bottom illustrate the settlement requests. Red solid lines depict the behavior of less spiteful subjects (i.e., subjects with below-median spite scores on the Spite-Questionnaire), while blue dashed lines indicate the response of more spiteful subjects. The error bars indicate the 95% confidence intervals.

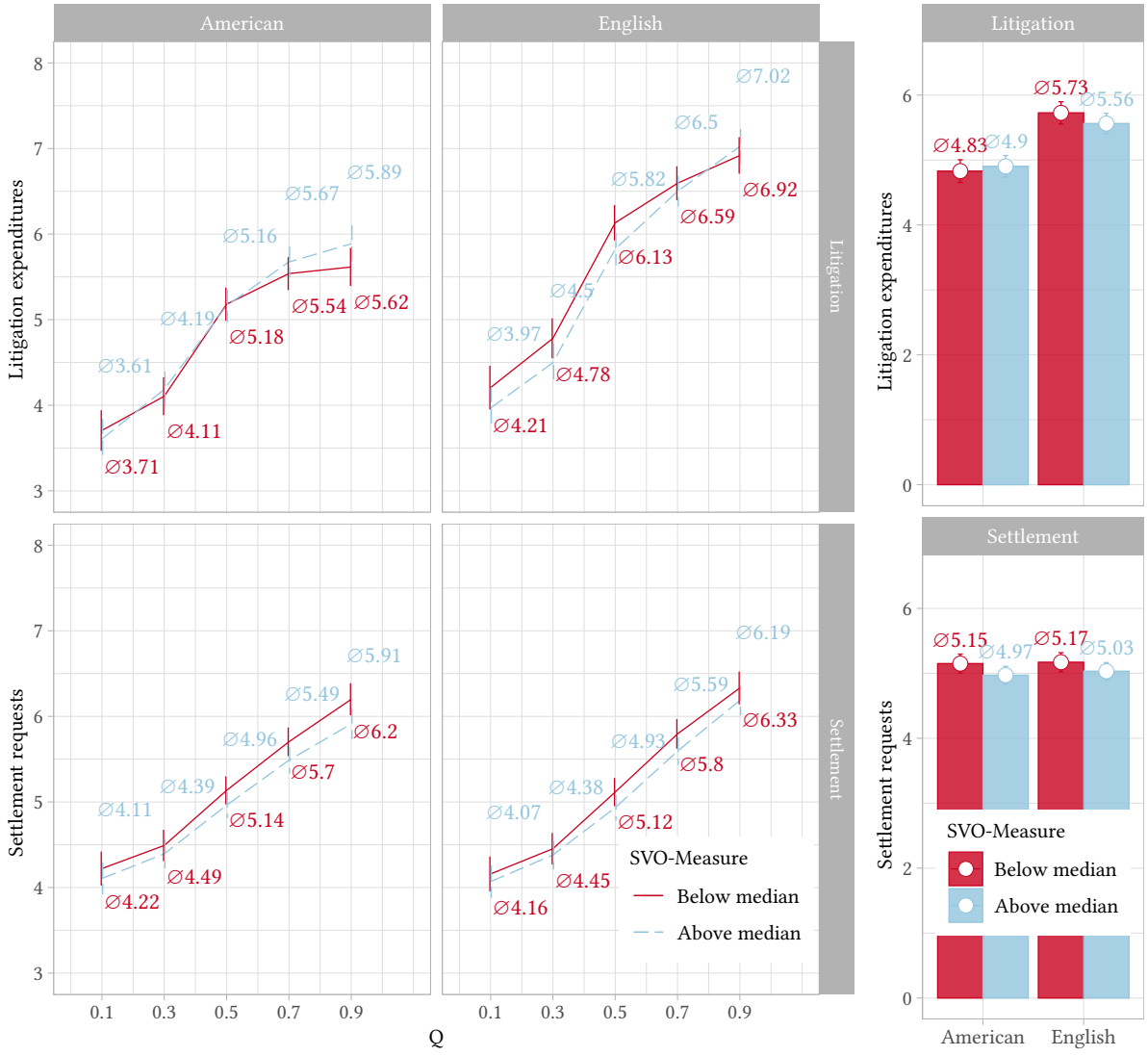


Figure 7: Litigation effort and settlement request under the American and English fee-shifting rule as a function of q for more/less prosocial subjects.

The figures to the left depict the litigation expenditures and settlement request by fee-shifting rule for more and less prosocial subjects as a function of q, while the figures to the right depict the aggregates. The panels on the top depict the litigation effort, while the panels on the bottom illustrate the settlement requests. Red solid lines depict the behavior of less prosocial subjects (i.e., subjects with below-median SVO-scores on the SVO-Measure), while blue dashed lines indicate the behavior of more prosocial subjects. The error bars indicate the 95% confidence intervals.

B.2. Further regressions

B.2.1. Order effects

In this subsection, we show that there is no order effect of the fee-shifting rule. In particular, Figure 8 shows the litigation expenditures and settlement requests as a function of the merit under the American and the English fee-shifting rule both if the American fee-shifting rule is played first and if the English fee-shifting rule is played first. Table 9 provides the corresponding regression. No order-effect can be found.

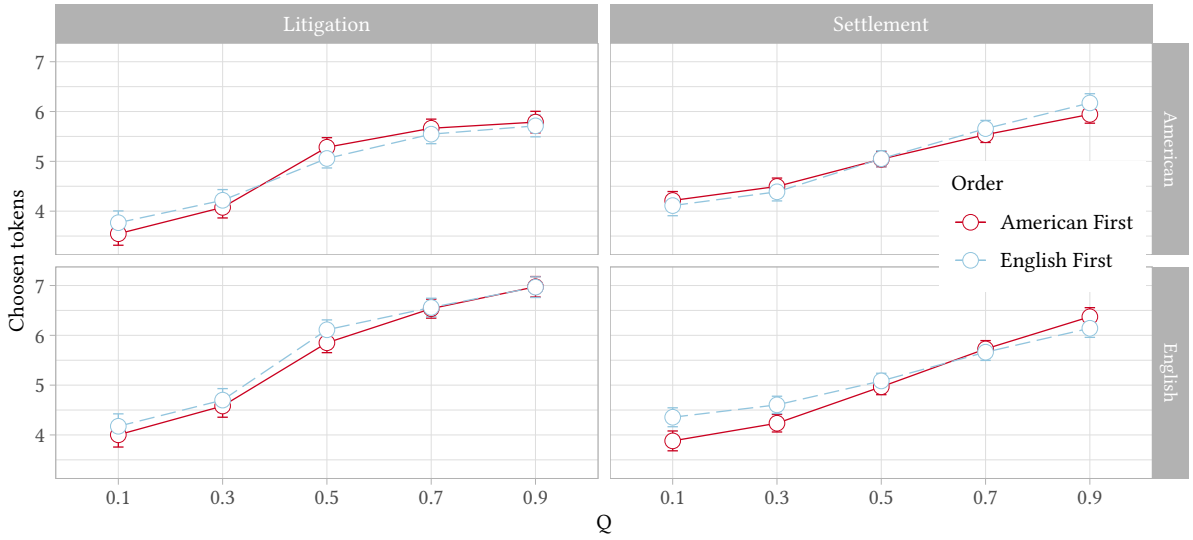


Figure 8: Order effects on litigation expenditures and settlement requests under both fee-shifting rules.

The panels on the left depict the litigation effort, while the panels on the right illustrate the settlement requests. The panels on top show the behavior under the American rule, while the panels on the bottom show the behavior under the English rule. Red solid lines depict the behavior if the American rule was played first, while blue dashed lines indicate the response if the English rule was played first in each panel.

Table 9: Mixed-effects regression of order effects on litigation expenditures and settlement requests under both fee-shifting rules.

	English rule first			
	American		English	
	(1)	(2)	(3)	(4)
Constant	4.87***	5.05***	5.59***	5.04***
	(0.09)	(0.07)	(0.08)	(0.07)
EnglishFirst	−0.01	0.03	0.11	0.13
	(0.12)	(0.10)	(0.12)	(0.10)
Litigation	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175
Log Likelihood	−19,509.13	−18,036.70	−20,527.36	−18,444.68
Akaike Inf. Crit.	39,026.26	36,081.41	41,062.72	36,897.36
Bayesian Inf. Crit.	39,054.30	36,109.44	41,090.76	36,925.39
Note:		$^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;		

Models (1) and (3) estimate the litigation expenditures. Models (2) and (4) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Standard errors are shown in parenthesis. *EnglishFirst* denotes a dummy with value one if the English rule was played first and zero if the American rule was played first.

B.2.2. Additional Controls

In this section, we employ a robustness check by running models that include controls (age, gender, and educational attainment) and risk preferences (see section B.2.4 for a discussion

of the measure). Table 10 shows the results of these regressions. We observe that all main findings remain robust to these alternative model specifications.

Table 10: Main mixed-effects regression with controls

	Litigation/Settlment											
	American		English		Both		American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A: Above/below median spiteful subjects (via Spite-Task)												
Constant	2.72***	3.59***	4.09***	3.60***	3.74***	3.54***	1.67***	2.48***	3.21***	2.66***	2.79***	2.54***
	(0.23)	(0.19)	(0.23)	(0.19)	(0.20)	(0.18)	(0.34)	(0.30)	(0.35)	(0.29)	(0.31)	(0.28)
NumQ	2.69***	2.57***	3.87***	2.95***	3.87***	2.95***	2.85***	2.61***	3.97***	2.87***	3.97***	2.87***
	(0.09)	(0.07)	(0.10)	(0.07)	(0.10)	(0.07)	(0.12)	(0.10)	(0.14)	(0.11)	(0.14)	(0.11)
MedianSpite	1.76***	1.55***	1.14***	1.59***	1.14***	1.59***	2.33***	2.02***	1.75***	1.94***	1.75***	1.94***
	(0.13)	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)	(0.18)	(0.16)	(0.19)	(0.16)	(0.18)	(0.16)
American					−0.67***	0.11*					−0.70***	0.06
					(0.09)	(0.06)					(0.12)	(0.09)
NumQ:American					−1.18***	−0.38***					−1.12***	−0.27*
					(0.14)	(0.10)					(0.20)	(0.15)
bretrisk							0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
							(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
NumQ:MedianSpite	−0.90***	−1.24***	−1.68***	−1.50***	−1.68***	−1.50***	−1.59***	−1.68***	−2.42***	−1.77***	−2.42***	−1.77***
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)	(0.16)	(0.14)	(0.19)	(0.15)	(0.19)	(0.15)
American:MedianSpite					0.61***	−0.05					0.58***	0.08
					(0.13)	(0.09)					(0.17)	(0.13)
NumQ:American:MedianSpite					0.78***	0.26*					0.83***	0.09
					(0.21)	(0.15)					(0.28)	(0.21)
Panel B: Above/below median spiteful subjects (via Spite-Questionnaire)												
Constant	2.57***	3.39***	4.01***	3.47***	3.55***	3.39***	1.51***	2.32***	2.99***	2.42***	2.54***	2.30***
	(0.25)	(0.20)	(0.24)	(0.20)	(0.22)	(0.19)	(0.35)	(0.30)	(0.36)	(0.30)	(0.32)	(0.29)
NumQ	2.75***	2.41***	3.71***	2.66***	3.71***	2.66***	2.95***	2.46***	4.01***	2.80***	4.01***	2.80***
	(0.09)	(0.07)	(0.10)	(0.08)	(0.10)	(0.08)	(0.12)	(0.11)	(0.14)	(0.11)	(0.15)	(0.11)
MedianSpiteQ	1.47***	1.37***	1.03***	1.30***	1.11***	1.31***	2.29***	1.98***	1.93***	2.05***	1.94***	2.06***
	(0.14)	(0.11)	(0.14)	(0.11)	(0.14)	(0.11)	(0.19)	(0.16)	(0.20)	(0.16)	(0.19)	(0.16)
American					−0.51***	0.06					−0.57***	0.15
					(0.09)	(0.07)					(0.13)	(0.09)
NumQ:American					−0.96***	−0.25**					−1.07***	−0.33**
					(0.15)	(0.11)					(0.21)	(0.15)
bretrisk							0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
							(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
NumQ:MedianSpiteQ	−1.01***	−0.89***	−1.31***	−0.88***	−1.31***	−0.88***	−1.71***	−1.35***	−2.40***	−1.56***	−2.40***	−1.56***
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)	(0.16)	(0.14)	(0.19)	(0.15)	(0.20)	(0.15)
American:MedianSpiteQ					0.27**	0.04					0.33*	−0.08
					(0.13)	(0.09)					(0.17)	(0.13)
NumQ:American:MedianSpiteQ					0.31	−0.01					0.70**	0.20
					(0.21)	(0.15)					(0.28)	(0.21)
Panel C: Above/below median prosocial subjects (via SVO-Measure)												
Constant	3.71***	4.40***	4.77***	4.43***	4.49***	4.37***	2.94***	3.54***	4.32***	3.66***	3.95***	3.54***
	(0.23)	(0.19)	(0.22)	(0.19)	(0.20)	(0.18)	(0.35)	(0.30)	(0.34)	(0.30)	(0.31)	(0.29)
NumQ	2.10***	2.07***	2.89***	2.28***	2.89***	2.28***	1.86***	1.82***	2.52***	2.07***	2.52***	2.07***
	(0.09)	(0.07)	(0.10)	(0.08)	(0.10)	(0.08)	(0.12)	(0.10)	(0.13)	(0.10)	(0.14)	(0.10)
MedianSVO	−0.05	−0.02	−0.25*	−0.02	−0.28**	−0.02	0.15	0.13	−0.38**	0.16	−0.37**	0.15
	(0.14)	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)	(0.19)	(0.16)	(0.19)	(0.16)	(0.19)	(0.16)
American					−0.50***	0.08					−0.64***	0.11
					(0.09)	(0.07)					(0.12)	(0.09)
NumQ:American					−0.79***	−0.21*					−0.66***	−0.25*
					(0.15)	(0.11)					(0.20)	(0.15)
bretrisk							0.02***	0.02***	0.02***	0.02***	0.02***	0.02***
							(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
NumQ:MedianSVO	0.32**	−0.19*	0.35**	−0.10	0.35**	−0.10	0.30*	−0.21	0.35*	−0.26*	0.35*	−0.26*
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)	(0.17)	(0.14)	(0.19)	(0.15)	(0.20)	(0.15)
American:MedianSVO					0.25**	0.004					0.52***	−0.02
					(0.13)	(0.09)					(0.17)	(0.13)
NumQ:American:MedianSVO					−0.03	−0.09					−0.05	0.05
					(0.21)	(0.15)					(0.28)	(0.21)
Litigation	✓	×	✓	×	✓	×	✓	×	✓	×	✓	×
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	8,175	8,175	8,175	8,175	16,350	16,350	4,110	4,110	4,110	4,110	8,220	8,220

Note: $^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), (5), (7), (9), and (11) estimate the litigation expenditures. Models (2), (4), (6), (8), (10), and (12) estimate the settlement requests. Models (1), (2), (7), and (8) estimate behavior under the American fee-shifting rule. Models (3), (4), (9), and (10) estimate behavior under the English fee-shifting rule. Models (5), (6), (11), and (12) additionally estimate the interaction between both fee-shifting rules. Models (7), (8), (9), (10), (11), and (12) additionally control for risk-aversion (bretrisk). Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *American* denotes a dummy with value one for the American rule and zero for the English rule. *MedianSpite*/*MedianSpiteQ*/*MedianSVO* denotes a dummy with value one if the subject displays above-median preferences in the respective measure of social preferences. All models account for age, gender, and educational attainment.

B.2.3. Wave Effects

In this section, we analyze whether behavior between the two waves significantly differs. Table 13 and Table 14 report on the mixed-effects regressions comparing the two waves. We see a general tendency to request more in the second wave in the settlement stage. We also see that litigation expenditures are higher in the second wave. Further, we find some small effects in the function of Q between the two waves. More importantly, however, we find no interaction effect between the wave and the fee-shifting rule.

Table 11: Mixed-effects regression of the litigation expenditures and settlement requests for the first and second wave.

	Litigation/Settlment					
	American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.59^{***}	4.75^{***}	5.41^{***}	4.82^{***}	5.41^{***}	4.82^{***}
	(0.09)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
American					-0.82^{***}	-0.07^{*}
					(0.06)	(0.04)
Wave	0.55^{***}	0.62^{***}	0.46^{***}	0.56^{***}	0.46^{***}	0.56^{***}
	(0.12)	(0.10)	(0.12)	(0.10)	(0.11)	(0.10)
American:Wave					0.09	0.07
					(0.08)	(0.06)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Log Likelihood	−19,499.17	−18,017.73	−20,520.21	−18,430.16	−40,231.93	−35,591.84
Akaike Inf. Crit.	39,006.35	36,043.46	41,048.43	36,868.31	80,475.86	71,195.69
Bayesian Inf. Crit.	39,034.38	36,071.50	41,076.46	36,896.35	80,522.07	71,241.90

Note: $^{+}p<0.1;^{*}p<0.05;^{**}p<0.01;^{***}p<0.001;$

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. *American* denotes a dummy with value one for the American rule and zero for the English rule. *Wave* denotes a dummy with value one if the behavior of the second wave is depicted and zero otherwise.

Table 12: Mixed-effects regression of the litigation expenditures and settlement requests as a function of q for the first and second wave.

	Litigation/Settlment					
	American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.33***	3.63***	3.69***	3.56***	3.69***	3.56***
	(0.10)	(0.08)	(0.10)	(0.08)	(0.09)	(0.08)
NumQ	2.51***	2.23***	3.45***	2.52***	3.45***	2.52***
	(0.09)	(0.07)	(0.10)	(0.08)	(0.11)	(0.08)
American					−0.35***	0.07
					(0.09)	(0.07)
Wave	0.80***	0.88***	0.84***	0.84***	0.84***	0.84***
	(0.14)	(0.11)	(0.14)	(0.11)	(0.13)	(0.11)
NumQ:American					−0.94***	−0.29***
					(0.15)	(0.11)
NumQ:Wave	−0.51***	−0.51***	−0.76***	−0.58***	−0.76***	−0.58***
	(0.12)	(0.10)	(0.14)	(0.11)	(0.15)	(0.11)
American:Wave					−0.04	0.03
					(0.13)	(0.09)
NumQ:American:Wave					0.25	0.07
					(0.21)	(0.15)
Litigation	✓	×	✓	×	✓	×
Observations	8,175	8,175	8,175	8,175	16,350	16,350
Log Likelihood	−18,893.89	−17,349.83	−19,687.65	−17,673.43	−39,003.90	−34,195.94
Akaike Inf. Crit.	37,799.78	34,711.65	39,387.29	35,358.85	78,027.80	68,411.88
Bayesian Inf. Crit.	37,841.83	34,753.71	39,429.35	35,400.91	78,104.82	68,488.89

Note: $^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;
Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *American* denotes a dummy with value one for the American rule and zero for the English rule. *Wave* denotes a dummy with value one if the behavior of the second wave is depicted and zero otherwise.

B.2.4. Risk Preferences

In the second wave, participants performed the bomb risk elicitation task (Crosetto and Filippin, 2013). In this task, subjects are presented with an interface that consists of 100 boxes. One of these boxes contains a bomb. Subjects are asked to choose how many boxes to select. If one of

the chosen boxes contains the bomb, their earnings are zero. Otherwise, they earn 1 point for every box that they choose to open. In this task, a risk-neutral subject would choose 50 boxes. Higher values are indicative of risk-seeking preferences and lower values as risk-aversion. We use the number of boxes chosen by the participants as their preferences to take risk.

Here, we look at how litigation expenditures and settlement requests are related to risk preferences. As before, we employ median splits. We classify subjects as risk-seeking if their score is higher than the median risk score and non-risk-seeking (risk-averse) otherwise. Table 13 and Table 14 report on the mixed-effects regressions and Figure 9 illustrates the results. Consistent with the literature, we see that higher levels of risk are related to higher litigation expenditures and settlement requests. However, we do not find any statistically significant differences in this relationship between the American and the English fee-shifting rule. We further find that the influence of risk decreases with increasing merit.

Table 13: Mixed-effects regression of the litigation expenditures and settlement requests with median risk splits.

	Litigation/Settlment					
	American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	4.62^{***}	4.88^{***}	5.41^{***}	4.91^{***}	5.41^{***}	4.91^{***}
	(0.12)	(0.11)	(0.12)	(0.10)	(0.11)	(0.10)
American					-0.79^{***}	-0.03
					(0.07)	(0.06)
MedianRisk	1.06^{***}	1.00^{***}	0.96^{***}	0.96^{***}	0.96^{***}	0.96^{***}
	(0.17)	(0.15)	(0.17)	(0.15)	(0.16)	(0.15)
American:MedianRisk					0.11	0.04
					(0.11)	(0.08)
Litigation	✓	×	✓	×	✓	×
Observations	4,110	4,110	4,110	4,110	8,220	8,220
Log Likelihood	−9,602.42	−9,001.19	−10,126.92	−9,130.35	−19,784.71	−17,614.26
Akaike Inf. Crit.	19,212.84	18,010.38	20,261.84	18,268.70	39,581.42	35,240.53
Bayesian Inf. Crit.	19,238.12	18,035.67	20,287.13	18,293.98	39,623.51	35,282.61

Note: $^{+}p<0.1;^{*}p<0.05;^{**}p<0.01;^{***}p<0.001;$

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. *American* denotes a dummy with value one for the American rule and zero for the English rule. *MedianRisk* denotes a dummy with value one if the subject displays above-median risk-seeking preferences.

Table 14: Mixed-effects regression of the litigation expenditures and settlement requests with median risk splits as a function of q.

	Litigation/Settlment					
	American		English		Both	
	(1)	(2)	(3)	(4)	(5)	(6)
Constant	3.42***	4.01***	3.93***	3.87***	3.93***	3.87***
	(0.13)	(0.12)	(0.13)	(0.12)	(0.13)	(0.12)
NumQ	2.41***	1.74***	2.96***	2.08***	2.96***	2.08***
	(0.12)	(0.10)	(0.13)	(0.10)	(0.14)	(0.10)
American					−0.51***	0.14
					(0.12)	(0.09)
MedianRisk	1.47***	1.02***	1.23***	1.10***	1.23***	1.10***
	(0.19)	(0.17)	(0.19)	(0.16)	(0.19)	(0.17)
NumQ:American					−0.55***	−0.34**
					(0.20)	(0.15)
NumQ:MedianRisk	−0.82***	−0.03	−0.55***	−0.29*	−0.55***	−0.29*
	(0.17)	(0.14)	(0.19)	(0.15)	(0.20)	(0.15)
American:MedianRisk					0.24	−0.08
					(0.17)	(0.13)
NumQ:American:MedianRisk					−0.27	0.25
					(0.28)	(0.21)
Litigation	✓	×	✓	×	✓	×
Observations	4,110	4,110	4,110	4,110	8,220	8,220
Log Likelihood	−9,324.59	−8,740.67	−9,773.33	−8,820.72	−19,243.78	−17,051.98
Akaike Inf. Crit.	18,661.18	17,493.33	19,558.66	17,653.43	38,507.55	34,123.96
Bayesian Inf. Crit.	18,699.10	17,531.26	19,596.59	17,691.36	38,577.70	34,194.11

Note: $^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;

Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate behavior under the American fee-shifting rule. Models (3) and (4) estimate under the English fee-shifting rule. Models (5) and (6) additionally estimate the interaction between both fee-shifting rules. Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *American* denotes a dummy with value one for the American rule and zero for the English rule. *MedianRisk* denotes a dummy with value one if the subject displays above-median risk-seeking preferences.

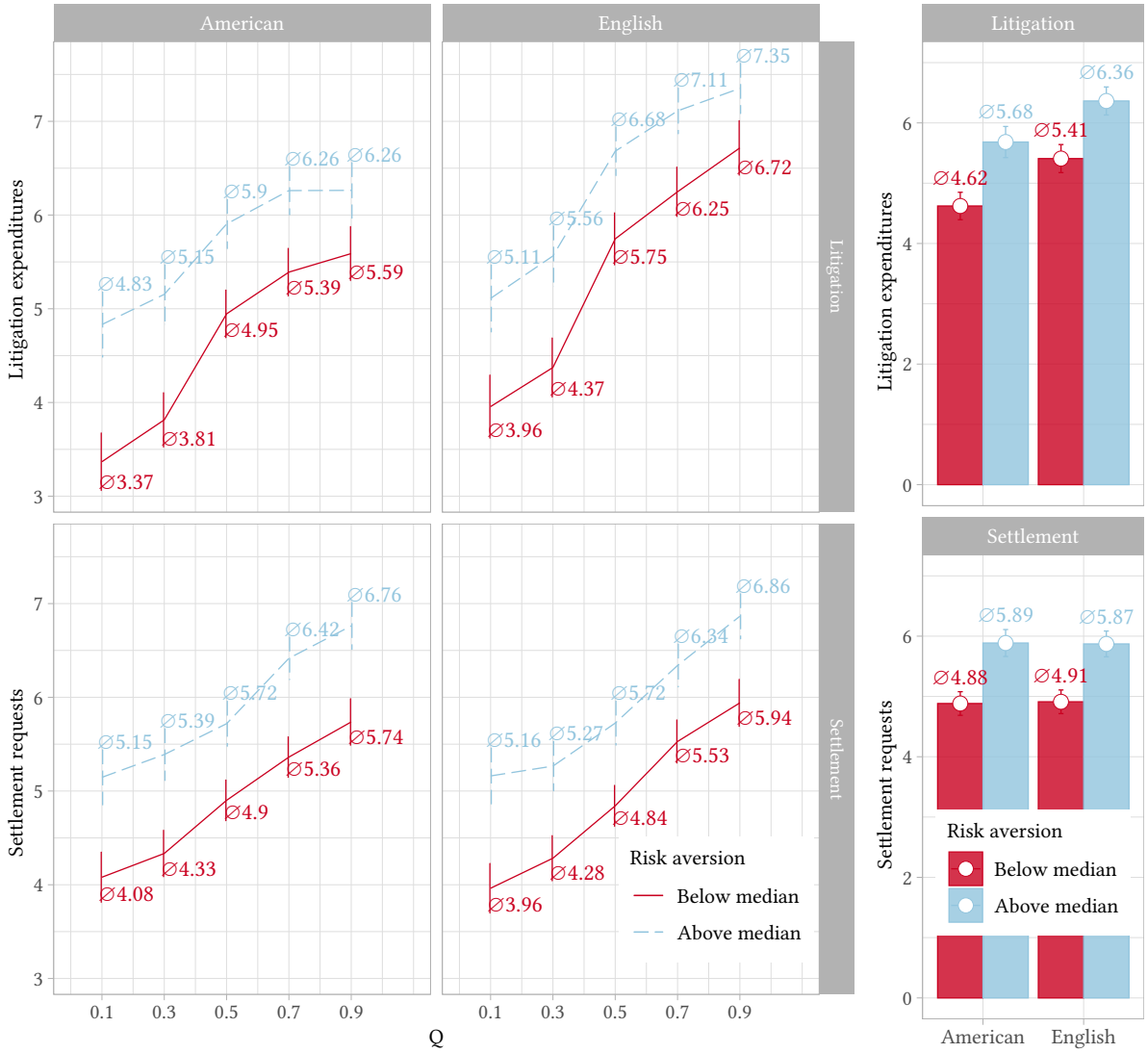


Figure 9: Litigation effort and settlement request under the American and English fee-shifting rule as a function of q for risk-seeking/ risk-averse subjects.

The figures to the left depict the litigation expenditures and settlement request by fee-shifting rule for risk-seeking and risk-averse subjects as a function of q, while the figures to the right depict the aggregates. The panels on the top depict the litigation effort, while the panels on the bottom illustrate the settlement requests. Red solid lines depict the behavior of risk-averse subjects (i.e., subjects with below-median scores in the Bomb-task), while blue dashed lines indicate the response of risk-seeking subjects (i.e., subjects with above-median scores in the Bomb-task). The error bars indicate the 95% confidence intervals.

B.3. Causality

In this paper, we provide correlational evidence for a relationship between subjects with spiteful preferences and higher litigation expenditures and settlement requests. However, social-preferences are not exogenously assigned to subjects. To deal with this issue, we tried to manipulate spite exogenously.

To do so, we conducted the following additional treatments: In the baseline treatment, subjects were competing with a fellow participant. As we are not aware of any way to directly manipulate spiteful preferences, we decided to exclude social preferences altogether. To exclude social preferences, we matched subjects with a computer player. Matching subjects with a

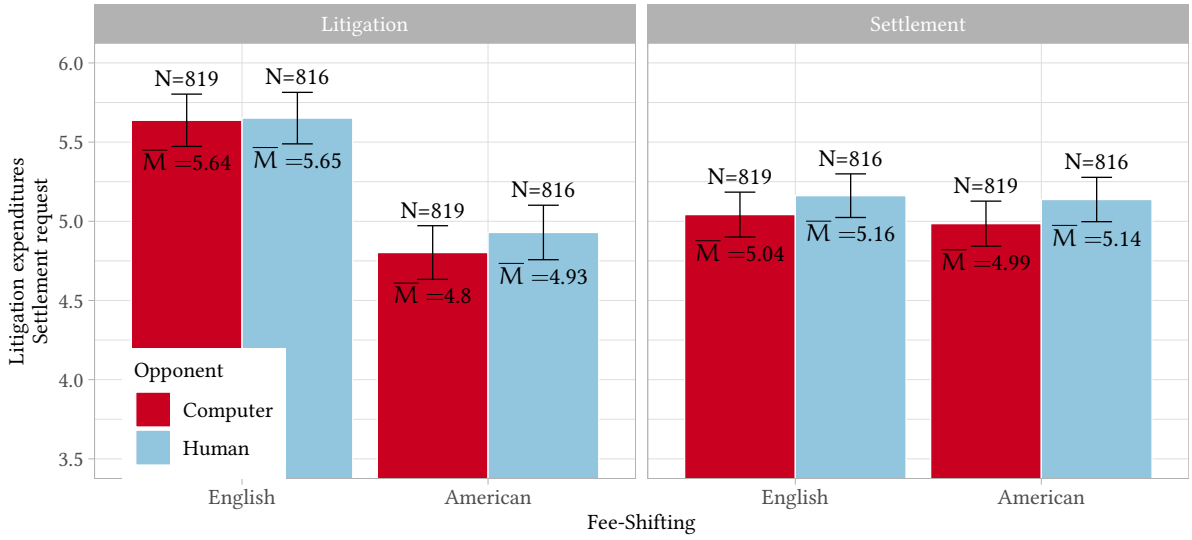


Figure 10:
Average litigation expenditures and settlement requests in each treatment.
The panel on the left depicts the litigation effort, while the panel on the right illustrates the settlement requests. The left two bars in each panel indicate the behavior under the English fee-shifting rule, while the two bars on the right indicate the response under the American fee-shifting rule in each panel. Red bars show the response if the opponent is a computer player, while blue bars show the response if the opponent is a human player. The error bars indicate the confidence intervals with the sample size on top and the mean below.

computer player changes, however, two aspects: 1) social preferences are excluded – as subjects arguably cannot have preferences over payoffs of a computer – and 2) beliefs. Beliefs are changed as subjects might anticipate the computer player to be more rational or, alternatively, subjects might believe the computer to be more random in its decisions. To exclude the second aspect and to ensure that subjects' choices are driven only by social preferences and not beliefs, they were informed that computer players were imitating the behavior of other subjects. This means that the actions of the computer players were random draws from the set of human players' actions. This way, only social preferences should be impacted. However, a major downside of this controlled-belief manipulation is that the manipulation is very weak, as the spiteful preferences of the opponent are kept constant between treatments. The factor Opponent was realized via between-subjects design, i.e., subjects either interacted with a human player or a computer player imitating a human player.

Figure 10 depicts the aggregate results. We see that both litigation expenditures and settlement requests are higher if participants compete against a fellow human compared to a computer. However, these differences do not rise to the required significance levels, and consequently, we find no statistically significant differences in the litigation expenditures nor in the settlement requests. On average, subjects invest 5.29 tokens in litigation against fellow humans, compared to 5.22 tokens in litigation against computers. The difference is statistically not significantly different from zero ($t(1633)= -0.7$, $p \geq 0.05$). Concerning the settlement requests, we find that subjects request on average 5.15 tokens in case the litigation is born out against a human, compared to 5.01 tokens in the computer treatment. Again, we do not find a significant effect, using a t-test: $t(1632.4)= -1.4$, $p \geq 0.05$. Also, using a mixed-effect regression, reported

in Table 15, does not show any significant difference between the two treatments, even though the effect of the human-treatment is consistently positive.

Table 15: Mixed-effects regression of the litigation expenditures and settlement requests by opponent as a function of q.

	C_1		C_2		C_3			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	5.22***	5.01***	4.80***	4.99***	3.86***	3.98***	3.66***	4.02***
	(0.07)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)	(0.09)	(0.08)
Human	0.07	0.14	0.13	0.15	0.13	0.11	0.15	0.10
	(0.11)	(0.10)	(0.11)	(0.10)	(0.12)	(0.10)	(0.13)	(0.11)
English			0.84***	0.06			0.40***	−0.09
			(0.06)	(0.04)			(0.09)	(0.07)
Human:English			−0.11	−0.03			−0.04	0.01
			(0.08)	(0.06)			(0.13)	(0.09)
NumQ					2.72***	2.07***	2.29***	1.92***
					(0.08)	(0.05)	(0.10)	(0.08)
Human:NumQ					−0.12	0.06	−0.05	0.10
					(0.11)	(0.08)	(0.15)	(0.11)
NumQ:English							0.88***	0.30***
							(0.15)	(0.11)
Human:NumQ:English							−0.14	−0.09
							(0.21)	(0.15)
Litigation	✓	×	✓	×	✓	×	✓	×
Observations	16,350	16,350	16,350	16,350	16,350	16,350	16,350	16,350
Log Likelihood	−40,424.41	−35,606.87	−40,242.84	−35,610.28	−39,274.18	−34,239.05	−39,032.83	−34,239.41
Akaike Inf. Crit.	80,856.82	71,221.74	80,497.68	71,232.56	78,560.36	68,490.10	78,085.66	68,498.82
Bayesian Inf. Crit.	80,887.63	71,252.55	80,543.89	71,278.77	78,606.57	68,536.31	78,162.68	68,575.84

Note: $^{+}$p<0.1;*p<0.05;**p<0.01;***p<0.001;
Models (1), (3), and (5) estimate the litigation expenditures. Models (2), (4), and (6) estimate the settlement requests. Models (1) and (2) estimate the average effect of the manipulation on behavior. Models (3) and (4) estimate the average interaction effect of the manipulation and the merit of the case. Models (5) and (6) estimate the interaction effect of the manipulation, the merit of the case, and the fee-shifting rule. Standard errors are shown in parenthesis. *NumQ* indicates the merit of the case while *Eng* denotes a dummy with value one for the English rule and zero for the American rule. *Human* denotes a dummy with value one if the opponent is a human player and zero if the opponent is a computer player.

We provide several explanations for why we do not find any significant differences between the human treatment and the computer treatment:

First, we conduct the experiment online. However, in online experiments, social preferences might not be as salient as in laboratory experiments. Participants have no way of meeting the other participants, nor do they feel very connected to them. Thus, social preferences might have paid already a relatively small role. This, in turn, might diminish the scope for the effects of spite between the treatments.

Second, we exclude social preferences altogether. That, however, also means we exclude

not only spiteful preferences but also prosocial preferences and other social preferences like inequality aversion. These potentially counteracting preferences might cancel each other out and substantially undermine the overall effect of spite on the observed behavior. Thus, other social preferences might mask the effect of spite. Even though we find that the results have the right tendency, indicating that spite matters, the missing significance might be due to other social preferences, resulting in a weak manipulation.

Third, we keep the beliefs about the behavior of the opponent constant across the human and the computer treatment. While this design choice seems to be essential to make the experiment clean, it also substantially reduces the scope of the manipulation. An optimal treatment would exclude the spiteful preferences of all participants in one treatment and retain them in the other. We, however, only exclude the social preferences of the decision-makers, while we keep the social preferences of the opponents constant. However, subjects are expected to change their behavior 1) due to their spiteful preferences and 2) due to the best response to the spiteful preferences of the opponents. By keeping the behavior of the opponent constant, we factually exclude the second channel. Thus, the scope of the manipulation is substantially reduced as we can only observe behavioral responses due to the first channel.

Overall, there are multiple arguments why our manipulation might not have been working or might have only a very limited effect on behavior. Still, even though we find no significant differences between the treatments, the consistent tendency of the results provides further support for the impact of spite on litigation and settlement behavior.

B.4. Further figures

Please decide upon a contribution.

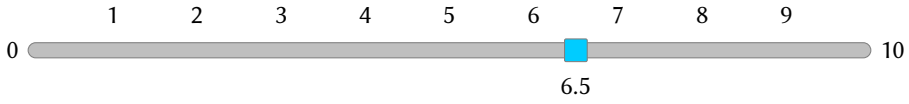
Scenario:
You are in scenario 3 (q=0.50). Hence: If you and your opponent contribute the same amount your chance of winning is 50% (5 out of 10 times you would win).
Here you can see the winning probabilities for each of your decisions dependent on the decision of your opponent.

Your Contribution \ Others Contribution	0	1	2	3	4	5	6	7	8	9	10
0	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	1.00	0.50	0.33	0.25	0.20	0.17	0.14	0.12	0.11	0.10	0.09
2	1.00	0.67	0.50	0.40	0.33	0.29	0.25	0.22	0.20	0.18	0.17
3	1.00	0.75	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	0.23
4	1.00	0.80	0.67	0.57	0.50	0.44	0.40	0.36	0.33	0.31	0.29
5	1.00	0.83	0.71	0.62	0.56	0.50	0.45	0.42	0.38	0.36	0.33
6	1.00	0.86	0.75	0.67	0.60	0.55	0.50	0.46	0.43	0.40	0.38
7	1.00	0.88	0.78	0.70	0.64	0.58	0.54	0.50	0.47	0.44	0.41
8	1.00	0.89	0.80	0.73	0.67	0.62	0.57	0.53	0.50	0.47	0.44
9	1.00	0.90	0.82	0.75	0.69	0.64	0.60	0.56	0.53	0.50	0.47
10	1.00	0.91	0.83	0.77	0.71	0.67	0.62	0.59	0.56	0.53	0.50

Your bonus payoff, if this task is determined payoff-relevant, is:
IF YOU WIN: Endowment + Prize.
IF YOU LOSE: Endowment -your contribution - your opponent's contribution.

The prize is worth 10 tokens.
Your endowment is 10 tokens.

Please choose a contribution.



Next

Figure 11: Interface for the litigation expenditures under the English rule with q = .5.

Please decide upon a request.

Scenario:
You have to choose a request. If the amount you and your opponent request sums up to less than (or equal to) 10 tokens, you receive, the amount you asked for + your endowment of 10 tokens as your payment. If both your requests are smaller than 10 you will get in addition half of the "leftover".

If the sum of your amounts exceeds 10 tokens, your payoff will be determined by the outcome from task A of **scenario 3**. Hence: If in task A you and your opponent contribute the same amount, your chance of winning is 50% (5 out of 10 times you would win).

Please choose a request.

Next

Figure 12: Interface for the settlement requests under the English rule with q = .5.

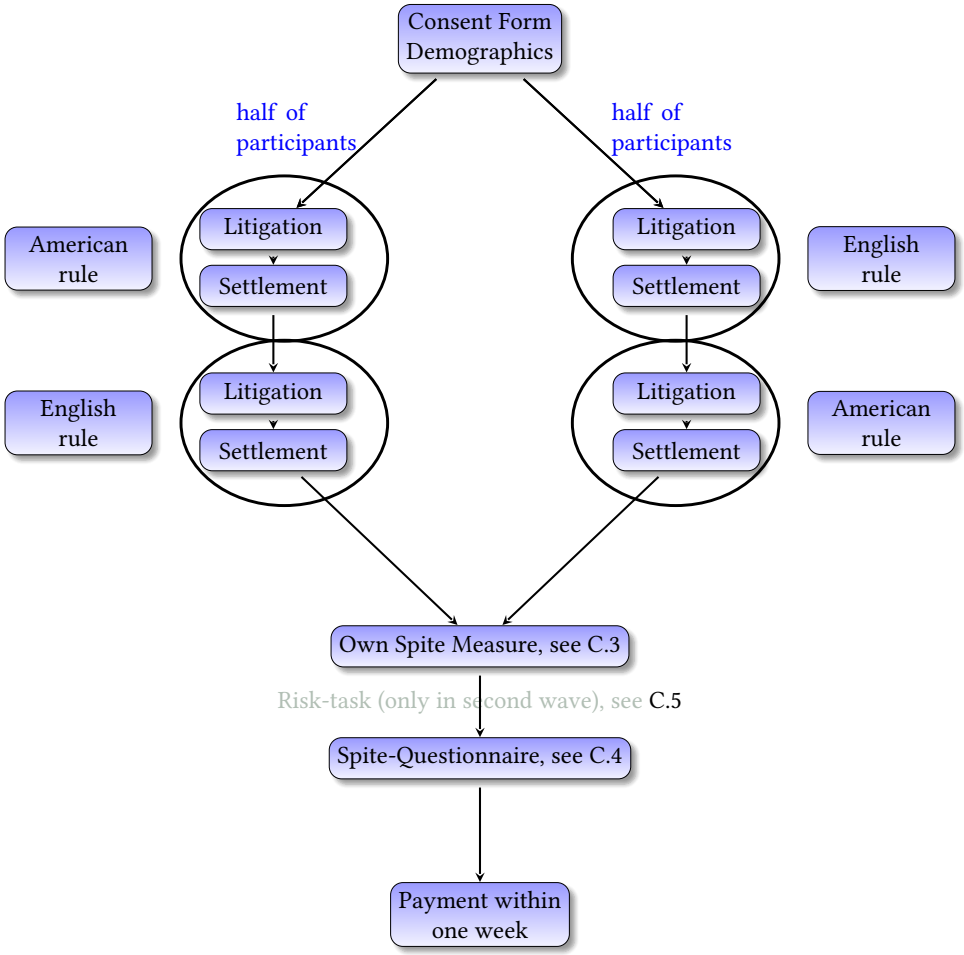


Figure 13: Experimental procedure

C. Instructions and control questions

In the following, we show the instructions and control questions used in this experiment.

C.1. Instructions

The following depicts the instructions used in the experiment:

Welcome to this experiment in the economics of decision making.

If you follow these instructions carefully and make good decisions you will earn a considerable amount of money that will be paid to you within a few days to your MTurk account.

We ask that you pay close attention to the instructions.

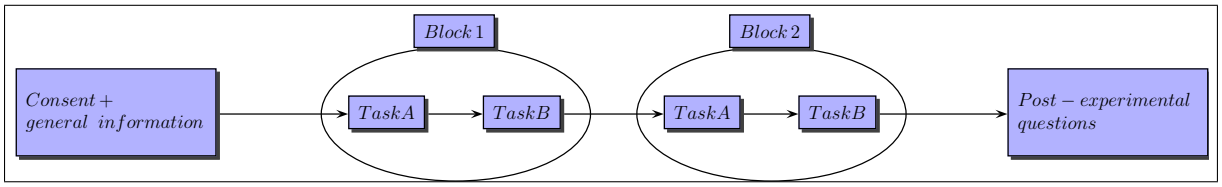
Note that during the experiment we will have several control question to see whether you read the instructions properly. If you read the instructions properly the control questions are very easy to answer. For every correctly answered control question, you will receive 5 cents in addition to your reward and your bonus payment from your decisions.

However, if you fail more than half of the control questions you will be excluded from all bonus payments and the experiment!

In the experiment today you will take decisions in two **blocks**.

Each **block** consists of two **tasks**. In both blocks you will need to make the same decisions; however, the blocks will differ in several aspects, which will be explained later in detail. The two tasks are either TASK A or TASK B. For each task, you will be instructed separately. Each task entails 5 decisions. Hence, overall you are going to make 5 (decisions per task) * 2 (tasks per block) * 2 (blocks) = 20 decisions.

The following graph illustrates the procedure of the experiment:



In the end, only one of the decisions (5 decisions in each task), from one of the tasks (two tasks in each block), from one of the blocks (two blocks) will be selected randomly.

Only this one selected decision will determine your payoff. Which one will be paid out was randomly determined when you agreed to take part in the study. However, you do not know which one will be payoff-relevant for YOU. Hence, you have to pay attention in each of the decisions as from your point of view any of the decision can be payoff-relevant for you.

Experimental Currency is used in the experiment. Your decisions and earnings will be recorded in tokens. Within a few days after the end of the experiment, you will be paid the bonus.

Tokens earned from the experiment will be converted to Dollars at a rate of:
1 token to 10 Dollar-cents ($0.10).

At the beginning of the experiment you are endowed with 10 tokens.
Any additional earning will be added to these tokens.
Any costs you encounter during your decisions will be deducted from the 10 tokens.

All tokens will be translated to dollars at the end of the experiment and paid as a bonus to you within a few days.

You have been assigned an opponent at the beginning of the experiment.
This opponent will stay your opponent for the duration of the whole experiment.
Importantly, the decisions of your opponent might influence your payoff.

[[in Computer treatment]]
Your opponent, however, is a computer player. This computer player will just copy the decisions of a real human player from a previous setting. Hence, the decisions of your opponent are implemented by a computer, but are copied from a human player. Your decisions can therefore **NOT** influence the payoff of your opponent, as the opponent is a computer player.

[[in Human treatment]]
All your decisions might also influence the payoff of your opponent, who is also a Mturker.

[[Instructions for the Litigation stage:]]

TASK A

In this task you are making a decision to win a prize worth 10 tokens. Your decision will influence your probability of winning this prize and hence your bonus payment.

Probability

For that purpose, you decide upon a contribution.
The higher your contribution the higher your chance of winning the prize. The higher the contribution of your opponent the lower your chance of winning the prize.

In addition: your chance of winning the prize does additionally depend on the scenario. The scenario describes your probability of winning the prize if both you and your opponent contribute the same amount.

Specifically, your chance of receiving the prize is given by your contribution divided by the sum of your contribution and your opponent's contribution as well as the scenario (q):

Chance of receiving the prize =

$$\frac{q \cdot (\text{your contribution})}{q \cdot (\text{your contribution}) + (1 - q) \cdot (\text{your opponent's contribution})} \tag{17}$$

Where q represents the scenario and is a number between 0 and 1. The scenario describes your probability of winning the reward if both you and your assigned partner contribute the same amount. Hence, it indicates whether the odds are in your favor.
Put differently: the scenario represents how much your contribution, relative to the contribution of your opponent, is weighted.

For example: if you and your opponent contribute the exact same amount and if the scenario is q = 0.5 then your chance of winning the reward is the same as your opponent's chance of winning. It also means, that your contribution has the same weight as the contribution of your opponent.

If however, you and your opponent contribute the exact same amount and the scenario is q = 0.9 then your chance of winning is 90 % and your opponent's chance of winning is 10 %, hence, the odds are in your favor. Put differently: your contribution is weighted 9 times more than the contribution of your opponent.

Another example: if you and your opponent contribute the exact same amount and if the scenario is q = 0.3 then your chance of winning is 30 % and your opponent's chance of winning is 70 %, hence, the odds are not in your favor. It also means, that one token of your contribution is weighted less than half (30/70) of one token of your opponent's contribution.
Put again differently: to get the same odds of winning as your opponent, if your opponent contributes 3 tokens, you have to contribute 7 tokens.

Accompanying each scenario, you will see a simple table indicating your chance of winning in

the respective scenario for possible contributions by you and your opponent.

The table will look like the following, which is an example table for scenario q = 0.90:
Note that you can choose any amount and for purpose of illustration we just pick integer (full numbers).

		Others contribution										
		0	1	2	3	4	5	6	7	8	9	10
Your Contribution	0	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1	1.00	0.90	0.82	0.75	0.69	0.64	0.60	0.56	0.53	0.50	0.47
	2	1.00	0.95	0.90	0.86	0.82	0.78	0.75	0.72	0.69	0.67	0.64
	3	1.00	0.96	0.93	0.90	0.87	0.84	0.82	0.79	0.77	0.75	0.73
	4	1.00	0.97	0.95	0.92	0.90	0.88	0.86	0.84	0.82	0.80	0.78
	5	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.87	0.85	0.83	0.82
	6	1.00	0.98	0.96	0.95	0.93	0.92	0.90	0.89	0.87	0.86	0.84
	7	1.00	0.98	0.97	0.95	0.94	0.93	0.91	0.90	0.89	0.88	0.86
	8	1.00	0.99	0.97	0.96	0.95	0.94	0.92	0.91	0.90	0.89	0.88
	9	1.00	0.99	0.98	0.96	0.95	0.94	0.93	0.92	0.91	0.90	0.89
	10	1.00	0.99	0.98	0.97	0.96	0.95	0.94	0.93	0.92	0.91	0.90

The columns represent your opponent's contributions and the rows represents your possible contributions.
The numbers in this table represent your chances of winning, given yours and your opponent's contributions.
This table represents your winning probabilities in scenario q = 0.90.

For example: if both you and your opponent choose to contribute 2, your chance of winning is .90 (90 percent).
For example: if your contribution is 2 and your opponent's contribution is 6 your chance of winning is .75 (75 percent probability of winning the reward).

You will have to make a decision for each scenario.

There will be 5 scenarios.
The scenarios will be shown in random order.

Scenario1 (q = 0.10): If you and your opponent contribute the same amount your chance of winning is 10 % (you would win one out of 10 times)

Scenario2 (q = 0.30): If you and your opponent contribute the same amount your chance of winning is 30 % (you would win three out of 10 times)

Scenario3 (q = 0.50): If you and your opponent contribute the same amount your chance of winning is 50 % (you would win five out of 10 times)

Scenario4 (q = 0.70): If you and your opponent contribute the same amount your chance of winning is 70 % (you would win seven out of 10 times)

Scenario5 (q = 0.90): If you and your opponent contribute the same amount your chance of winning is 90 % (you would win nine out of 10 times)

Which scenario is relevant for your payoff was already determined before the experiment. However, you do not know which one will be payoff-relevant for YOU. Hence, you have to pay attention in each scenario as from your point of view any of the decisions can be payoff-relevant for you.

YOUR PAYOFF:

[[American rule]]	*[[English rule]]*
If you win you receive the prize and you will have to pay your contribution. If you lose you will have to pay your contribution and you will NOT receive the prize.	If you win you receive the prize and you will not have to pay anything. If you lose you will have to pay your contribution and you will have to pay the contribution of your opponent and you will NOT receive the prize.

Hence your payoff is:

[[American rule]]	*[[English rule]]*
IF YOU WIN: Endowment + prize -you contribution **IF YOU LOSE: Endowment - your contribution**	**IF YOU WIN: Endowment + prize** **IF YOU LOSE: Endowment - your contribution - your opponent's contribution**

Remember:
Your endowment at the beginning of the experiment was 10 tokens.
The prize is also worth 10 tokens.
Example:
Imagine, at the beginning of the experiment the first task was randomly selected to be payoff-relevant for you.
Imagine, of the first task the third scenario (q=.50) was randomly selected to be relevant for you.

Hence, your payoff is determined by your decision in this task, the decision of your opponent and a random draw. The third scenario is the scenario where your chance of winning the prize, if both you and your opponent contribute the same amount, is 50%.

The table explaining your winning probabilities given possible contributions of you and possible contributions of your opponent is given by:

		Others contribution										
		0	1	2	3	4	5	6	7	8	9	10
Your Contribution	0	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1	1.00	0.50	0.33	0.25	0.20	0.17	0.14	0.12	0.11	0.10	0.09
	2	1.00	0.67	0.50	0.40	0.33	0.29	0.25	0.22	0.20	0.18	0.17
	3	1.00	0.75	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	0.23
	4	1.00	0.80	0.67	0.57	0.50	0.44	0.40	0.36	0.33	0.31	0.29
	5	1.00	0.83	0.71	0.62	0.56	0.50	0.45	0.42	0.38	0.36	0.33
	6	1.00	0.86	0.75	0.67	0.60	0.55	0.50	0.46	0.43	0.40	0.38
	7	1.00	0.88	0.78	0.70	0.64	0.58	0.54	0.50	0.47	0.44	0.41
	8	1.00	0.89	0.80	0.73	0.67	0.62	0.57	0.53	0.50	0.47	0.44
	9	1.00	0.90	0.82	0.75	0.69	0.64	0.60	0.56	0.53	0.50	0.47
	10	1.00	0.91	0.83	0.77	0.71	0.67	0.62	0.59	0.56	0.53	0.50

Imagine now that your opponent's contribution is one token and your contribution is one token. Hence, your chance of winning is 50%.

If you win (which happens in half of the cases) your payoff is:

[[American rule]]
Your Endowment + Prize -your contribution= 10+ 10 -1= 19 tokens

[[English rule]]
Your Endowment + Prize = 10+ 10 = 20 tokens

If you lose (which happens in half of the cases) your payoff is:

[[American rule]]
Your Endowment -your contribution = 10 -1 = 9 tokens

[[English rule]]
Your Endowment -your contribution -your opponent's contribution= 10 -1 -1 = 8 tokens

Imagine now that your opponent's contribution is three tokens and your contribution is one token. Hence, your chance of winning is 25%. Hence, in three out of four cases you would lose and in one out of four cases you would win.

If you win (which happens in 1 out of 4 cases) your payoff is:

[[American rule]]	*[[English rule]]*
Your Endowment + Prize -your contribution= 10+ 10 -1= 19 tokens	Your Endowment + Prize = 10+ 10 = 20 tokens

If you lose (which happens in 3 out of 4 cases) your payoff is:

[[American rule]]	*[[English rule]]*
Your Endowment -your contribution = 10 -1 = 9 tokens	Your Endowment -your contribution -your opponent's contribution= 10 -1 -3 = 6 tokens

Imagine now that your opponent's contribution is one token and your contribution is nine tokens. Hence, your chance of winning is 90%. Hence, in 9 out of 10 cases you would win and in 1 out of 10 cases you would lose.

If you win (which happens in 9 out of 10 cases) your payoff is:

[[American rule]]	*[[English rule]]*
Your Endowment + Prize -your contribution= 10+ 10 -9= 11 tokens	Your Endowment + Prize = 10+ 10 = 20 tokens

If you lose (which happens in 1 out of 10 cases) your payoff is:

[[American rule]]	*[[English rule]]*
Your Endowment -your contribution = 10 -9 = 1 token	Your Endowment -your contribution -your opponent's contribution= 10 -9 -1 = 0 tokens

[[Instructions for the Settlement stage:]]

TASK B

In the second task you will still be playing with the person assigned to you at the beginning of the experiment.

DECISION:
You and your opponent both can ask for a fraction of a prize. The prize is worth 10 tokens, just as in task A.

Payoff:
If the amount you and your opponent ask for sums up to less than (or equal to) 10 tokens, you receive, as payment, the amount you asked for. Hence, if the sum of both of your requests is smaller or equal to 10 tokens you will receive this requested amount as your payment plus your endowment. If both your requests are smaller than 10 you will get in addition half of the

“leftover”.

If the sum of your amounts exceeds 10 tokens, your payoff will be determined by the outcome from task A.

Hence, you will have to make again 5 decisions in the second task. Each decision is an amount you request from the 10 tokens. If both your requests are in sum less or equal to 10 this will be your payoff + half of the "leftover" + your endowment. If both your requests sum to more than 10 your payoff is determined by the result of task A.

EXAMPLES:
Imagine you request 3 tokens and your opponent requests 3 tokens. The sum is 6 and obviously smaller than 10. Hence, you will get as payoff your request (3 tokens) + half of the leftover (the leftover is 4 tokens) which is 2 + your endowment. Therefore, your total payoff equals to 15 tokens.

Imagine you request 3 tokens and your opponent requests 7 tokens. The sum is 10. Hence, you will get as payoff your request (3 tokens) + half of the leftover (the leftover is 0 tokens) which is 0 + your endowment. Therefore, your total payoff equals to 13 tokens.

Imagine you request 7 tokens and your opponent requests 7 tokens. The sum is 14. Hence, your payoff will be determined by the respective scenario from task one. Note that the range of total payoffs from the task A is 0 to 20 tokens.
For example, assume that the relevant scenario is q=0.10, assume also that you contributed in the first task 4 tokens and that your opponent contributed 4 tokens.

[[American rule]]	*[[English rule]]*
In case you win in task A (which would be the case in 1 of 10 cases given your contributions) your total payoff will be: your endowment + the prize - your contribution= 16 tokens. In case you lose in task A your total payoff will be: your endowment - your contribution = 6 tokens.	In case you win in task A (which would be the case in 1 of 10 cases given your contributions) your total payoff will be: your endowment + the prize= 20 tokens. In case you lose in task A your total payoff will be: your endowment - your contribution - your opponent’s contribution= 2 tokens.

Before each decision, you will be told which scenario (q is either 0.1 or 0.3 or 0.5 or 0.7 or 0.9) from task one would be payoff-relevant if both your requests exceed 10 tokens.

C.2. Control Questions

The following control questions have been asked after the instructions of the litigation and the settlement decision.[34]

Litigation

Assume that task A (the task you just have been instructed to) has been randomly selected to be payoff-relevant for you.

Who is your opponent:

- (a) A fellow Mturker
- (b) A random computer
- (c) A computer imitating the choices of a previous participant
- (d) A fellow Mturker imitating the choices of a previous participant
- (e) Was not mentioned

Assume that your contribution is 5 tokens and your opponent's contribution is 3 tokens and you win. What would be your total payoff?:

[[American rule:]]

- (a) 15 tokens
- (b) 10 tokens
- (c) 5 tokens
- (d) 25 tokens
- (e) 20 tokens

[[English rule:]]

- (a) 20 tokens
- (b) 10 tokens
- (c) 2 tokens
- (d) 25 tokens
- (e) 15 tokens

Assume that your contribution is 5 tokens and your opponent's contribution is 3 tokens and you lose. What would be your total payoff?:

[34] Note: in the second wave participatns were told that they would be able to proceed only if they answer all the questions correctly.

[[American rule:]]

- (a) 15 tokens
- (b) 10 tokens
- (c) 5 tokens
- (d) 25 tokens
- (e) 20 tokens

[[English rule:]]

- (a) 20 tokens
- (b) 10 tokens
- (c) 2 tokens
- (d) 25 tokens
- (e) 15 tokens

Assume that your contribution is 1 tokens and your opponent's contribution is 3 tokens and you lose. What would be your total payoff?:

[[American rule:]]

- (a) 11 tokens
- (b) 9 tokens
- (c) 13 tokens
- (d) 19 tokens
- (e) 21 tokens

[[English rule:]]

- (a) 11 tokens
- (b) 6 tokens
- (c) 13 tokens
- (d) 20 tokens
- (e) 19 tokens

Assume that your contribution is 1 tokens and your opponent's contribution is 3 tokens and you win. What would be your total payoff?:

[[American rule:]]

- (a) 11 tokens
- (b) 9 tokens
- (c) 13 tokens
- (d) 19 tokens
- (e) 21 tokens

[[English rule:]]

- (a) 11 tokens
- (b) 6 tokens
- (c) 13 tokens
- (d) 20 tokens
- (e) 19 tokens

Imagine the payoff-relevant scenario for you is the third scenario (q=.50). Hence, your winning probabilities for receiving the prize are described by the following table:

		Others contribution										
		0	1	2	3	4	5	6	7	8	9	10
Your Contribution	0	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1	1.00	0.50	0.33	0.25	0.20	0.17	0.14	0.12	0.11	0.10	0.09
	2	1.00	0.67	0.50	0.40	0.33	0.29	0.25	0.22	0.20	0.18	0.17
	3	1.00	0.75	0.60	0.50	0.43	0.38	0.33	0.30	0.27	0.25	0.23
	4	1.00	0.80	0.67	0.57	0.50	0.44	0.40	0.36	0.33	0.31	0.29
	5	1.00	0.83	0.71	0.62	0.56	0.50	0.45	0.42	0.38	0.36	0.33
	6	1.00	0.86	0.75	0.67	0.60	0.55	0.50	0.46	0.43	0.40	0.38
	7	1.00	0.88	0.78	0.70	0.64	0.58	0.54	0.50	0.47	0.44	0.41
	8	1.00	0.89	0.80	0.73	0.67	0.62	0.57	0.53	0.50	0.47	0.44
	9	1.00	0.90	0.82	0.75	0.69	0.64	0.60	0.56	0.53	0.50	0.47
	10	1.00	0.91	0.83	0.77	0.71	0.67	0.62	0.59	0.56	0.53	0.50

Suppose your opponent contributed 3 tokens. Suppose further that you contributed 7 tokens. What is your probability of winning the prize?

- (a) .50 (50% probability)
- (b) .70 (70% probability)
- (c) .84 (84% probability)
- (d) .88 (88% probability)
- (e) .90 (90% probability)

Suppose the same scenario is still payoff-relevant for you.
Suppose your opponent contributed 1 token. Suppose further that you contributed 1 token. What is your probability of winning the prize?

- (a) .50 (50% probability)
- (b) .70 (70% probability)
- (c) .84 (84% probability)
- (d) .88 (88% probability)
- (e) .90 (90% probability)

Settlement

Assume that task B (the task you just have been instructed to) has been randomly selected to be payoff-relevant for you.

Assume that your request is 5 tokens and your opponent's request is [[First question: 3]][[Second question: 5]][[Third question: 7]] tokens. Assume further that the relevant scenario is q=0.10. What would be your total payoff?

- (a) 16 tokens
- (b) 10 tokens
- (c) The payoff will be determined by the outcome from task A from scenario q=0.1
- (d) 15 tokens
- (e) 20 The payoff will be determined by the outcome from task A from scenario q=0.3

C.3. Own spite measure

In this task, you are still paired with your opponent from the previous tasks, whom we will refer to as the opponent. All of your choices will be confidential. After you take your decisions this task will not be repeated and there is no further interaction with your opponent.

You will be making a series of decisions about allocating resources between you and your opponent. For each of the following questions, please indicate the distribution you prefer most by selecting the button below the payoff allocations. You can only make one selection for each question. Your decisions will yield money for both yourself and your opponent.

Each point shown is worth 0.2 cents (100 points = 20 cents).

In the example below, a person has chosen to distribute the payoff so that he/she receives 50 points (=10 cents), while his opponent receives 40 points (=8 cents).

There are no right or wrong answers, this is all about personal preferences. After you have made your decision, select the resulting distribution of money by clicking on the button below your choice. As you can see, your choices will influence both the amount of money you receive as well as the amount of money your opponent receives.

At the end of the experiment, a computer program will randomly pick either you or your opponent as the payoff-relevant decision maker.

Only one of the following decisions will be payoff relevant. Which decision will be paid will be determined by a random process at the end of the experiment. Hence, you have to take all decisions seriously as any of those can be chosen by the random process with equal probability.

Your payment of this task will be added to your payment of the previous task.

Please indicate your choice for each of the following distributions.
Note: These decisions are payoff relevant and will influence your payment!

[[Participants had to make choices as shown in Table 1]]

C.4. Spite-Questionnaire

The questions of the questionnaire according to Marcus et al. (2014) included the following questions:

- I would be willing to take a punch if it meant that someone I did not like would receive two punches.
- I would be willing to pay more for some goods and services if other people I did not like had to pay even more.
- If I was one of the last students in a classroom taking an exam and I noticed that the instructor looked impatient, I would be sure to take my time finishing the exam just to irritate him or her.
- If my neighbor complained about the appearance of my front yard, I would be tempted to make it look worse just to annoy him or her.
- It might be worth risking my reputation in order to spread gossip about someone I did not like.
- If I am going to my car in a crowded parking lot and it appears that another driver wants my parking space, then I will make sure to take my time pulling out of the parking space.
- I hope that elected officials are successful in their efforts to improve my community even if I opposed their election. (reverse scored)
- If my neighbor complained that I was playing my music too loud, then I might turn up the music even louder just to irritate him or her, even if meant I could get fined.
- I would be happy receiving extra credit in a class even if other students received more points than me. (reverse scored)
- Part of me enjoys seeing the people I do not like fail even if their failure hurts me in some way.
- If I am checking out at a store and I feel like the person in line behind me is rushing me, then I will sometimes slow down and take extra time to pay.
- It is sometimes worth a little suffering on my part to see others receive the punishment they deserve.
- I would take on extra work at my job if it meant that one of my co-workers who I did not like would also have to do extra work.
- If I had the opportunity, then I would gladly pay a small sum of money to see a classmate who I do not like fail his or her final exam.
- There have been times when I was willing to suffer some small harm so that I could punish someone else who deserved it.
- I would rather no one get extra credit in a class if it meant that others would receive more credit than me.

- If I opposed the election of an official, then I would be glad to see him or her fail even if their failure hurt my community.

C.5. Risk task

Here is a second short mini-experiment!
Another opportunity to earn money...

On this screen you will see a field composed of 100 boxes. Behind one of these boxes a bomb is hidden; the remaining 99 boxes are empty. You do not know where the bomb is. You only know that it can be in any place with equal probability.

Your task is to choose how many boxes to select. The position of the bomb will only be revealed after you made all your choices.

If you happen to have selected the box in which the bomb is located you will earn zero. If the time bomb is located in a box that you did not select you will earn 1 cent for each box you have chosen.

Below you will be asked to indicate which boxes you would like to select. You confirm your choice by hitting the next button. The position of the bomb will be revealed on the subsequent screen.

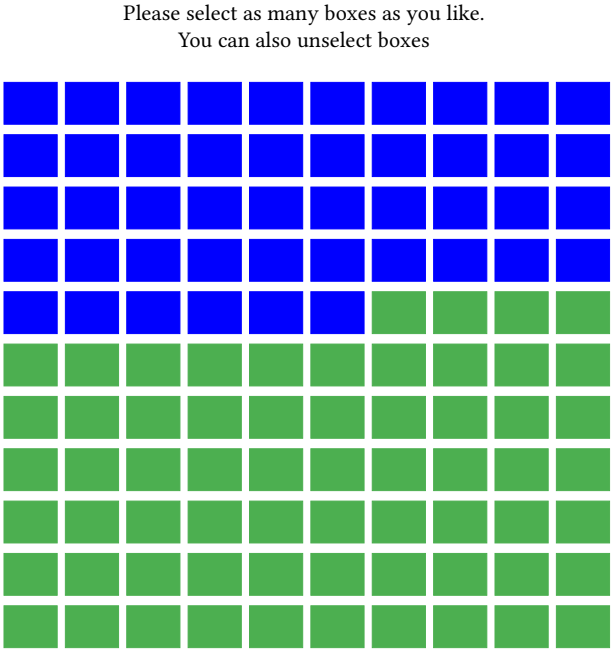


Figure 14: Interface of the bomb task.