

Estimating Effects of English Rule on Litigation Outcomes

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Abstract

The English rule for fee allocation prescribes that the loser of a lawsuit pay the winner's litigation costs. Economic theory predicts that the English rule discourages settlement, increases litigation costs and encourages meritorious claims. The principal empirical work on the impact of the English rule by Hughes and Snyder (1990, 1995) relies on data from Florida's use of the Rule for medical malpractice claims between 1980 and 1985. The principal findings are that plaintiffs win more often at trial, receive higher awards in these trials, and receive larger settlements. These findings are consistent with the notion that the English rule tends to screen out less meritorious cases. One potential difficulty with these studies is that they may not be robust to the method of controlling for case selection under alternative rules. In this paper we reexamine the Florida experiment with the English rule by placing bounds on the selection effects. We find that the median jury award increases under the English rule. We also find that the mean and median settlement amount increases. We find less conclusive evidence that the litigation costs increase although these results are not robust to the most extreme possible selection mechanisms. Collectively these findings are consistent with the prediction that the English rule improves case quality.

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1 Introduction

In most western legal systems loser of a lawsuit pays the winners legal fees (Katz, 1997). Such a system essentially indemnifies the winner against the costs of litigation and in some ways seems the logical rule for a tort system that aims to make victims whole. However in most jurisdictions the United States eschews such indemnification at least with regard to attorney's fees.¹ For largely historical reasons in the law and economics literature these contrasting systems are typically called the English (or British) and American rules. Under the English rule for fee allocation the loser of a lawsuit pay the winner's litigation costs. In recent years a number of reformers have suggested that the United States should move to greater fee shifting. For example, Texas recently passed a highly publicized fee shifting provision and several nationwide fee shifting rules have been proposed. Typically reformers argue that indemnification will reduce frivolous litigation, improve case quality and lower litigation costs.

Perhaps unsurprisingly economic theory dealing with the impact of the English rule is far more nuanced than the reformers' claims. Economic theory predicts that the English rule discourages claims that are unlikely to be successful and hence may encourage meritorious claims. The theory also predicts that the rule lowers the likelihood of settlement and increases litigation costs. Given the trade-off between higher quality cases, i.e. fewer "frivolous" suits in the parlance of reformers, and higher litigation costs either due to fewer settlements or the direct effect of the English rule on litigation costs, empirical work is needed to inform whether moves to greater indemnification are likely to improve or retard the efficiency of the American legal system.

Fortunately the state of Florida has helpfully provided an experiment. Between 1980 and 1985 Florida used the English rather than the American rule for allocating legal costs.² Although the law applied only to medical malpractice litigation Florida's brief experiment with the English rule provides the best evidence on the magnitude of the English rule's impact. In a series of studies Hughes and Snyder (1990, 1995) estimate the impact of the English rule using the Florida experiment. Their principle findings are that plaintiffs

¹There are exceptions. For example, since 1995, Oklahoma and Oregon have had a fee shifting regime that applies under very specific circumstances. Alaska has had a fee-shifting rule since 1900.

²Interestingly by 1985 doctors in Florida, who had pushed for the law, were pressing for its repeal. The claim by the Florida Medical Association was that law had dramatically increased legal expenditures exemplified by a multi-million dollar plaintiff's attorneys' fee against a Florida doctor that made national headlines in 1983.

win more often at trial, receive higher awards in these trials, and receive larger settlements: consistent with the notion that the English rule tends to screen out relatively less meritorious cases.

Simply because Hughes and Snyder undertook their studies in the late 1980s and early 1990s they have a relatively short time period surrounding the English rule experiment and hence our estimates represent a reexamination of the evidence with a large dataset. That is not the principle contribution of our study. Hughes and Snyder, like most studies using data generated by the litigation process have a classic selection problem: they observe only out-of-court settlements for settled cases and awards only for cases that go to trial. If the English rule changes the probability of settlement, as it theoretically does, there will be a selection bias. Hughes and Snyder use the Heckman (1979) parametric selection method to correct for sample selection. This is potentially problematic because absent a strong identification restriction resulting from a quasi-experiment the Heckman approach relies on non-linearity for identification.³

In this paper, rather than parametrically control for selection, we place bounds on the selection effects. Following Lee (2009) and Horowitz and Manski (1995) we determine an interval for effect size that correspond to extreme assumptions about the impact of selection on the observed outcome of settled versus litigated cases. We are able to narrow the bounds by assuming the selection effects are monotone. Specifically most theories of the English rule's impact predict that if litigants would agree to settle under the English rule then they must agree to settle under the American rule implying that the settlement decision is monotonic. Since the trial decision is simply the absence of a settlement this also implies monotonicity of the trial decision.

Armed with these assumptions we find the median award at trial increases under the English rule. We also find that the average settlement amount under the English increases. We find similar evidence for the median settlement amount although the difference between the lower bound of the English rule's effect and the median settlement amount under the American rule is not statistically significant. We find less evidence that defense costs, either at trial or for settled cases, increase under the English rule. We cannot distinguish a difference in mean or median litigation costs under the two systems.

³The problem of sample selection in data generated by the litigation process is well known. See Gelbach (2012) for a recent discussion of the complex selection mechanisms possible in litigation data. The difficulty is that the theory of litigation rarely provides the econometrician believable exclusion restrictions. This has led many studies of litigation outcomes, such as the impact of law changes on settlement amounts or trial judgments, to either estimate structural selection models or ignore the problem of selection completely.

We decompose our results by the quantile of payments. We find that the improvement in case quality for trials occurs primarily in the lower 85% of the trial payment distribution while the increase in payments in settlement occurs at the top of the distribution of payments. Our findings suggest that the impact of the English rule improves case quality but with effects that vary greatly depending on payment size.

We then extend our bound analysis allowing that decisions and therefore sample selections occur in multiple steps. This is closely related to the recent advancements in Gelbach (2012), Chen and Flores (2012), and Frumento, Mealli, Pacini, and Rubin (2012). In this case we continue to find that the English rule improves the quality of cases going to trial. Our settlement results, however, are not robust to the most extreme forms of selection.

The article is structure as follows. The next section presents a simple theoretical model of the English rule's impact. Section 3 presents the data while Section 4 discusses the estimating methodology. Section 5 discusses estimation of the bounds and inference. Section 6 presents the results of our bound analysis and Section 7 provides a methodology for estimating a two step version of the bounds analysis. Section 8 concludes.

2 Theory

There is an extensive theoretical literature on the impact of the English rule on litigation outcomes (see Katz 1997 and Spier 2007 for surveys of the literature). In this section we use the older differing perceptions model of litigation developed by Landes (1971), Posner (1972) and Gould (1973).⁴ We utilize this model, which does not allow for updating of the litigants inconsistent beliefs, due to its prevalence in much of the early theoretical treatments of the English rule (see Shavell 1982). Fortunately the predictions of the more modern asymmetric information models are quite similar with regards to the English rule (see Spier 2007). Assume that P_p is the plaintiff's predicted probability of winning at trial and P_d is the defendant's prediction of the probability that the plaintiff wins. Further assume that J equals the trial award and C_p and C_d are the cost of trial for the plaintiff and defendant. For ease of exposition assume further that settlement costs are zero.

2.1 Filing Decision

The primary policy interest in the English rule is its hypothesized ability to improve the quality of litigation. This is typically interpreted as discouraging cases in which the plaintiff

⁴Our treatment follows Miceli (1997).

is less likely to prevail at trial. Shavell (1982) and Katz (1990) show that the English rule reduces the expected value of low probability of success cases while increasing the value of high likelihood of recovery cases. We start by examining the filing decision of the plaintiff and assume that all cases have a threshold value for filing, the opportunity cost of filing suit, labeled w . Assume first that the case will settle for amount S under its respective rule (English and American) and that $S \geq w$. We first consider the American rule. We also assume that the settlement surplus (maximum offer-minimum acceptable payment) is divided evenly. Thus under the American rule

$$(P_d J + C_d) - (P_p J - C_p) = (C_p - C_d) - (P_p - P_d)J.$$

If $P_p = P_d$

$$S_A = P_p J - C_p + (1/2)(C_p + C_d).$$

By contrast the settlement amount under the English rule

$$\begin{aligned} & [P_d(J + C_p + C_d)] - [P_p J - (1 - P_p)(C_p + C_d)] \\ &= [P_d + (1 - P_p)](C_p + C_d) - (P_p - P_d)J. \end{aligned}$$

If $P_p = P_d$

$$S_E = P_p J - (1 - P_p)(C_p + C_d) + (1/2)(C_p + C_d).$$

A suit will be less likely to file under the English rule if $S_E < S_A$ which is true if

$$P_p < C_d / (C_p + C_d). \tag{1}$$

Thus less optimistic plaintiffs (lower P_p) receive lower settlement amounts and more optimistic plaintiffs (higher P_p) receive higher settlement amounts under English rule. Although we cannot determine if the number of lawsuits is greater under the English or American rule we can say that observed settlement amounts should be higher under the English rule.

For similar reasons we would expect the observed trial amounts to be higher under the English rule. The expected value of a trial to the plaintiff under the American rule is $P_p J - C_p$ so the case is filed if this value exceeds the opportunity cost of filing w . In the case of the English rule this threshold changes to $P_p J - (1 - P_p)(C_p + C_d) > w$. A case is more likely to be filed under the English rule if

$$P_p J - (1 - P_p)(C_p + C_d) > P_p J - C_p$$

which reduces to equation 1. As with settled cases, we find that since more optimistic plaintiffs file case the average award at trial is predicted to increase under the English rule.

2.2 Litigation Costs

Braeutigam, et al. (1984), Hause, (1989) and Katz (1987) argue that, in contrast to our assumption above, litigation costs are likely to be higher under the English rule. There are two reasons. First the stakes of the case are higher which increases litigation expenditures. Under the American rule the stakes are PJ (although the parties can disagree about the plaintiff's probability of winning at trial). Under the English rule the stakes rise to $PJ + C_p + C_d$ since a trial now determines not only damages but litigation costs as well. Since each party expects the other to bear the litigation costs with some $P > 0$ the English rule externalizes some of the cost of litigation essentially subsidizing litigation expenditures. It is worth noting that this would tend to increase the settlement range under the English rule relative to the American.

2.3 Settlement Behavior

Under the American rule the plaintiffs value of trial is $P_p J - C_p > 0$ and the plaintiff will accept any settlement offer, S , such that

$$S \geq P_p J - C_p.$$

The defendant's expected cost of trial $P_d J + C_d$ and hence the defendant will settle for any amount

$$S \leq P_d J + C_d.$$

Thus there exists a feasible settlement if

$$P_p J - C_p \leq P_d J + C_d$$

and settlement will occur if $(P_p - P_d)J \leq C_p + C_d$. The case settles if the plaintiff's relative optimism times the expected judgment do not exceed the cost of testing that optimism with a trial.

Viewed in this way the impact of the English rule becomes clear. Essentially the English rule magnifies optimism. Under the English rule the expected value of the case to the plaintiff becomes

$$P_p J - (1 - P_p)(C_p + C_d)$$

while the defendant's expected cost of trial becomes

$$P_d(J + C_p + C_d).$$

The settlement range becomes

$$(P_p - P_d)(J + C_p + C_d) \leq C_p + C_d$$

The settlement range is smaller and settlement is less likely under the English rule. More cases go to trial, regardless of whether the English rule improves case quality.⁵ Critically for our application this implies that the selection of cases for litigation is not random and the sample of litigated (or settled) cases will differ under each rule.

There are several alternative models with different predictions. For example risk aversion would tend to increase the settlement range under the English rule, the reverse of our prediction, since the English rule involves a larger gamble than the American rule (Coursey and Stanley (1988)). Combined with the impact of increased litigation costs it is possible that the English rule actually increases settlement because the impact of increased litigation costs and risk aversion dominate the English rule's effect of magnifying optimism. Finally, Donohue (1991) has argued since any settlement inherently involves bargaining over the allocation of legal costs then according to the Coase theorem we should observe no differences between the settlement rate under the English or the American rules. More generally he argues that any differences we do see must be due to transactions costs that prevent the respective parties from capturing the gains to settlement.

3 Data

In an effort to reduce low merit claims Florida adopted a mandatory fee-shifting rule for medical malpractice cases (§ 768.56, Fla. Stat.). The law covered cases with injuries that occurred after July 1980. The law was repealed in 1985 and all cases with injuries after October 1985 returned to the American rule. Conveniently Florida enacted no other major reforms in this period although it did enact contingency fee reform in 1986 and a split

⁵The prediction that more cases go to trial under the English rule is also found in asymmetric information models (See Bebchuk (1984)). In these models rather than exaggerate optimism the English rules exaggerates the value of the defendants asymmetric information since the stakes are now both the expected trial award and who bears the cost of litigation. As Spier (2007) points out the result only holds if defendants have private information the probability of being liable. If the probability of liability is common knowledge and the asymmetric information concerns only damages then the English and American rule's have the same probability of settlement (see Reinganum and Wilde (1986)).

recovery statute, periodic payments and joint and several liability reforms in 1987 (see Avraham (2010) and Helland and Tabarrok (2002)). It is possible that these reforms also impacted case outcomes although this is unlikely to affect our estimation strategy given that the injury date, which as we discuss below is exogenous to which legal rules the case will be pursued under, determines whether a case is litigated under the English or American rules.

Our data come from the Florida Department of Insurance's (FDI) closed claim data from 1975-1998. Since 1975 the State of Florida has required medical professional liability insurers to report all closed claims. The archive file, which we are using, contains 59,573 claims resolved from 1975 and 1999. The availability of certain fields, such as the plaintiff's injury, is not consistent across the years but the variables of interest in our study, whether the case is dropped, settled or litigated, the amount of the payment (if any) and the defense's litigation costs (before fee shifting), are available for the full sample period. During this time period Florida required that all claims, regardless of outcome, be submitted to the Florida Department of Insurance (FDI) database even if the litigants had not formally filed the case with the courts. We convert all payments to 2011 dollars. As discussed below, we restrict our sample cases closing between 1976 to 1989 so that the sample includes approximately four years before and after English rule.

The theory surrounding the English rule treats cases as either settling, when the plaintiff receives a payment without a trial or going to trial (decided by a judge or jury). At trial the plaintiff can win, i.e. recover money, or lose. Mapping these outcomes to the Florida data requires the researcher to make some judgments about what constitutes a trial or settlement. We treat a case as dropped if it does not receive a payment and did not go to trial. We treat a case as settled if the plaintiff receive a payment without a trial. Trials are more complex. The data identify several outcomes in which the court resolves the case. These range from summary judgments to trials. For consistency we treat awards as payments resulting from a bench or jury trial.⁶

Table 1: Summary Statistics.

⁶Given that the vast majority of summary judgments are for the defendant and result in zero payment this is not particularly restrictive. For trial costs, however, we have costs for all types of cases including summary judgments and trials. We therefore estimate defense costs with two measures; using all court resolved outcomes and only trials recognizing that a summary judgment would be far less costly in terms of lawyers time, expert witnesses or other costs associated with trial simply due to the nature and timing of the judgment.

The summary statistics for our sample are given in Table 1. Our sample differs slightly from Hughes and Synder (1990, 1995). In particular they use two data sets. The Florida Department of Insurance data for claims from October 1985 to June 1988 and a data set from the National Association of Insurance Commissioners for the period 1975-1978. Hughes and Synder's version of the FDI data has about 8050 cases in which 2/3 (5369 cases) are governed by the English and 1/3 (2685) are under the American. Our original sample is somewhat larger as there are claims resolved after 1990 that would be covered by the English rule. If we restrict our FDI sample to Hughes and Synder's sample period, October 1985 to June 1988, and use their methodology of assigning cases to the English rule based on the plaintiff's injury date (a difference discussed further below) we have 7788 English cases and 2556 American cases: a similar ratio.

Returning to Table 1 and our sample we find that the means and medians of both trial awards and settlement amounts suggest that the English rule cases involved higher payments, which is consistent with the theoretical prediction that the English rule improved case quality. We find less evidence of a cost increase although the English rule is associated with high defense costs in our second measure of trial costs (which includes only bench and jury trials and not summary judgments) and the defense's cost at settlement. Given that the English rule reduces the likelihood of settlement (and thereby increases the likelihood of trials) it remains an open possibility that these differences are driven entirely by the selection effects and not by a change in the average quality of the plaintiff's case.

4 Estimating Methodology

Any study of the English rule experiment in Florida must confront the selection problem inherent in all data on litigation outcomes. In particular a researcher will observe only out-of-court settlements for cases in which the case settles (i.e. no trial) and the jury award only for cases which go to trial. Given that the English rule theoretically effects both case quality and which cases settle, determining the impact of the English rule on case quality requires that a researcher deal with this sample selection. Hughes and Synder (1990 and 1995) address the sample selection with the Heckman (1979) method. The difficulty with this approach is that it requires either a plausible quasi-experiment that effects the likelihood of settlement without impacting case quality or joint normality. Absent a quasi-experiment the identification is based entirely on the non-linearity of the first stage: a parametrically strong assumption.

Our alternative approach is based on Lee (2009) and Horowitz and Manski (1995). This approach bounds the outcome variable and does not require us to make assumptions about the selection mechanism. Our approach to estimating the average treatment effect is similar to Lee’s (2009) implementation. We also extend Lee’s truncation strategy to the quantile treatment effects. In particular we assume random assignment of treatment by assuming that the date of the plaintiff’s injury is not determined by whether the case will be governed by the English or American rule. In practice we are assuming that the English rule has no impact on patient safety.

The main benefit of a bound analysis is that we do not need any specific selection equation and hence we do not need to estimate selection to settlement or trial. The bound estimates for treatment effects in Section 6 will be valid under any potential selection mechanisms as long as they are consistent with two conditions we introduce below.

4.1 Exogeneity Condition

One critical issue for our methodology is determining which cases are assigned to the English versus the American rule. The Florida data do not specifically identify which cases potentially involved fee shifting. Typically the law “attaches” to the case at the time of injury.⁷ This would imply that cases with injuries prior to October 1985 were covered by the English rule. There are however exceptions to this rule. If the plaintiff successfully argues that he or she was not aware of the injury then the law would attach to the case at the date the plaintiff became aware of the injury and not necessarily at the injury date. Alternatively the defense could argue for a different injury date in cases in which medical treatment occurred over an extended time period.

There is some evidence that the courts were flexible in determining fee rules. In Figure 1 we consider cases involving injuries in 1984. The top panel shows the distribution of years that the cases are filed with the court. Clearly most cases are filed within a year of the injury with the vast majority being filed within 3 years. In the bottom panel we plot the month of filing for 1984 injuries when the filing year is 1985. Given that the fee rules returned to the American rule in October of 1985, the spike in filings in August and September suggest that plaintiffs were aiming to increase the likelihood that their case used the English rule. In other words, by expediting filing, plaintiffs acted as if they believed

⁷See *MORALES v. SCHERER* No. 4-86-1959.528 So.2d 1 (1988) for a discussion of the precedential cases on when Florida law attaches to an injury. Specifically *MORALES* invalidated a retrospective application of the repeal of section 768.56 and awarded \$120,000 in fees to plaintiffs in a case resolved in 1988.

that they could influence the likelihood that a case is assigned the English rule even though the injury already occurred in the English rule period and hence would have been assigned to that fee rule. This would not make sense if the injury date strictly determined the fee rules. What the spike in Figure 1 implies is that cases within a year of the change back to the American rule may have the most ability to manipulate the filing date in hopes of influencing the fee rules assigned by the courts.

Figure 1: Distribution of years and months of lawsuit when injury year is 1984.

A similar, if less dramatic, pattern can be seen in Figure 2 where we consider cases involving injuries in 1979. The law changed to the English rule in July of 1980, and we observe that plaintiffs file their cases in advance of the switch to the English rule.

Figure 2: Distribution of years and months of lawsuit when injury year is 1979.

If we consider 1983 injuries, in the middle of the English rule period and when repeal was not actively discussed, we do not find a strong evidence of an August effect. It suggests that parties' ability to delay is not infinite.

Figure 3: Distribution of years and months of lawsuit when injury year is 1983.

A similar pattern can be seen in Figure 4 where we consider cases involving injuries in 1978. In the bottom panel in Figure 4 showing the filing months when injury year is 1978 and lawsuit year is 1980, we see no spike right before the introduction the law. The window for individual involved in litigation to influence which fee distribution rule applied to their case is somewhat limited.

Figure 4: Distribution of years and months of lawsuit when injury year is 1978.

Figures 1-4 suggest that injury date may not perfectly predict fee rules. In order to assure exogeneity of treatment assignment we restrict our sample and include only cases whose injury and filing date fall entirely to the English or American rule regime. For example, if we have a case whose injury date is August, 1979, but whose filing date is September 1981, we drop the case from the sample. The assumption is that it would be very hard for a plaintiff to argue that they did not know about the injury after they had filed the lawsuit so the fee rules must attach at some point between injury and filing date.

One potential problem with this limitation is that our exclusion criteria can be asymmetrical. For example, of all cases whose injury date is in 1984, we will include those who chose to go to trial earlier (for English rule), but exclude those who chose later (American). In the end, for cases around 1985, we will include more English cases than American ones. The opposite is true for cases around 1980. To avoid this asymmetrical truncation of observations, we will also remove any cases whose injury date is less than one year before the law changes; i.e. all cases whose injury dates are between July, 1979 and June, 1980 and also between October, 1984 and September, 1985.⁸ Although one year window is somewhat arbitrary the results are robust if we change it to one and a half years or two years.⁹ With these exclusion restrictions our assumption is that the assignment of fee allocation rules is exogenous.

Figure 5: Litigation tree.

Another important consideration is role of unilateral drops. To make our presentation as simple as possible, for this section, we assume that drops do not change due to the change in law. Consider Figure 5 which provides a litigation-tree. Clearly a sizable fraction of the cases are dropped without a trial or receiving payment. We are assuming that the English rule does not affect the likelihood a case drops and hence can be treated as exogenous. There is some evidence for this assumption in Figure 3 and Table 1 in which the probability a case is unilaterally dropped without a payment is 0.329 under the English rule versus 0.356 under the American rule. We therefore confine our analysis to the bottom half of the decision tree. That is using cases that were not dropped we begin with whether a case settles and then estimate the impact of the English rule on settlement amounts and trial awards. But these assumptions may be too strong based both on the theoretical models and Hughes and Snyder's findings. Hence, in Section 7, we relax it allowing that drops can be affected by the treatment regimes, and explore its consequence. There we treat the drop/non-drop and settlement/trial as a two-step decision procedure where each step is subject to sample selection.

⁸Information about the potential for a law change was available only one year before the 1980 and 1985 switches. The logic of our approach is that these plaintiff's potentially had knowledge of the law change and were not so close to the end of their statute of limitations that delaying filing until after the law change to improve the chances of being under on regime or another was possible.

⁹An alternative strategy would be to use only cases for which the statute of limitations forced a case to be under one rule or the other. However during the time period in questions the statute of limitations on medical malpractice cases was four years: too long for all put a handful of cases to be forced into one rule or the other.

4.2 Monotone Selection Mechanism

The monotone selection mechanism (Lee (2009)) in our context means that if a defendant and plaintiff would agree to settle under the English rule, then they must agree to settle under the American rule. Although this monotonicity assumption is fundamentally non-testable, here it is predicted by both generally accepted economic models (divergent expectations and asymmetric information).

Suppose that we have a pair of {plaintiff, defendant} whose subjective winning probability, settlement cost, and awards are (P_p, C_p, J) and (P_d, C_d, J) . Recall that from Section 2 the settlement range under the American rule is

$$(P_p - P_d)J \leq C_p + C_d$$

and the settlement range under the English rule is

$$(P_p - P_d)(J + C_p + C_d) \leq C_p + C_d.$$

There are three cases to consider; when $P_p - P_d$ is positive, zero, or negative. In all three cases, one can easily check that if the pair would agree to settle under the English rule, then they must agree to settle under the American rule making the settlement decision monotonic. Since the trial decision is the mirror image of the settlement decision, it also implies that trial decision is monotone.

To be more precise consider the set of possible outcomes, typically called potential outcome notation in the bounds literature. Let D indicate the fee allocation rule such that

$$D = \begin{cases} 1, & \text{English rule} \\ 0, & \text{American rule.} \end{cases}$$

Let S denote whether the litigants settle the case or the settlement negotiations fail and the case ends in trial

$$S = \begin{cases} 1, & \text{pursue trial} \\ 0, & \text{settle.} \end{cases}$$

Combining D and S we have two potential trial indicators S_0 and S_1 . This potential decision notation S_D , $D \in \{0, 1\}$ emphasizes that the fee allocation rule affects the litigant's decision. Thus, if $S_0 = 0$ and $S_1 = 1$, we observe the plaintiff's trial outcome only under the English rule.

Suppose that the outcome is the monetary compensation a plaintiff wins at trial. Let Y_1 be the outcome under English rule and Y_0 be the outcome under American rule. Only

one of two potential outcomes will be observed since a case is tried either under the English or American rule but not both. The observables are (D, S, Y) and they are related to the potential decision and outcome variables through

$$\begin{aligned} S &= D \cdot S_1 + (1 - D) \cdot S_0, \\ Y &= S \cdot \{D \cdot Y_1 + (1 - D) \cdot Y_0\}. \end{aligned}$$

We are ready to state the monotonicity of the trial decision using potential decision variables. It is one of main predictions of the theory in Section 2.

Assumption 4.1 (Monotonicity)

$$S_1 \geq S_0 \text{ with probability one.}$$

The fee shifting rule effects trial decisions in one direction. What is not allowed is a case which takes values $S_0 = 1$ but at the same time $S_1 = 0$. Under this assumption, there are only three distinct groups: ‘never-trials’ is a group of subjects with $S_0 = S_1 = 0$, ‘switchers’ is those $S_0 = 0, S_1 = 1$, and ‘always-trials’ is $S_0 = S_1 = 1$.

Armed with the assumption that assignment to the English rule only effects attrition in one direction, we can place bounds on the average treatment effect for ‘always-trials’. In our case those are cases which would have gone to trial regardless of fee allocation rules. Focusing on the subgroups that are not affected by the treatment status, we can bound the causal impact of the English rule on case quality. Specifically absent selection the impact is measured by whether the average (or median) award or settlement amount higher is under the English or American rule.

Figure 6: Trial Decisions under English and American rules

Figure 6 summarizes the role of the monotonicity assumption on what we can observe. Under the English rule, we observe trial outcomes for both switchers and always-trials (blue shaded area). Under the American rule, we observe trial outcomes only for always-trials. The next assumption is the independence assumption.

Assumption 4.2 (Independence)

$$(Y_1, Y_0, S_1, S_0) \text{ is independent of } D.$$

The independence assumption is satisfied by the exogeneity of the injury date. Note that this assumption does not say that the observed outcomes (Y, S) are independent of D . What assumption 4.2 says is that potential outcomes under different treatment regimes, after the randomness in D is resolved, are independent of the treatment itself. In a typical threshold-crossing type selection model, this assumption amounts to saying that the error terms of the selection and the structural equations are independent of the treatment conditioned on all observed characteristics: a very common assumption in sample selection models.

One main implication of the independence assumption is that proportions of three groups under the English rule remain the same as those under the American rule. In the next section, we exploit this invariance of relative frequencies to find out the proportions of always-trials and switchers.

4.3 Average and Quantile Treatment Effects

This section proposes how to measure the effect of the fee shifting on trial outcomes. The observed outcome Y is either the jury award that plaintiffs won at trial or the trial cost for the defendants before any fee shift. The first effect we want to measure is the average treatment effect for always-trials

$$\Delta = E[Y_1 - Y_0 | S_0 = 1, S_1 = 1].$$

The second quantity of interest is the τ -th quantile treatment effect for always-trials

$$\Upsilon(\tau) = Q_{Y_1 | S_0=1, S_1=1}(\tau) - Q_{Y_0 | S_0=1, S_1=1}(\tau).$$

These quantities are not exactly identified, but the range of their possible values can be identified. To do so, define p , the normalized difference in fractions of cases going to trial under English and American rules

$$p = \frac{\Pr(S = 1 | D = 1) - \Pr(S = 1 | D = 0)}{\Pr(S = 1 | D = 1)}.$$

Intuitively, this fraction measures the relative numbers of switchers compared to the number of always trials,

$$p = \frac{\text{number of switchers}}{\text{number of always trials} + \text{number of switchers}}.$$

Let $F_{Y|D=1,S=1}$ be the cdf of Y given $D = 1, S = 1$ and let $y_q = F_{Y|D=1,S=1}^{-1}(q)$ be the q -th quantile of the conditional distribution. The next lemma provides the sharp lower and upper bounds for the average treatment effect, originally obtained by Lee (2009).

Lemma 4.3 (Bounds for the Average Effect) *Assume the Monotonicity and Independence conditions. The lower bound for the average treatment effect is*

$$\Delta^{LB} = E[Y|D = 1, S = 1, Y \leq y_{1-p}] - E[Y|D = 0, S = 1].$$

The upper bound is

$$\Delta^{UB} = E[Y|D = 1, S = 1, Y \geq y_p] - E[Y|D = 0, S = 1].$$

These bounds are sharp in the sense that they provide the shortest bound that is consistent with the observed data under given assumptions.

The next proposition provides the sharp lower and upper bounds for the quantile treatment effect. Let $Q_{Y|D=1,S=1}(\cdot)$ be the quantile functions of Y given $D = 1, S = 1$ and define $Q_{Y|D=0,S=1}(\cdot)$ similarly.

Proposition 4.4 (Bounds for the Quantile Effects) *Assume the Monotonicity and Independence conditions. The lower bound for the τ -th quantile treatment effect is*

$$\Upsilon(\tau)^{LB} = Q_{Y|D=1,S=1}((1-p)\tau) - Q_{Y|D=0,S=1}(\tau).$$

The upper bound for the τ -th quantile treatment effect is

$$\Upsilon(\tau)^{UB} = Q_{Y|D=1,S=1}(p + (1-p)\tau) - Q_{Y|D=0,S=1}(\tau).$$

These bounds are sharp in the sense that they provide the shortest bound that is consistent with the observed data under given assumptions.

To understand intuitions behind the above results, let us focus on the lower bound of the average effect, Δ^{LB} . Other objects can be understood similarly. First observe that under the American rule, it is only always-trials which would choose to go to trial, so the conditioning set $\{S_0 = 1, S_1 = 1\}$ is exactly identified by $\{D = 0, S = 1\}$. This explains the second term in Δ^{LB} . Under the English rule, conditioning set $\{D = 1, S = 1\}$ is comprised

of two subgroups; switchers $\{S_0 = 0, S_1 = 1\}$ and always-trials $\{S_0 = 1, S_1 = 1\}$. The difference in group composition is due to the monotonicity condition. Although we do not know which type a specific case falls into (“i.e. would a specific case be a switcher?”), we do know that the subgroup $\{D = 1, S = 1\}$ that chooses to go to trial under the English rule has $100p\%$ of switchers and $100(1-p)\%$ of always-trials. Focusing on always-trials, the worst case for them is that the best $100p\%$ of outcomes belong to the switchers. Operationally this means that to calculate the lower bound for the average effect of always-trials, we truncate the upper $100p\%$ of outcomes and calculate the “ p -trimmed” mean. This explains the first term in Δ^{LB} . For a quantile effect, the equivalent trimmed version of the τ -th quantile leads to the first term in $\Upsilon(\tau)^{LB}$. The upper bounds can be understood using the same logic. The best case for always-trials is when the the worst $100p\%$ of outcomes belong to the switchers. So the only difference in the upper bound is that we truncate the lower $100p\%$ of outcomes.

4.4 Out-of-court Settlement Outcomes

The methods used to analyze the out-of-court settlement outcomes are close to what we discussed for the trial outcomes, but there is one significant difference: for the settlement outcomes what we can consistently measure is the effect for never-trials. This is the group of subjects whose decision are not affected by fee shifting. Operationally, this means that we will truncate outcomes under the American rule.

The monotonicity of the settlement decision implies that under the English rule, we observe settlement outcomes only for never-trials. Under the American rule, we observe settlement outcomes for both switchers and never-trials. The treatment status does not change the settlement decision of never-trials. Figure 7 summarizes the role of the monotonicity assumption on what we can observe when it concerns the settlement outcome.

Figure 7: Settlement Decisions under English and American rules

Let Z_D , $D \in \{0, 1\}$ be the potential outcomes a plaintiff receives through an out-of-court settlement, so Z_1 is the settlement outcome under English rule and Z_0 is the outcome under American rule. The outcome in question can be the settlement amounts or the legal costs for defendants from the case when it is settled before trial. As before, we observe either Z_1 or Z_0 but not both.

The average treatment effects of out-of-court settlements for never-trials is

$$\Delta_c = E[Z_1 - Z_0 | S_0 = 0, S_1 = 0].$$

The τ -th quantile treatment effect of out-of-court settlements for never-trials is

$$\Upsilon_c(\tau) = Q_{Z_1|S_0=0, S_1=0}(\tau) - Q_{Z_0|S_0=0, S_1=0}(\tau).$$

To place a bound on these quantities, define

$$p_c = \frac{\Pr(S = 0 | D = 0) - \Pr(S = 0 | D = 1)}{\Pr(S = 0 | D = 0)},$$

which defines the normalized fraction of switchers compared to never trials. This fraction p_c is typically small in our analysis, so the bound on settlement outcomes can be very tight.

Lemma 4.5 (Bounds of ATE for Settlement Outcomes) *Assume the Monotonicity and Independence conditions. The lower bound for the average treatment effect is*

$$\Delta_c^{LB} = E[Z | D = 1, S = 0] - E[Z | D = 0, S = 0, Z \geq z_{p_c}].$$

The upper bound is

$$\Delta_c^{UB} = E[Z | D = 1, S = 0] - E[Z | D = 0, S = 0, Z \leq z_{1-p_c}].$$

These bounds are sharp in the sense that they provide the shortest bound that is consistent with the observed data under given assumptions.

For the settlement decision we observe only never trials when $D = 1$, but observe both switchers and never trials when $D = 0$. So the best and worst case bounds for never-trials can be obtained by truncating outcomes under the American rule. The next proposition states the sharp bounds for the quantile treatment effect.

Proposition 4.6 (Bounds of QTE for Settlement Outcomes) *Assume the Monotonicity and Independence conditions. The lower bound for the τ -th quantile treatment effect is*

$$\Upsilon(\tau)^{LB} = Q_{Z|D=1, S=0}(\tau) - Q_{Z|D=0, S=0}(p_c + (1 - p_c)\tau).$$

The upper bound is

$$\Upsilon(\tau)^{UB} = Q_{Z|D=1, S=0}(\tau) - Q_{Z|D=0, S=0}((1 - p_c)\tau).$$

These bounds are sharp in the sense that they provide the shortest bound that is consistent with the observed data under given assumptions.

The defendant's litigation cost at settlement can be analyzed similarly.

5 Estimation and Inference

5.1 Estimation

This section explains how to calculate quantities defined in Section 4. We first explain how to calculate the bounds on the average treatment effects of trial outcomes. The estimation can be divided into three steps; we first calculate the truncation fraction \hat{p} , then the sample quantile \hat{y}_q , and finally the lower and upper bounds as trimmed means.

The fraction of switchers, i.e., the fraction of truncation, can be calculated by

$$\hat{p} = \left(\frac{\sum_{i=1}^n S_i D_i}{\sum_{i=1}^n D_i} - \frac{\sum_{i=1}^n S_i (1 - D_i)}{\sum_{i=1}^n (1 - D_i)} \right) / \left(\frac{\sum_{i=1}^n S_i D_i}{\sum_{i=1}^n D_i} \right).$$

The q -th sample quantile of the conditional distribution $F_{Y|D=1,S=1}$ is given by

$$\hat{y}_q = \min \left\{ y : \frac{\sum_{i=1}^n S_i \cdot D_i \cdot I(Y_i \leq y)}{\sum_{i=1}^n S_i \cdot D_i} \geq \hat{q} \right\}.$$

The lower and upper bounds of the ATE can be obtained by

$$\begin{aligned} \hat{\Delta}^{LB} &= \frac{\sum_{i=1}^n Y_i \cdot D_i \cdot S_i \cdot I(Y_i \leq \widehat{y}_{1-\hat{p}})}{\sum_{i=1}^n D_i \cdot S_i \cdot I(Y_i \leq \widehat{y}_{1-\hat{p}})} - \frac{\sum_{i=1}^n Y_i \cdot S_i \cdot (1 - D_i)}{\sum_{i=1}^n S_i \cdot (1 - D_i)}, \\ \hat{\Delta}^{UB} &= \frac{\sum_{i=1}^n Y_i \cdot D_i \cdot S_i \cdot I(Y_i \geq \widehat{y}_{\hat{p}})}{\sum_{i=1}^n D_i \cdot S_i \cdot I(Y_i \geq \widehat{y}_{\hat{p}})} - \frac{\sum_{i=1}^n Y_i \cdot S_i \cdot (1 - D_i)}{\sum_{i=1}^n S_i \cdot (1 - D_i)}. \end{aligned}$$

To calculate the bounds for the quantile treatment effects, we only need two steps. First we calculate truncation fraction \hat{p} as before, then for the lower bound we calculate the lower $(1 - \hat{p})\tau$ -th sample quantile. In short notations, what we need to do is to get

$$\begin{aligned} \hat{Y}(\tau)^{LB} &= \widehat{Q}_{Y|D=1,S=1}((1 - \hat{p})\tau) - \widehat{Q}_{Y|D=0,S=1}(\tau), \\ \hat{Y}(\tau)^{UB} &= \widehat{Q}_{Y|D=1,S=1}(\hat{p} + (1 - \hat{p})\tau) - \widehat{Q}_{Y|D=0,S=1}(\tau). \end{aligned}$$

What it means operationally is that to calculate the lower bound, we find two sample quantiles

$$\widehat{Q}_{Y|D=1,S=1}((1 - \hat{p})\tau) = \min \left\{ y : \frac{\sum_{i=1}^n S_i \cdot D_i \cdot I(Y_i \leq y)}{\sum_{i=1}^n S_i \cdot D_i} \geq (1 - \hat{p})\tau \right\}$$

and

$$\widehat{Q}_{Y|D=0,S=1}(\tau) = \min \left\{ y : \frac{\sum_{i=1}^n S_i \cdot (1 - D_i) \cdot I(Y_i \leq y)}{\sum_{i=1}^n S_i \cdot (1 - D_i)} \geq \tau \right\}.$$

The same method applies to the upper bound. It may appear paradoxical at first that calculating quantile effects is simpler than the average effect. But it stems from a simple fact that the lower (upper) bound of a quantile is given by another quantile. So all we need to do to bound the effect at the τ -th quantile is to calculate $(1 - p)\tau$ -th quantile. This simplicity in quantile estimation has additional merit when we consider inference.

Now we explain how to calculate bounds of the treatments effects for the settlement outcomes. We calculate the truncation fraction by

$$\widehat{p}_c = \left(\frac{\sum_{i=1}^n (1 - S_i)(1 - D_i)}{\sum_{i=1}^n (1 - D_i)} - \frac{\sum_{i=1}^n (1 - S_i)D_i}{\sum_{i=1}^n D_i} \right) / \left(\frac{\sum_{i=1}^n (1 - S_i)(1 - D_i)}{\sum_{i=1}^n (1 - D_i)} \right).$$

The q_c -th sample quantile of the conditional distribution $F_{Z|D=0,S=0}$ is given by

$$\widehat{y}_{q_c} = \min \left\{ z : \frac{\sum_{i=1}^n (1 - S_i) \cdot (1 - D_i) \cdot I(Z_i \leq z)}{\sum_{i=1}^n (1 - S_i) \cdot (1 - D_i)} \geq q_c \right\}.$$

The lower and upper bounds of the ATE are

$$\begin{aligned} \widehat{\Delta}_c^{LB} &= \frac{\sum_{i=1}^n Y_i \cdot D_i \cdot (1 - S_i)}{\sum_{i=1}^n D_i \cdot (1 - S_i)} - \frac{\sum_{i=1}^n Z_i \cdot (1 - D_i) \cdot (1 - S_i) \cdot I(Z_i \geq \widehat{y}_{\widehat{p}})}{\sum_{i=1}^n (1 - D_i) \cdot (1 - S_i) \cdot I(Z_i \geq \widehat{y}_{\widehat{p}_c})} \\ \widehat{\Delta}_c^{UB} &= \frac{\sum_{i=1}^n Z_i \cdot D_i \cdot (1 - S_i)}{\sum_{i=1}^n D_i \cdot (1 - S_i)} - \frac{\sum_{i=1}^n Y_i \cdot (1 - D_i) \cdot (1 - S_i) \cdot I(Z_i \leq \widehat{y}_{1-\widehat{p}_c})}{\sum_{i=1}^n (1 - D_i) \cdot (1 - S_i) \cdot I(Z_i \leq \widehat{y}_{1-\widehat{p}_c})}. \end{aligned}$$

These three steps allow us to estimate the bounds of the average treatment effect. For quantile effects, the lower and upper bounds are given by sample quantiles

$$\begin{aligned} \widehat{\Upsilon}(\tau)^{LB} &= \widehat{Q}_{Z|D=1,S=0}(\tau) - \widehat{Q}_{Z|D=0,S=0}(\widehat{p}_c + (1 - \widehat{p}_c)\tau) \\ \widehat{\Upsilon}(\tau)^{UB} &= \widehat{Q}_{Z|D=1,S=0}(\tau) - \widehat{Q}_{Z|D=0,S=0}((1 - \widehat{p}_c)\tau). \end{aligned}$$

To actually calculate the lower bound, the τ -th sample quantile for outcomes under the English rule is given by

$$\widehat{Q}_{Z|D=1,S=0}(\tau) = \min \left\{ z : \frac{\sum_{i=1}^n D_i \cdot (1 - S_i) \cdot I(Z_i \leq z)}{\sum_{i=1}^n D_i \cdot (1 - S_i)} \geq \tau \right\}$$

and the lower bound of outcomes under the American rule can be calculated by

$$\widehat{Q}_{Z|D=0,S=0}(\widehat{p}_c + (1 - \widehat{p}_c)\tau) = \min \left\{ z : \frac{\sum_{i=1}^n S_i \cdot D_i \cdot I(Z_i \leq z)}{\sum_{i=1}^n S_i \cdot D_i} \geq \widehat{p}_c + (1 - \widehat{p}_c)\tau \right\}.$$

The upper bound can be estimated similarly.

5.2 Inference

Any estimate of a bound using sample information inherently has a degree of uncertainty and we need a way to measure the sampling variation in our estimate. One method is to find the large sample approximation of the variance of the estimate. From now on, we use a subscript 0 to denote the true value of a parameter. For the average treatment effect, the following result is available in Lee (2009).

Lemma 5.1 (Asymptotic Normality for the Average Effects) *Let*

$$\begin{aligned} \mu^{LB} &= E[Y|D = 1, S = 1, Y \leq y_{1-p_0}], \\ \mu^{UB} &= E[Y|D = 1, S = 1, Y \geq y_{p_0}], \\ \varsigma^{LB} &= \text{Var}(Y|D = 1, S = 1, Y \leq y_{1-p_0}), \\ \varsigma^{UB} &= \text{Var}(Y|D = 1, S = 1, Y \geq y_{p_0}), \\ \alpha_0 &= \text{Pr}(S = 1|D = 0). \end{aligned}$$

Assume the Monotonicity and Independence conditions. Let \bar{p} be a positive constant strictly less than one. Suppose that $0 < p_0 \leq \bar{p}$ and $\alpha_0 > 0$, then

$$\begin{aligned} \sqrt{n} \left(\widehat{\Delta}^{LB} - \Delta_0^{LB} \right) &\Rightarrow N(0, V^{LB} + V^C), \\ \sqrt{n} \left(\widehat{\Delta}^{UB} - \Delta_0^{UB} \right) &\Rightarrow N(0, V^{UB} + V^C), \end{aligned}$$

where

$$\begin{aligned} V^{LB} &= \frac{\varsigma^{LB}}{E[SD](1-p_0)} + \frac{(y_{1-p_0} - \mu^{LB})^2 p_0}{E[SD](1-p_0)} + \left(\frac{y_{1-p_0} - \mu^{LB}}{1-p_0} \right)^2 \cdot V^p, \\ V^{UB} &= \frac{\varsigma^{UB}}{E[SD](1-p_0)} + \frac{(y_{p_0} - \mu^{UB})^2 p_0}{E[SD](1-p_0)} + \left(\frac{y_{p_0} - \mu^{UB}}{1-p_0} \right)^2 \cdot V^p, \\ V^p &= (1-p_0)^2 \left(\frac{1 - \frac{\alpha_0}{1-p_0}}{E[D] \left(\frac{\alpha_0}{1-p_0} \right)} + \frac{1 - \alpha_0}{(1 - E[D])\alpha_0} \right), \\ V^C &= \frac{\text{var}(Y|D = 0, S = 1)}{E[S(1-D)]}. \end{aligned}$$

We explain the intuition behind the variance formula using the lower bound. The variance of the upper bound can be understood similarly. The variance has two components, V^{LB} and V^C . The former is the variance of the first term in $\widehat{\Delta}^{LB}$ and the latter is the variance of its second term. The term V^{LB} in turn has three components. The first term is the variance of a trimmed-mean if we knew the true value of the quantile y_{1-p_0} and the true value of the fraction p_0 . Since those two terms need to be estimated, we have the next two terms; the second term reflects the extra uncertainty coming from the fact that y_{1-p_0} is estimated, and the third term is from the extra uncertainty due to the fact that we need to estimate p_0 . The first term in V^{LB} has a term $E[SD](1-p_0)$ correcting for the effective sample size. We have further comments regarding this correction term after the next proposition.

For the quantile treatment effects, we have the following result. As far as we know, this result is new in the literature.

Proposition 5.2 (Asymptotic Normality for the Quantile Effects) *Let*

$$\begin{aligned} q^{LB} &= Q_{Y|D=1, S=1}((1-p_0)\tau) \\ q^{UB} &= Q_{Y|D=1, S=1}(p_0 + (1-p_0)\tau). \end{aligned}$$

Assume the Monotonicity and Independence conditions. Let \bar{p} be a positive constant strictly less than one. Suppose that $0 < p_0 \leq \bar{p}$ and $\alpha_0 > 0$, then

$$\begin{aligned} \sqrt{n} \left(\widehat{\Upsilon}(\tau)^{LB} - \Upsilon_0(\tau)^{LB} \right) &\Rightarrow N(0, W^{LB} + W^C), \\ \sqrt{n} \left(\widehat{\Upsilon}(\tau)^{UB} - \Upsilon_0(\tau)^{UB} \right) &\Rightarrow N(0, W^{UB} + W^C), \end{aligned}$$

where

$$\begin{aligned} W^{LB} &= \frac{\tau(1-p_0) \cdot (1-\tau(1-p_0))}{f(q^{LB}|S=1, D=1)^2 E[SD]} + \frac{\tau^2}{f(q^{LB}|S=1, D=1)^2} W^P \\ W^{UB} &= \frac{(p_0 + \tau(1-p_0)) \cdot (1-(p_0 + \tau(1-p_0)))}{f(q^{UB}|S=1, D=1)^2 E[SD]} + \frac{(1-\tau)^2}{f(q^{UB}|S=1, D=1)^2} W^P, \\ W^P &= \left\{ \frac{\frac{\alpha_0}{1-p_0} \left(1 - \frac{\alpha_0}{1-p_0}\right)}{\left(\frac{\alpha_0}{(1-p_0)^2}\right)^2 E[D]} + \frac{\alpha_0(1-\alpha_0)}{\left(\frac{\alpha_0}{1-p_0}\right)^2 (1-E[D])} \right\}, \\ W^C &= \frac{\tau \cdot (1-\tau)}{f(q_\tau|S=1, D=0)^2 E[S(1-D)]}. \end{aligned}$$

We again explain the intuition behind the variance formulas using the lower bound. The second term in variance, W^C , is due to the second term in the lower bound. It is the variance of the τ -th quantile of the conditional distribution of Y for a group with $S = 1, D = 1$. The first term in W^{LB} is the variance of $\tau(1 - p_0)$ -th quantile of the conditional distribution of Y for a group with $S = 1, D = 1$, if p_0 is known. The term $E[SD]$ in the denominator corrects for the effective sample size because to calculate this quantile, we only use observations with $S = 1, D = 1$. The second term is due to the fact that the quantile index $\tau(1 - p_0)$ is in fact unknown and has to be estimated. This extra uncertainty increases the uncertainty of the quantile estimate. Compared to the average treatment effect, we have one less term to estimate. It is because we have one less nuisance parameter to estimate in order to calculate the bounds.

One interesting fact is that the correction term in the denominator for the effective sample size is $E[SD](1 - p_0)$ for the average treatment effect, but $E[SD]$ for the quantile treatment effect. The difference arises because to calculate a trimmed mean, we start with a subgroup with $S = 1, D = 1$, then we drop the lowest $100p_0\%$ observations. So the effective sample size to calculate the trimmed mean is indeed $100E[SD](1 - p_0)\%$ of the total sample size. For the quantile, we use the same subgroup with $S = 1, D = 1$, then calculate $\tau(1 - p_0)$ -th quantile of that subgroup, without dropping any additional observations. So the effective sample size for a quantile bound is $100E[SD]\%$ of the total sample size.

The assumption that p_0 is strictly less than one can be understood once we recognize that $1 - p_0$ is the relative size of always-trials. If it is zero, the group we are interested in will be empty.

Concerning the settlement outcomes, we have the following results. The next lemma which corresponds to Lemma 5.1 provides the expressions for the asymptotic variances when it comes to the average treatment effect for a settlement outcome.

Lemma 5.3 (The Average Effects of the Settlement Outcome) *Let*

$$\begin{aligned}\mu_c^{LB} &= E[Z|D = 0, S = 0, Z > z_{p_0}], \\ \mu_c^{UB} &= E[Z|D = 0, S = 0, Z \leq z_{1-p_0}], \\ \varsigma_c^{LB} &= Var(Z|D = 0, S = 0, Z > z_{p_0}), \\ \varsigma_c^{UB} &= Var(Z|D = 0, S = 0, Z \leq z_{1-p_0}), \\ \alpha_{c,0} &= Pr(S = 0|D = 1).\end{aligned}$$

Assume the Monotonicity and Independence conditions. Let \bar{p} be a positive constant strictly less than one. Suppose that $0 < p_{c,0} \leq \bar{p}$ and $\alpha_{c,0} > 0$, then

$$\begin{aligned}\sqrt{n} \left(\widehat{\Delta}_c^{LB} - \Delta_{c,0}^{LB} \right) &\Rightarrow N(0, V_c^{LB} + V_c^C), \\ \sqrt{n} \left(\widehat{\Delta}_c^{UB} - \Delta_{c,0}^{UB} \right) &\Rightarrow N(0, V_c^{UB} + V_c^C),\end{aligned}$$

where

$$\begin{aligned}V_c^{LB} &= \frac{\varsigma_c^{LB}}{E[(1-S)(1-D)](1-p_{c,0})} + \frac{(z_{p_{c,0}} - \mu_c^{LB})^2 p_{c,0}}{E[(1-S)(1-D)](1-p_{c,0})} + \left(\frac{z_{p_0} - \mu_c^{LB}}{1-p_{c,0}} \right)^2 \cdot V_c^p, \\ V_c^{UB} &= \frac{\varsigma_c^{UB}}{E[(1-S)(1-D)](1-p_{c,0})} + \frac{(z_{1-p_{c,0}} - \mu_c^{UB})^2 p_{c,0}}{E[(1-S)(1-D)](1-p_{c,0})} + \left(\frac{z_{1-p_{c,0}} - \mu_c^{UB}}{1-p_{c,0}} \right)^2 \cdot V_c^p, \\ V_c^p &= (1-p_{c,0})^2 \left(\frac{1 - \frac{\alpha_{c,0}}{1-p_{c,0}}}{(1-E[D]) \left(\frac{\alpha_{c,0}}{1-p_{c,0}} \right)} + \frac{1 - \alpha_{c,0}}{E[D]\alpha_{c,0}} \right), \\ V_c^C &= \frac{\text{var}(Z|D=1, S=0)}{E[(1-S)D]}.\end{aligned}$$

For the quantile treatment effect of a settlement outcome, we have the following proposition.

Proposition 5.4 (Quantile Effects for Settlement Outcome) *Let*

$$\begin{aligned}q_c^{LB} &= Q_{Z|D=0, S=0}(p_{c,0} + (1-p_{c,0})\tau) \\ q_c^{UB} &= Q_{Z|D=0, S=0}((1-p_{c,0})\tau).\end{aligned}$$

Assume the Monotonicity and Independence conditions. Let \bar{p} be a positive constant strictly less than one. Suppose that $0 < p_{c,0} \leq \bar{p}$ and $\alpha_{c,0} > 0$, then

$$\begin{aligned}\sqrt{n} \left(\widehat{\Upsilon}_c(\tau)^{LB} - \Upsilon_{c,0}(\tau)^{LB} \right) &\Rightarrow N(0, W_c^{LB} + W_c^C), \\ \sqrt{n} \left(\widehat{\Upsilon}_c(\tau)^{UB} - \Upsilon_{c,0}(\tau)^{UB} \right) &\Rightarrow N(0, W_c^{UB} + W_c^C),\end{aligned}$$

where

$$\begin{aligned}
W_c^{LB} &= \frac{(p_{c,0} + \tau(1 - p_{c,0})) \cdot (1 - (p_{c,0} + \tau(1 - p_{c,0})))}{f(q_c^{LB}|S=0, D=0)^2 E[(1-S)(1-D)]} + \frac{(1-\tau)^2}{f(q_c^{LB}|S=0, D=0)^2} W_c^P, \\
W_c^{UB} &= \frac{\tau(1 - p_{c,0}) \cdot (1 - \tau(1 - p_{c,0}))}{f(q_c^{UB}|S=0, D=0)^2 E[(1-S)(1-D)]} + \frac{\tau^2}{f(q_c^{UB}|S=0, D=0)^2} W_c^P \\
W_c^P &= \left\{ \frac{\frac{\alpha_{c,0}}{1-p_{c,0}} \left(1 - \frac{\alpha_{c,0}}{1-p_{c,0}}\right)}{\left(\frac{\alpha_{c,0}}{(1-p_{c,0})^2}\right)^2 (1 - E[D])} + \frac{\alpha_{c,0}(1 - \alpha_{c,0})}{\left(\frac{\alpha_{c,0}}{1-p_{c,0}}\right)^2 E[D]} \right\}, \\
W_c^C &= \frac{\tau \cdot (1 - \tau)}{f(q_\tau|S=0, D=1)^2 E[(1-S)D]}.
\end{aligned}$$

6 Empirical Results

In this section we turn to the estimates of the bounds of the treatment effect of the English rule.

6.1 Probabilities of Drop, Settle, Litigation, and Plaintiff's winning

Table 1 reports the probability that a case is dropped, settled, goes to trial, and of plaintiff winning. Once a claim is begun, a plaintiff may choose to drop the claim or pursue it further. The dropping probabilities conditional on filing are 0.329 under the English rule and 0.356 under the American rule. The dropping probability is slightly lower under the English rule than under the American rule, although the difference is small. Snyder and Hughes (1990) report that in their sample the drop probability is 0.539 under the English rule and 0.435 under the American rule. One difference is the magnitude of probabilities. The drop probability in our sample is smaller because our sample only includes cases that were filed with the court.¹⁰ Because filing involves a fee and the production of the necessary court documents, it is not surprising that once filed, the conditional probability a plaintiff unilaterally drops the case goes down significantly. Another difference is that the drop probability in Snyder and Hughes (1990) under American rule is lower than English rule, contrary to the theoretical prediction and contrary to our estimate.

This difference may arise due to the differences in sample periods or sample restrictions. To test this possibility we compute the drop probabilities when we restrict our sample period October, 1985 to June, 1988 just as Snyder and Hughes (1990) did for their FDI sample,

¹⁰Our definition of the English rule requires that we know both injury date and filing date hence we largely ignore non-filed cases in the analysis that follows.

and we use injury dates as the sole determinant classifying whether a case is governed by English or American rule. We further include cases that were not filed in the comparison sample (as Hughes and Snyder do in their estimates and we do not). The drop probabilities in this more inclusive sample are 0.496 and 0.577 under the English and American rule respectively. Although closer to the magnitudes in Hughes and Snyder we still find higher drop rates for American rule cases suggesting that our finding that the drop probability goes up under the American rule is robust to alternative sample periods and sample restrictions.

Among claims that are not dropped, the settlement probabilities are 0.742 under the English rule and 0.794 under American rule. The direction of the difference is consistent with the monotonicity assumption (based on the theory in Section 2 which motivates it) in that the settlement probability is higher in the American rule cases. In contrast, Snyder and Hughes (1990) report that the conditional probability of settlement is 0.876 under the English rule and 0.811 under the American rule suggesting the settlement probability is lower under the American rule. When we again apply the same sample restrictions used above to compare for the drop probability, we find the conditional probabilities equal to 0.726 and 0.825 under the English and American rule cases. Again the magnitudes approach Hughes and Snyder but the direction of the effect in our sample is robust to alternative sample restrictions.¹¹

Among claims that are not dropped, the trial probabilities are 0.257 under the English and 0.205 under the American rule. This is not surprising since it is the mirror image of the settlement probability. This means that the sample trimming proportion for the trial outcome \hat{p} is 0.203. Similarly the sample trimming proportion for the settlement outcome \hat{p}_c is 0.065. The winning probability for plaintiffs is slightly higher under the English rule (0.102) than under the American rule (0.088). When we further condition on bench or jury trial cases, the probability of a plaintiff winning gets higher: 0.2519 for the English rule and 0.1712 for the American rule. Hughes and Snyder (1995) report that the probabilities of a plaintiff winning are 0.216 and 0.114 under English and American rule respectively.

¹¹The difference may be due to the fact that we apply different definition of a trial. Hughes and Snyder (1990) appear to use only cases decided by a judge or a jury after a trial has started. Our sample includes cases with a summary judgment ruling by judges. It is also possible that these differences may reflect the trend of dropping and settlement probabilities over time. Hughes and Snyder (1990) include a sample of cases provided by the NAICS that contains cases from the mid-1970s, which were all classified as American rule cases. Since the settlement rate was lower (the trial rate was higher) in the earlier time periods independent of fee allocation regime, by including earlier periods, Hughes and Snyder (1990) may lower their overall rate of settlement for American rule cases. Unfortunately the NAICS data is no longer available and we are utilizing the less detailed FIC data for the pre-English rule period (see Helland, Klick and Tabarrok 2005).

In contrast to our previous discussion the direction of the effect is the same although of a different magnitude.

6.2 Average and Quantile Effects of Trial Outcomes

Table 2 reports the average and median effects of the English rule. The first half of the table presents the results for the trial outcomes. They include the dollar value of payments to the plaintiff at trial and the trial cost for defendants. The second half of the table presents results from settlement outcomes including the monetary compensation that plaintiffs received through out-of-court settlement and the defendant costs when cases ended in settlement. For the trial outcomes, we obtain bounds for the treatment group (cases under the English rule). For the settlement, we obtain bounds for the control group (cases under the American rule).

Table 2: Average and Median Effects

We find that the English rule increases the dollars amounts that plaintiffs are awarded at trial. The average effect is inconclusive; the lower and upper bound of the average trial awards under the English rule are \$420,813 and \$1,166,449, while the average awards under the American rule is \$570,414. The difference of these two quantities (reported in the last column) is the average treatment effect, which ranges from -\$149,601 to \$596,035. This bound on the average treatment effect includes zero. Following Imbens and Manski (2004) we also report the 95% confidence intervals of the treatment effect.

Some discussion of inference in bounds is warranted. The bounds in Table 2 represent the best and worst case scenarios for the impact of selection. Thus if the upper bound of the English rule is greater than the average award at trial under the American rule we could find an effect under the most mild form of selection. The difference between the upper bound of the English rule (\$1,166,449) and the American rule (\$570,414) mean award is the upper bound of the average treatment effect (\$596,035) in brackets in column 4. If the upper bound of the effect is below zero, we cannot claim a positive treatment effect even under the most favorable selection scenario. The lower bound is similar. The lower bound of the average treatment effect (-\$149,601) in column 4 is the difference between the lower bound of the English rule (\$420,813) and the American rule (\$570,414) mean award. If the lower bound is above zero, we can claim a positive treatment effect even under the least favorable selection scenario. Thus if the confidence interval is strictly above zero, we are

quite confident that the English rule has an effect and that this effect is not due to selection. The 95% confidence interval in parentheses in column 4 is the confidence interval for the estimated bounds of the treatment effect.

Snyder and Hughes (1995) report that the average English-rule judgment, conditional on a plaintiff verdict, is \$321,346 (in 1980 dollars) versus \$215,828 for American rule cases. After adjusting for inflation, their figures amount to \$840,340 and \$564,403 (2011 dollars) for English and American claims rule respectively. Their point estimate for the American rule is similar to ours, but their point estimate of the English rule is closer to the upper bound of our estimates. This may imply the importance of correcting selection although given the different sample restrictions such comparisons should be made with caution. If we ignore the sample selection all together, their results are very close to ours as reported in Table 1. While the mean effect is inconclusive, the median effect is significant; under the English rule, it ranges from \$334,639 to \$685,172 in 2011 dollars, while under the American rule, it is \$225,071. The median treatment effect ranges from \$109,567 to \$460,101. This supports a claim that the median jury award under the English rule went up significantly compared to cases in American rule.

Figure 8: Quantile Effects of Jury Awards.

A more complete picture of the effect of fee shifting on jury awards can be seen through the quantile effects. The differential expectations model would predict that, all else held constant, the impact of English rule should be greater for cases with a larger potential award J . The intuition is that both the English rule and larger stakes in the case magnify optimism meaning that as the stakes increase we should observe a greater impact from the English rule. In fact, as shown in Figure 8, we find that the English rule has the largest impact on the bottom 85% of the distribution. In the first panel of Figure 8 the solid maroon line shows quantiles of trial awards under the American rule. The gray shaded area shows the bounds of quantiles of trial awards under the English rule. We find that the strongest effect of English rule is on small and medium quantiles. At the high quantiles, although the lower bound under the English rule is very close to the American rule, the effect becomes inconclusive. Overall, Figure 8 shows that the size of judgments is bigger under the English rule than under the American rule throughout the distribution. This is consistent with findings in Hughes and Snyder (1995) (see their Table 5).

The second panel of Figure 8 shows the quintile treatment effects (QTEs) (the dashed maroon lines) along with the 95% confidence intervals (the two-dashed purple lines). The difference between the upper bound and the quantile under the American rule is consistently above zero. The difference between the lower bound and the quantile under the American rule is significantly above zero at the middle of the distribution and slightly above or at zero at the top quantiles. The confidence intervals say that the quantile effects at the middle of the outcome distribution prove to be significant beyond sampling uncertainty.

In row 2 and 3 of Table 2 we present the bounds on the effect of the English rule on the defendant’s litigation costs at trial, before fee shifting. We consider two versions of the defendant’s cost of going to trial. The first uses the cost of all cases that do not settle whether the case is resolved by a jury or bench trial or a summary judgment. This number may be problematic since summary judgment rulings often come early in the litigation process before the parties have had time to invest significant resources in the case (i.e. attorney’s fees, expert witnesses, etc.). Thus it may be that our measure masks the impact of the English rule simply because some of the cases are decided by the courts before the fee shifting rules have time to manifest themselves on costs. For this reason, in row 3, we also estimate the model using only cases decided by a jury or bench trial.

In Table 2, the average trial cost (for all non-settled cases) under the English rule ranges from \$21,478 to \$52,976, while the average cost under the American rule is \$45,995 which does not suggest that the English rule significantly increases the litigation cost. Although the upper bound of the English rule is larger than the American rule average, the confidence interval includes zero. This remains the same in the median effect. Figure 9 shows the quantile effects. Again we do not find strong evidence of an English rule impact. This contrasts with Snyder and Hughes (1990) who do find a statistically significant increase in costs of \$13,214 in 1980 dollars using the Heckman type selection model.

Figure 9: Quantile Effects of Defendant’s Trial Cost (all non-settled cases).

When we consider the defendant’s trial cost conditional bench or jury trials, we see a different picture. Under the heading ‘cost-2’, Table 2 reports the bounds of the treatment effects for defendant’s cost of trials. The average effect is still inconclusive: it ranges from -\$22,096 to \$16,013. The median effect ranges from -\$3,951 and \$18,149. We note that the lower bound is much closer to zero. Although the evidence is not strong enough to draw a certain conclusion, it is still plausible that after selection is accounted for the median

defendant's cost under trials actually went up for cases that used the English rule. The quantile treatment effects in Figure 10 show a similar pattern. The effects are mostly visible at the middle of the distribution. It means that the fee shifting does not increase the defendant's cost much if the cases cost either very little or a lot for defendants, but it does increase the cost for moderately expensive cases.

Figure 10: Quantile Effects of Defendant's Trial Cost.

6.3 Average and Quantile Effects of Settlement Outcomes

In this subsection we turn to the settlements outcomes. As noted above we now place bounds on the American rule and compare the average under the English rule: the reverse of procedure for trials. The average settlement amount that plaintiffs receive in out-of-court settlement is \$321,401 under the English rule and is bounded by \$141,802 and \$268,186. The mean of the English rule is bigger than the upper bound of the American rule, so we conclude that the fee shifting increases the mean settlement amount significantly. We find the same evidence at the median. The median settlement amount for the English rule is \$96,741, while the bounds are \$72,680 and \$92,441 for American rule. When we consider the confidence interval, however, the statistical significance of the median effect disappears although the average effect remains statistically significant.

Figure 11: Quantile Effects of Out-of-court Settlements.

In order to get a more complete picture, in Figure 11, we show the quantile effects of the settlement amounts. There we see that the biggest effects are at higher quantiles, meaning that the largest impact of the fee shifting rules on settlement outcomes is the case where potential stakes are high. At the median the difference between the English rule and the upper bound under the American rule is a modest \$4,299 in 2011 dollars, but at the 97th percentile, the difference is as high as \$482,118.

Finally, we examine the defendant's costs of litigation for the settled cases. At the mean and the median, we do not find any conclusive results. The mean defendant legal cost for settled cases is \$33,535 under the English rule and ranges from \$24,168 to \$34,148 under the American rule. Its median counterpart is \$21,093 for the English rule and \$19,976 to \$23,011 for the American rule. So the evidence is not conclusive at the center of the distribution. In contrast, Snyder and Hughes (1990) find a significant increase under the English rule with of \$7,632 in 1980 dollars.

Figure 12: Quantile Effects of Defendant Litigation Cost for Settled Cases.

In Figure 12 we find that defendant's costs rise at the top end of the cost distribution. We see two possible explanations. One is that improvement in case quality seen at the top end of the settlement distribution is consistent with an increase in the cost of defending these cases. The second possibility is that we are observing the impact of the English rule's implicit subsidy on litigation expenditures. Since both sides believe there is some probability that they will not have to pay their own fees then they will invest more in the case.

7 Extension : Allowing Sample Selection in Drops

This section relaxes an assumption that the drop decision is not affected by fee shifting. We allow both drop and settlement decisions to be influenced by the English rule.

7.1 Two Step Sample Selection Procedure

Let T take 0 if a filed case is dropped and 1 if the case is not dropped. The potential drop decision is denoted by T_D , $D \in \{0, 1\}$, so if $T_0 = 0$ and $T_1 = 1$, the case will be pursued only under the English rule.

When a plaintiff drops his case, we do not observe his settlement decision, nor do we observe any trial/settlement outcome. Keeping in mind that we observe an outcome only from a non-dropped case, we may divide cases using the observed characteristics as follows; (i) $\{T = 0, D = 1\}$ is a group of dropped cases under the English rule, (ii) $\{T = 0, D = 0\}$ is for the American rule, (iii) $\{T = 1, S = 0, D = 1\}$ is a group of non-dropped cases that settled under the English rule, (iv) $\{T = 1, S = 0, D = 0\}$ is for the American rule, (v) $\{T = 1, S = 1, D = 1\}$ is a group of non-dropped cases that go to trial under the English rule, (vi) $\{T = 1, S = 1, D = 0\}$ is for the American rule.

Mapping these subgroups based on observed decisions to a set of subgroups (stratum) based on unobserved types is our next task. For this purpose, we make the monotonicity assumption for drops just as we did for trials. In effect we are treating drops as zero settlements and hence they follow the theory outline in Section 2.

Assumption 7.1 (Monotonicity of Drops)

$$T_1 \geq T_0 \text{ with probability one.}$$

Under Assumption 7.1, we have three subgroups; $\{T_0 = T_1 = 0\}$ are ‘always-drops’, $\{T_0 = 0, T_1 = 1\}$ are ‘d-switchers’, and $\{T_0 = T_1 = 1\}$ are ‘never-drops’. So there can be potentially $3 \times 3 = 9$ types of cases over two (drop and trial) decisions. In order to identify the relative fractions of unobserved types, we make further restrictions. It takes the form of exclusion restrictions applied to the always-drops and the d-switchers.

Assumption 7.2 (Exclusion)

$$Pr(S = 1|T_0 = T_1 = 0) = 0 \text{ with probability one,}$$

$$Pr(S = 1|T_0 = 0, T_1 = 1) = 0 \text{ with probability one.}$$

The first exclusion restriction is not a restrictive assumption. It simply states the fact that if a case will be dropped under any circumstances, then the case won’t go to trial. Under this assumption, we can collapse three potential subgroups, (i) $\{T_0 = T_1 = 0\} \times \{S_0 = S_1 = 0\}$, (ii) $\{T_0 = T_1 = 0\} \times \{S_0 = 0, S_1 = 1\}$, (iii) $\{T_0 = T_1 = 0\} \times \{S_0 = S_1 = 1\}$ into a single strata $\{T_0 = T_1 = 0\}$ because we can ignore the trial decision. The second assumption is substantive. It is an exclusion restriction for the d-switchers. It means that if the value of a plaintiff’s case is so marginal that he drops under the American rule but not under the English rule, then the chance of him actually going to trial is ignorable. Our assumption amounts to saying that small cases that are not worth pursuing unless there is a chance the defendant will pay the litigation costs are not going to go to trial even under the English rule. Under this assumption, we can eliminate two subgroups, (i) $\{T_0 = 0, T_1 = 1\} \times \{S_0 = 0, S_1 = 1\}$, (ii) $\{T_0 = 0, T_1 = 1\} \times \{S_0 = S_1 = 1\}$, which have positive trial probabilities for d-switchers. The number of types now reduce from nine to five. They are

- (a) $\{T_0 = T_1 = 0\}$, the always-drops,
- (b) $\{T_0 = 0, T_1 = 1\} \times \{S_0 = S_1 = 0\}$, the d-switchers-never-trials,
- (c) $\{T_0 = T_1 = 1\} \times \{S_0 = S_1 = 0\}$, the never-drops-never-trials,
- (d) $\{T_0 = T_1 = 1\} \times \{S_0 = 0, S_1 = 1\}$, the never-drops-switchers,
- (e) $\{T_0 = T_1 = 1\} \times \{S_0 = S_1 = 1\}$, the never-drops-always-trials.

We will study the treatment effects of the trial and settlement outcomes by focusing on the subgroups whose decisions are not affected by the English rule.

7.2 Bounds of the Average and Quantile Effects

Let us consider a trial outcome. Under the American rule, we observe a trial outcome only for one group: $\{T_0 = T_1 = 1\} \times \{S_0 = S_1 = 1\}$. They are the never-drops-always-trials, that is, ‘never-drops’ in terms of drop decision and ‘always-trials’ in terms of settlement decision. This is the group whose average and quantile effects we will define shortly.

Under the English rule, we observe trial outcomes for two subgroups; $\{T_0 = T_1 = 1\} \times \{S_0 = S_1 = 1\}$, the never-drops-always-trials, and $\{T_0 = T_1 = 1\} \times \{S_0 = 0, S_1 = 1\}$, the never-drops-switchers. We obtain bounds by truncating the extra subgroup under the English rule. The truncation fraction is given by¹²

$$p^* = \frac{\Pr(T = 1, S = 1|D = 1) - \Pr(T = 1, S = 1|D = 0)}{\Pr(T = 1, S = 1|D = 1)}.$$

It only depends on observable quantities. The average treatment effect for never-drops-always-trials is

$$\Delta^* = E[Y_1 - Y_0|T_0 = T_1 = 1, S_0 = S_1 = 1].$$

The τ -th quantile treatment effect for the subgroup is

$$\Upsilon^*(\tau) = Q_{Y_1|T_0=T_1=1, S_0=S_1=1}(\tau) - Q_{Y_0|T_0=T_1=1, S_0=S_1=1}(\tau).$$

We have two propositions concerning the sharp bounds of trial outcomes when we allow two-step sample selection.

Proposition 7.3 (Bounds for Average Treatment Effect) *Suppose that Assumptions 4.1, 4.2, 7.1 and 7.2 hold. The lower bound for the average treatment effect is*

$$\Delta^{*,LB} = E[Y|D = 1, T = 1, S = 1, Y \leq y_{1-p^*}] - E[Y|D = 0, T = 1, S = 1].$$

The upper bound is

¹²In Section 4, we assume that drops are exogenous and only use cases that were not dropped. Using the extended notations introduced in this section, the truncation fraction in Section 4 can be rewritten as

$$p = \frac{\Pr(S = 1|T = 1, D = 1) - \Pr(S = 1|T = 1, D = 0)}{\Pr(S = 1|T = 1, D = 1)}.$$

When the drops are indeed exogenous, i.e., $\Pr(T = 1|D = 1) = \Pr(T = 1|D = 0)$, one can show that two fractions, p and p^* , are identical. The same comments apply to other quantities defined in Section 4.

$$\Delta^{*,UB} = E[Y|D = 1, T = 1, S = 1, Y \geq y_{p^*}] - E[Y|D = 0, T = 1, S = 1].$$

These bounds are sharp in the sense that they provide the shortest bound that is consistent with the observed data under given assumptions.

Proposition 7.4 (Bounds for Quantile Treatment Effects) *Suppose that Assumptions 4.1, 4.2, 7.1 and 7.2 hold. The lower bound for the τ -th quantile treatment effect is*

$$\Upsilon(\tau)^{*,LB} = Q_{Y|D=1,T=1,S=1}((1 - p^*)\tau) - Q_{Y|D=0,T=1,S=1}(\tau).$$

The upper bound is

$$\Upsilon(\tau)^{*,UB} = Q_{Y|D=1,T=1,S=1}(p^* + (1 - p^*)\tau) - Q_{Y|D=0,T=1,S=1}(\tau).$$

These bounds are sharp in the sense that they provide the shortest bound that is consistent with the observed data under given assumptions.

Next, let us consider out-of-court settlement outcomes. Under the American rule, we observe settlement outcomes for two subgroups: $\{T_0 = T_1 = 1\} \times \{S_0 = S_1 = 0\}$, the never-drops-never-trials, and $\{T_0 = T_1 = 1\} \times \{S_0 = 0, S_1 = 1\}$, the never-drops-switchers. Under the English rule, we observe settlement outcomes for two subgroups: $\{T_0 = T_1 = 1\} \times \{S_0 = S_1 = 0\}$, the never-drops-never-trials, and $\{T_0 = 0, T_1 = 1\} \times \{S_0 = 0, S_1 = 0\}$, the d-switchers-never-trials.

The only subgroup we consistently observe under two regimes, therefore, the subgroup we shall focus on, is the never-drops-never-trials. They are ‘never-drops’ in terms of drop decision and ‘never-trials’ in terms of the settlement decision. For this subgroup, the average treatment effects of out-of-court settlements is

$$\Delta_c^* = E[Z_1 - Z_0|T_0 = T_1 = 1, S_0 = S_1 = 0].$$

The quantile treatment effects is

$$\Upsilon_c^*(\tau) = Q_{Y_1|T_0=T_1=1,S_0=S_1=0}(\tau) - Q_{Y_0|T_0=T_1=1,S_0=S_1=0}(\tau).$$

To obtain the bounds, the idea is that we truncate outcomes under the English as well as outcomes under the American rules. Two truncation fractions, one for the English rule and the other for the American rule, can be identified by

$$p_{c_1}^* = \frac{\Pr(T = 1, S = 1|D = 1) - \Pr(T = 1, S = 1|D = 0)}{1 - \Pr(T = 0|D = 0) - \Pr(T = 1, S = 1|D = 1)},$$

$$p_{c_2}^* = \frac{\Pr(T = 0|D = 0) - \Pr(T = 0|D = 1)}{1 - \Pr(T = 0|D = 0) - \Pr(T = 1, S = 1|D = 1)}.$$

We have the following results stating the bounds for the average and quantile effects.

Proposition 7.5 (Bounds of Settlement Outcomes for the Average Effect) *Suppose that Assumptions 4.1, 4.2, 7.1 and 7.2 hold. The lower bound for the average treatment effect is*

$$\Delta_c^{*,LB} = E[Y|D = 1, T = 1, S = 1, Y \leq y_{1-p_{c_1}^*}] - E[Y|D = 0, T = 1, S = 1, Y \geq y_{p_{c_2}^*}].$$

The upper bound is

$$\Delta_c^{*,UB} = E[Y|D = 1, T = 1, S = 1, Y \geq y_{p_{c_1}^*}] - E[Y|D = 0, T = 1, S = 1, Y \leq y_{1-p_{c_2}^*}].$$

Proposition 7.6 (Bounds of Settlement Outcomes for the Quantile Effects) *Suppose that Assumptions 4.1, 4.2, 7.1 and 7.2 hold. The lower bound for the τ -th quantile treatment effect is*

$$\Upsilon(\tau)_c^{*,LB} = Q_{Y|D=1,T=1,S=1}((1 - p_{c_1}^*)\tau) - Q_{Y|D=0,T=1,S=1}(p_{c_2}^* + (1 - p_{c_2}^*)\tau).$$

The upper bound is

$$\Upsilon(\tau)_c^{*,UB} = Q_{Y|D=1,T=1,S=1}(p_{c_1}^* + (1 - p_{c_1}^*)\tau) - Q_{Y|D=0,T=1,S=1}((1 - p_{c_2}^*)\tau).$$

Thus for the lower bound of treatment effects, we compare the worst case scenario under the English rule and the best case scenario under the American rule. The approach is similar for the upper bounds.

7.3 Empirical Results under the Two Step Procedure

The truncation fractions defined in this section can be computed analogously to Section 5. For a trial outcome it is $\hat{p}^* = 0.2359$. Recall that previously when only the trial decision is subject to sample selection, the truncation fraction for the trial outcome is 0.205. So for a trial outcome the cost of applying the two step sample selection is that we simply truncate more observations, extra 3%, for the English rule. This will result in a wider bound.

Table 3 reports the estimated average and median treatment effects under the two step sample selection procedure. For the trial awards and trial costs, we see the results are quantitatively similar to what we reported before. The bounds are wider therefore the results get less precise, but the conclusions from Section 6 are robust to the two step procedure.

For the settlement outcomes, the two step procedure alters our findings. We now truncate observations for both American and English rule cases. Then the upper bound of a treatment effect is obtained by comparing the best case scenario under the English rule and the worst case scenario under the American rule. The lower bound, on the other hand, is obtained by comparing the worst case scenario under the English rule and the best case scenario under the American rule. So the resulting bounds can be very wide and therefore less conclusive.

The estimated truncation fractions are $\hat{p}_{c1}^* = 0.0866$ for the English rule and $\hat{p}_{c2}^* = 0.0581$ for the American rule. The trimming fraction for the American rule cases are close to what we had before. The extra cost to use the two sample selection procedure is that we now have to truncate about 8.6% cases under the English rule. The results are reported in the bottom of Table 3. For settlement amount and the defendant's cost under settlement, the effects of English rule become inconclusive. This is in contrast to the significantly positive effects we had in Section 6. This is understandable given that we now trim observations for both treatment and control groups and match the worst case under the treatment group against the best under the control group.

8 Conclusion

In this paper we demonstrate a method for dealing with the sample selection present in most empirical studies of litigation outcomes. We then apply to this technique to a well-known legal change: Florida's use of the English rule from 1980 to 1985. Theoretically the English

rule, which shifts court costs from the winner of the court case to the loser, should improve case quality. Complicating the econometric analysis is the fact that the English rule also decreases the likelihood that litigants will settle a case. Thus the sample of cases resolved via trials versus settlements will be different under the two fee shifting rules.

In a series of papers Hughes and Snyder (1990, 1995) examine the impact of fee shifting on case quality. We reexamine the findings of those studies by constructing bounds on the selection effects. Specifically we construct bounds based on the theoretical prediction that the English rule will decrease the probability of settlement. This effect is monotone in that all cases that settle under the English rule will also settle under the American rule and vice versa for trials. We find that although average awards at trial under the English rule increase we cannot rule out the possibility that selection would reverse this effect. We do find evidence that the median award at trial increases under the English rule and that this result is robust to even the most restrictive assumptions on sample selection. We also find evidence that this effect is driven by the lower 80% of the distribution of awards. The evidence on defense costs for cases that go to trial is suggestive of an English rule effect, particularly when estimated only on bench and jury trials and not summary motions. As with trial awards the results may not be robust to all selection mechanisms.

In the case of settled claims we find more robust evidence that the English rule increases settlement amounts. In the case of both the average and median effects the English rule averages lie outside the bounds for the effect of the American rule. In addition the difference is statistically significant when we compare the English rule average and the upper and lower bound for the American rule. For the median effect only the lower bound is significant although even the upper bound difference is close to zero. This suggests that the finding that the English rule increases settlement amounts is quite robust to possible selection effects. This result appears to be driven by the top 20% of the distribution of settlement amounts. Again our results are not conclusive with regards to cost estimates. In the case of trial awards these results are robust to a two step procedure that bounds selection based on dropping and settlement. However the settlement results are not robust to the two step procedure.

Our results are therefore broadly consistent with their findings that the English rule improves case quality as measured by awards at trial or settlement amounts. Our results also suggest that this effect is rather robust to possible selection mechanisms.

A Proof of Main Claims

Proof of Proposition 4.4

The Proposition 3 in Horowitz and Manski (1995) states that if we have a mixture distribution

$$F(y) = pF_1(y) + (1 - p)F_2(y)$$

and the mixing probability p is known, the sharp lower bound of the τ -th quantile of $F_2(\cdot)$ is given by $\tau(1 - p)$ -th quantile of $F(\cdot)$ and the sharp upper bound of the τ -th quantile of $F_2(\cdot)$ is given by $(p + \tau(1 - p))$ -th quantile of $F(\cdot)$.

In our setup, by the monotonicity and independence assumptions, the distribution of the observed outcome Y for a group $D = 1, S = 1$ can be decomposed into the mixture of two subgroups

$$F_{Y|D=1,S=1}(y) = p_0 F_{Y_1|S_0=0,S_1=1}(y) + (1 - p_0) F_{Y_1|S_0=S_1=1}(y)$$

where the first term is the distribution of Y_1 for switchers and the second term is for always-trials. The mixing probability p_0 is identified by

$$p_0 = \frac{\Pr(S = 1|D = 1) - \Pr(S = 1|D = 0)}{\Pr(S = 1|D = 1)} = \frac{\Pr(S_0 = S_1 = 1|D = 1)}{\Pr(S = 1|D = 1)}.$$

What we want to know is the τ -th quantile of $F_{Y_1|S_0=S_1=1}(y)$. Let's call it $Q_{Y_1|S_0=S_1=1}(\tau)$. Also let $Q_{Y|D=1,S=1}(\cdot)$ be the quantile function of $F_{Y|D=1,S=1}(\cdot)$. By the Proposition 3 in Horowitz and Manski (1995), the sharp lower and upper bounds of $Q_{Y_1|S_0=S_1=1}(\tau)$ are given by $Q_{Y|D=1,S=1}(\tau(1 - p_0))$ and $Q_{Y|D=1,S=1}(\tau(1 - p_0) + p_0)$. This complete the proof.

Proposition 4.6 can be proved similarly.

Proof of Proposition 5.2

We focus on the lower bound. The upper bound can be worked out similarly. Let a set of parameters $\theta = (q, p, \alpha)$ and observed data $Z_i = (Y_i, S_i, D_i)$. Define a moment equation

$$g(Z_i, \theta) = \begin{pmatrix} (I(Y_i < q) - (1 - p)\tau) S_i D_i \\ \left(S_i - \frac{\alpha}{1-p}\right) D_i \\ (S_i - \alpha)(1 - D_i) \end{pmatrix},$$

the sample mean of the moment equation

$$M_n(\theta) = n^{-1} \sum_{i=1}^n g(Z_i, \theta),$$

and its population mean

$$M(\theta) = E[g(Z_i, \theta)].$$

The unique values of the parameters $\theta_0 = (q_0, p_0, \alpha_0)$ that solves the moment equation, i.e., $M(\theta_0) = 0$, can be shown to be

$$\begin{aligned}
q_0 &= Q_Y((1 - p_0)\tau|S = 1, D = 1), \\
p_0 &= \frac{\Pr(S = 1|D = 1) - \Pr(S = 1|D = 0)}{\Pr(S = 1|D = 1)}, \\
\alpha_0 &= \Pr(S = 1|D = 0).
\end{aligned}$$

The moment condition is unbiased, meaning that the true values of the parameters we wish to estimate constitute the unique solution of the moment equation. So techniques in Chapters 6 & 7 of McFadden and Newey (1994) are well applicable here. Let $\|\cdot\|$ denote the Euclidean norm, $\|x\| = x'x$. The estimates of θ_0 are obtained by

$$\hat{\theta} = \arg \max_{\theta} \|M_n(\theta)\|.$$

To explore the asymptotic properties of $\hat{\theta}$, we take several steps that follow. The consistency of $\hat{\theta}$ can be easily established by using Theorem 2.6 in Newey and McFadden (1994). For the asymptotic normality, by the stochastic equicontinuity argument, we establish the following lemma.

Lemma A.1 *Suppose that p_0 is bounded by a positive number \bar{p} which is strictly less than one, then*

$$M_n(\hat{\theta}) - M(\hat{\theta}) - \{M_n(\theta_0) - M(\theta_0)\} = o_p(1).$$

Proof. The first term in $g(Z_i, \theta)$ is bounded by 2 because of the indicator function and the fact that S_i and D_i are binary random variables. The second term is bounded by $\left(1 + \frac{1}{1-\bar{p}}\right)$ due to assumption that p_0 is strictly away from one and the fact that α is a conditional probability, bounded by one. The third term is bounded by 2. Overall, the function class $\{g(Z, \theta), \theta \in R \times (0, \bar{p}) \times (0, 1)\}$ satisfies assumptions in Theorem 1 of Andrews (1994) with a square-integrable envelope $\bar{M} = \left(2, 1 + \frac{1}{1-\bar{p}}, 2\right)$. This guarantees the stochastic equicontinuity. ■

Since $M_n(\hat{\theta}) = o_p$ and $M(\theta_0) = 0$, we have

$$M(\hat{\theta}) = -M_n(\theta_0) + o_p(1)$$

Let $G(\theta_0) = \frac{dM(\theta)}{d\theta}|_{\theta=\theta_0}$. We obtain the explicit expression for $G(\theta_0)$ below and show that it is a nonsingular matrix. Then the first order Taylor expansion of $M(\hat{\theta})$ around θ_0 leads to

$$\sqrt{n}(\hat{\theta} - \theta_0) = -G(\theta_0)^{-1}\sqrt{n}M_n(\theta_0) + o_p(1)$$

This leads to the next lemma which is the main result of this section.

Lemma A.2 *Under conditions in Proposition 5.2,*

$$\sqrt{n}(\hat{\theta} - \theta_0) \xrightarrow{d} N(0, \Omega)$$

where $\Omega = G(\theta_0)^{-1}\Sigma(G(\theta_0)')^{-1}$ and $\Sigma = \text{Var}(g(Z_i, \theta_0))$.

In particular

$$\sqrt{n}(\hat{q} - q_0) \xrightarrow{d} N(0, \Omega_q)$$

where

$$\Omega_q = \frac{\tau(1-p_0) \cdot (1-\tau(1-p_0))}{f(q_0|S=1, D=1)^2 E[SD]} + \frac{\tau^2}{f(q_0|S=1, D=1)^2} \left\{ \frac{\frac{\alpha_0}{1-p_0} \left(1 - \frac{\alpha_0}{1-p_0}\right)}{\left(\frac{\alpha_0}{1-p_0}\right)^2 E[D]} + \frac{\alpha_0(1-\alpha_0)}{\left(\frac{\alpha_0}{1-p_0}\right)^2 (1-E[D])} \right\}.$$

First let us calculate the Hessian and the variance of the moment equation one by one. It is straightforward to show that $M(\theta)$ is equal to

$$\begin{pmatrix} \{F_Y(q|S=1, D=1) - (1-p)\tau\} E[SD] \\ \{E[S=1|D=1] - \frac{\alpha}{1-p}\} E[D] \\ \{E[S=1|D=0] - \alpha\} (1-E[D]) \end{pmatrix}$$

After some calculations it is possible to show that $G(\theta)$ is equal to

$$\begin{pmatrix} f_Y(q|S=1, D=1)E[SD] & \tau E[SD] & 0 \\ 0 & \frac{\alpha}{(1-p)^2} E[D] & -\frac{1}{1-p} E[D] \\ 0 & 0 & -(1-E[D]) \end{pmatrix}$$

Also recall that $E[S=1|D=1] = \frac{\alpha_0}{1-p_0}$, then the variance and covariance calculations show that Σ is equal to

$$\begin{pmatrix} (1-p_0)\tau \{1 - (1-p_0)\tau\} E[SD] & 0 & 0 \\ 0 & \frac{\alpha_0}{1-p_0} \left(1 - \frac{\alpha_0}{1-p_0}\right) E[D] & 0 \\ 0 & 0 & \alpha_0(1-\alpha_0)(1-E[D]) \end{pmatrix}$$

The variance of the main parameter of interest \hat{q} is given by the top-left element of $G(\theta_0)^{-1}\Sigma(G(\theta_0)')^{-1}$. To calculate this, write matrices as

$$G(\theta_0) = \begin{pmatrix} G_{11} & G_{12} \\ 2 \times 2 & 2 \times 1 \\ 0 & G_{22} \\ 1 \times 2 & 1 \times 1 \end{pmatrix}, \quad \Sigma = \begin{pmatrix} \Sigma_1 & 0 \\ 2 \times 2 & 2 \times 1 \\ 0 & \Sigma_2 \\ 1 \times 2 & 1 \times 1 \end{pmatrix}.$$

By the inversion formula of partitioned matrices, the upper left 2×2 block of $G(\theta_0)^{-1}\Sigma(G(\theta_0)')^{-1}$ is equal to

$$G_{11}^{-1}\Sigma_1(G_{11}^{-1})' + G_{11}^{-1}G_{12}G_{22}^{-1}\Sigma_2(G_{22}^{-1})'(G_{12})'(G_{11}^{-1})'$$

whose upper left element is the variance \hat{q} . By straightforward calculation, the upper left element of $G_{11}^{-1}\Sigma_1(G_{11}^{-1})'$ is equal to

$$\frac{\tau(1-p_0) \cdot (1-\tau(1-p_0))}{f(q_0|S=1, D=1)^2 E[SD]} + \frac{\tau^2 \frac{\alpha_0}{1-p_0} \left(1 - \frac{\alpha_0}{1-p_0}\right)}{f(q_0|S=1, D=1)^2 \left(\frac{\alpha_0}{(1-p_0)^2}\right)^2 E[D]}$$

and the upper left element of $G_{11}^{-1}G_{12}G_{22}^{-1}\Sigma_2(G_{22}^{-1})'(G_{12})'(G_{11}^{-1})'$ can be shown to be

$$\frac{\tau^2 \alpha_0 (1 - \alpha_0)}{f(q_0|S=1, D=1)^2 \left(\frac{\alpha_0}{1-p_0}\right)^2 (1 - E[D])}.$$

Combining the two terms, we obtain the expression for Ω_q .

The asymptotic variance of the lower bound estimate $\hat{\Upsilon}(\tau)^{LB}$ has two terms. Lemma A.2 explains the first term W^{LB} . The second W^C is the variance of the τ -quantile (without any truncation) using the control group. This completes the proof of Proposition 5.2.

Proof of Proposition 5.4

To show the result for settlement outcomes, we apply methods similar to trial outcomes. Here we will simply point out main differences. We focus on the upper bound this time. The set of parameters are

$$\begin{aligned} q_0 &= Q_Y((1-p_0)\tau|S=0, D=0), \\ p_{c,0} &= \frac{\Pr(S=0|D=0) - \Pr(S=0|D=1)}{\Pr(S=0|D=0)}, \\ \alpha_{c,0} &= \Pr(S=0|D=1), \end{aligned}$$

and the corresponding moment equation is

$$g_c(Z_i, \theta) = \begin{pmatrix} (I(Y_i < q) - (1-p)\tau) (1 - S_i)(1 - D_i) \\ \left((1 - S_i) - \frac{\alpha}{1-p}\right) (1 - D_i) \\ ((1 - S_i) - \alpha) D_i \end{pmatrix}.$$

By applying the similar arguments, one can obtain the following variance expression.

$$\begin{aligned} \Omega_q &= \frac{\tau(1-p_{c,0}) \cdot (1-\tau(1-p_{c,0}))}{f(q_0|S=0, D=0)^2 E[(1-S)(1-D)]} \\ &+ \frac{\tau^2}{f(q_0|S=0, D=0)^2} \left\{ \frac{\frac{\alpha_{c,0}}{1-p_{c,0}} \left(1 - \frac{\alpha_{c,0}}{1-p_{c,0}}\right)}{\left(\frac{\alpha_{c,0}}{(1-p_{c,0})^2}\right)^2 (1 - E[D])} + \frac{\alpha_{c,0}(1 - \alpha_{c,0})}{\left(\frac{\alpha_{c,0}}{1-p_{c,0}}\right)^2 E[D]} \right\}. \end{aligned}$$

This explains the first term of the asymptotic variance of $\hat{\Upsilon}_c(\tau)^{UB}$. The second term is the variance of the τ -th quantile using the treatment group (the English rule). This completes the proof of Proposition 5.4.

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TABLE 1. Summary Statistics

Variables	English rule			American rule		
	Mean	Median	Std	Mean	Median	Std
(a) Summary Statistics of Outcomes						
Trial Award	\$931,313	\$546,176	\$1,230,280	\$570,415	\$225,072	\$1,678,425
Trial Cost-1	\$42,260	\$25,682	\$53,217	\$45,996	\$28,048	\$62,441
Trial Cost-2	\$60,659	\$48,150	\$61,192	\$59,680	\$41,566	\$69,105
Settlement Amount	\$321,401	\$96,741	\$740,494	\$250,748	\$83,223	\$642,121
Settlement Cost	\$33,536	\$21,094	\$45,016	\$31,895	\$21,368	\$41,726
(b) Probabilities of Drop, Settle, Trial, and Plaintiff's winning						
Drop	0.3292			0.3566		
Trial	0.2577			0.2052		
Settlement	0.7422			0.7947		
Plaintiff Winning-1	0.1027			0.0885		
Plaintiff Winning-2	0.2519			0.1712		
Sample size	3,589			2,414		

In panel (a), we report the mean, median, and standard deviations of outcome variables in 2011 dollars. In panel (b), the probability of drop is the probability of dropping a case. The probability of trial is the conditional probability of going trials when cases are not dropped. The probability of settlement is the conditional probability of settlements when cases are not dropped. The first probability of plaintiff winning is the conditional probability of plaintiff winning when cases are not dropped nor settled. The second winning probability only uses bench or jury trial cases. The sample size is the number of non-dropped cases under the English or American rule that satisfy our sample restrictions (in terms of injury and trial dates) during our sample periods (1976-1989).

TABLE 2. Average and Median Effects

Dependent variables	English rule: (1)	American rule: (2)	Difference: (1)-(2)
Trial Award			
Average Effect (Confidence Interval)	[\$420,813, \$1,166,449]	\$570,414	[-\$149,601, \$596,035] (-\$268,173, \$734,201)
Median Effect (Confidence Interval)	[\$334,639, \$685,172]	\$225,071	[\$109,567, \$460,101] (\$53,876, \$520,569)
Trial Cost-1			
Average Effect (Confidence Interval)	[\$21,478, \$52,976]	\$45,995	[-\$24,517, \$6,980] (-\$29,164, \$12,435)
Median Effect (Confidence Interval)	[\$15,914, \$37,456]	\$28,048	[-\$12,133, \$9,408] (-\$16,187, \$13,971)
Trial Cost-2			
Average Effect (Confidence Interval)	[\$37,583, \$75,693]	\$59,680	[-\$22,096, \$16,013] (-\$27,332, \$22,154)
Median Effect (Confidence Interval)	[\$37,614, \$59,715]	\$41,565	[-\$3,951, \$18,149] (-\$8,850, \$23,261)
Settlement Amount			
Average Effect (Confidence Interval)	\$321,401	[\$141,802, \$268,186]	[\$53,214, \$179,598] (\$20,693, \$207,623)
Median Effect (Confidence Interval)	\$96,741	[\$72,680, \$92,441]	[\$4,299, \$24,060] (-\$4,442, \$33,197)
Settlement Cost			
Average Effect (Confidence Interval)	\$33,535	[\$24,168, \$34,148]	[-\$612, \$9,366] (-\$2,795, \$11,504)
Median Effect (Confidence Interval)	\$21,093	[\$19,976, \$23,011]	[-\$1,917, \$1,117] (-\$3,367, \$2,624)

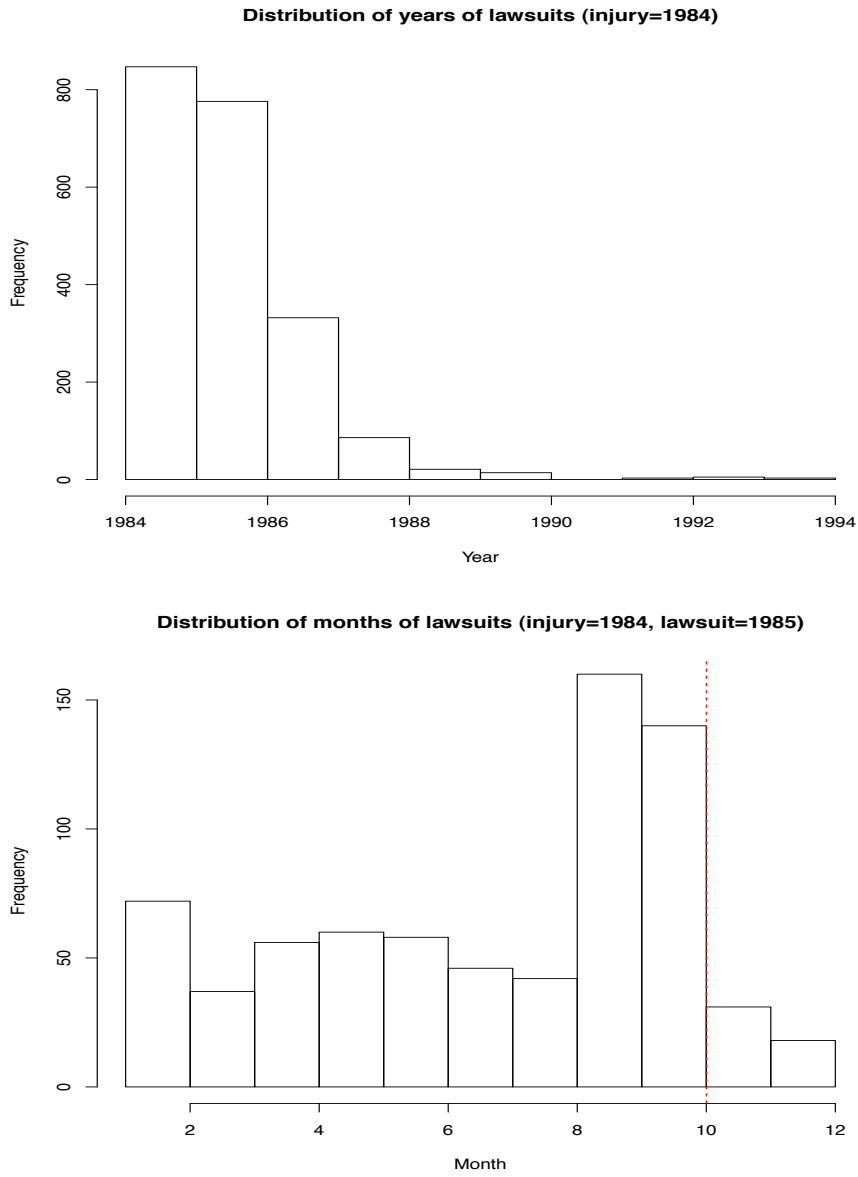
For the trial outcomes, we obtain the upper and lower bounds for the treatment group (English rule). For the settlement outcomes, we obtain bounds for the control group (American rule). The difference in the final column (in brackets) is the treatment effect. The 95% confidence intervals (in parentheses) are from Imbens and Manski (2004). They include the true value of treatment effect at least 95% of the time.

TABLE 3. Average and Median Effects from Two Step Procedure.

Dependent variables	English rule	American rule	Difference
Trial Award			
Average Effect	[\$388,575, \$1,224,091]	\$570,414	[-\$181,839, \$653,676]
Median Effect	[\$292,703, \$719,222]	\$225,071	[\$67,631, \$494,150]
Trial Cost-1			
Average Effect	[\$19,608, \$55,033]	\$45,995	[-\$26,387, \$9,037]
Median Effect	[\$14,565, \$39,024]	\$28,048	[-\$13,482, \$10,976]
Trial Cost-2			
Average Effect	[\$35,469, \$78,223]	\$59,680	[-\$24,210, \$18,542]
Median Effect	[\$36,072, \$61,622]	\$41,565	[-\$5,493, \$20,056]
Settlement Amount			
Average Effect	[\$155,028, \$355,747]	[\$147,621, \$266,166]	[-\$111,138, \$208,125]
Median Effect	[\$75,117, \$111,387]	[\$73,556, \$90,850]	[-\$15,732, \$37,831]
Settlement Cost			
Average Effect	[\$23,369, \$37,600]	[\$24,663, \$34,091]	[-\$10,722, \$12,936]
Median Effect	[\$18,618, \$23,466]	[\$20,197, \$22,819]	[-\$4,200, \$3,268]

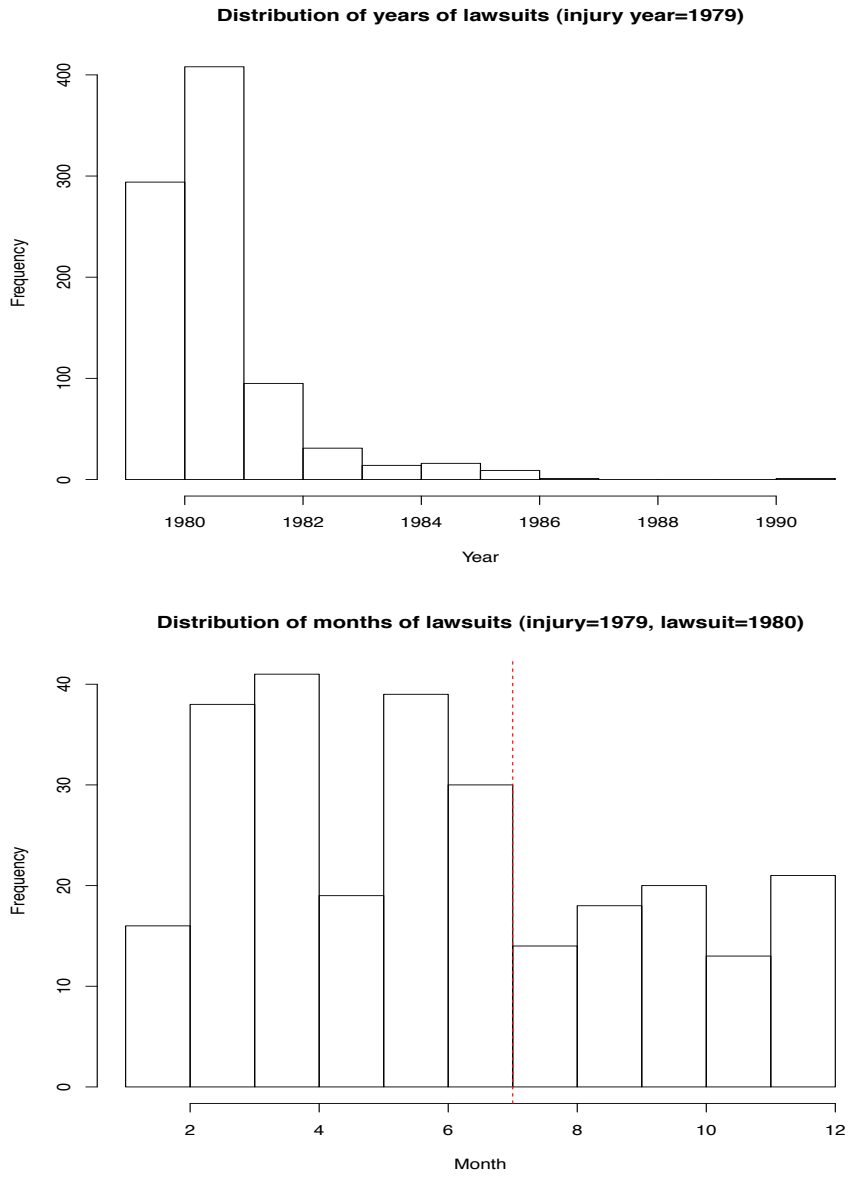
For the trial outcomes, we estimate the bounds for the treatment group. For the settlement outcomes, we estimates the bounds for the control group as well as the treatment group. The resulting bounds for the average and quantile effects are defined in Section 7.

FIGURE 1. Timing of lawsuits when injury year is 1984



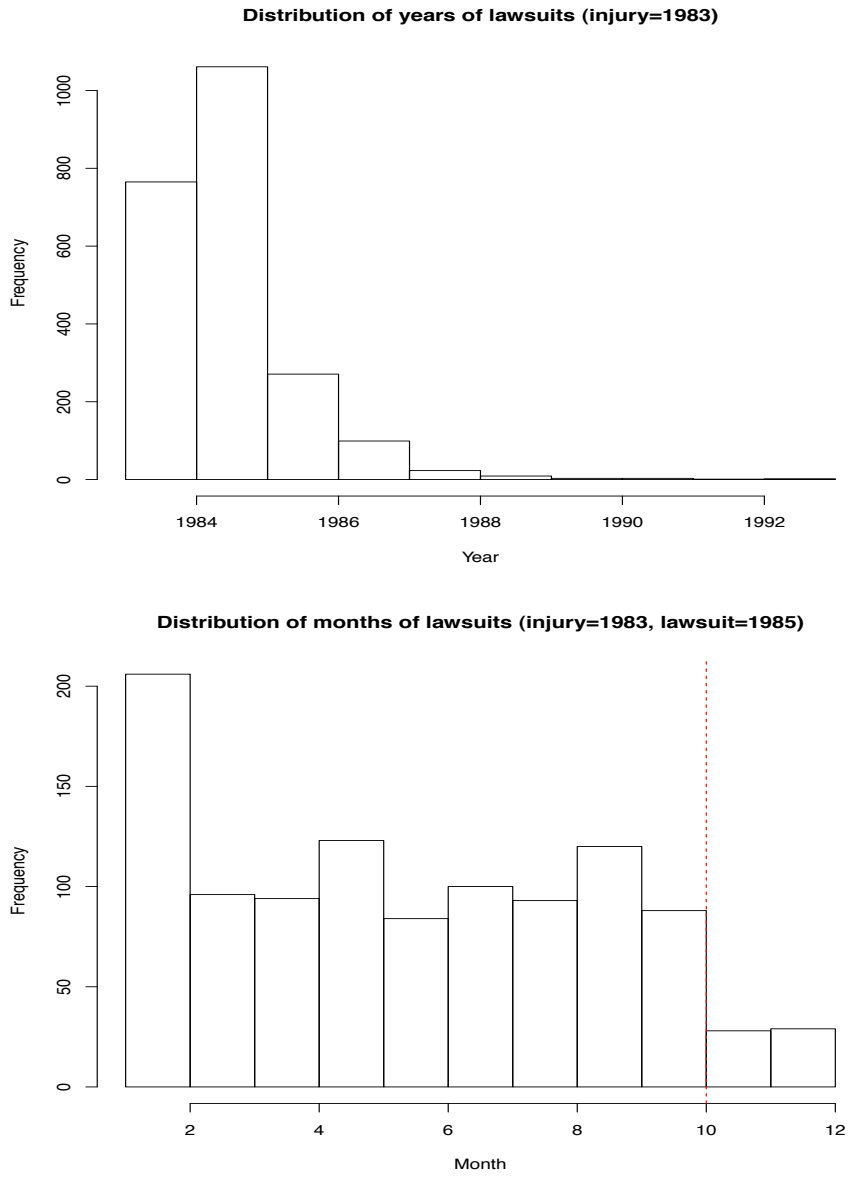
The top panel shows the distribution of years of lawsuit when injury year is 1984. The bottom panel shows the distribution of months of lawsuit when injury year is 1984 and lawsuit year is 1985.

FIGURE 2. Timing of lawsuits when injury year is 1979



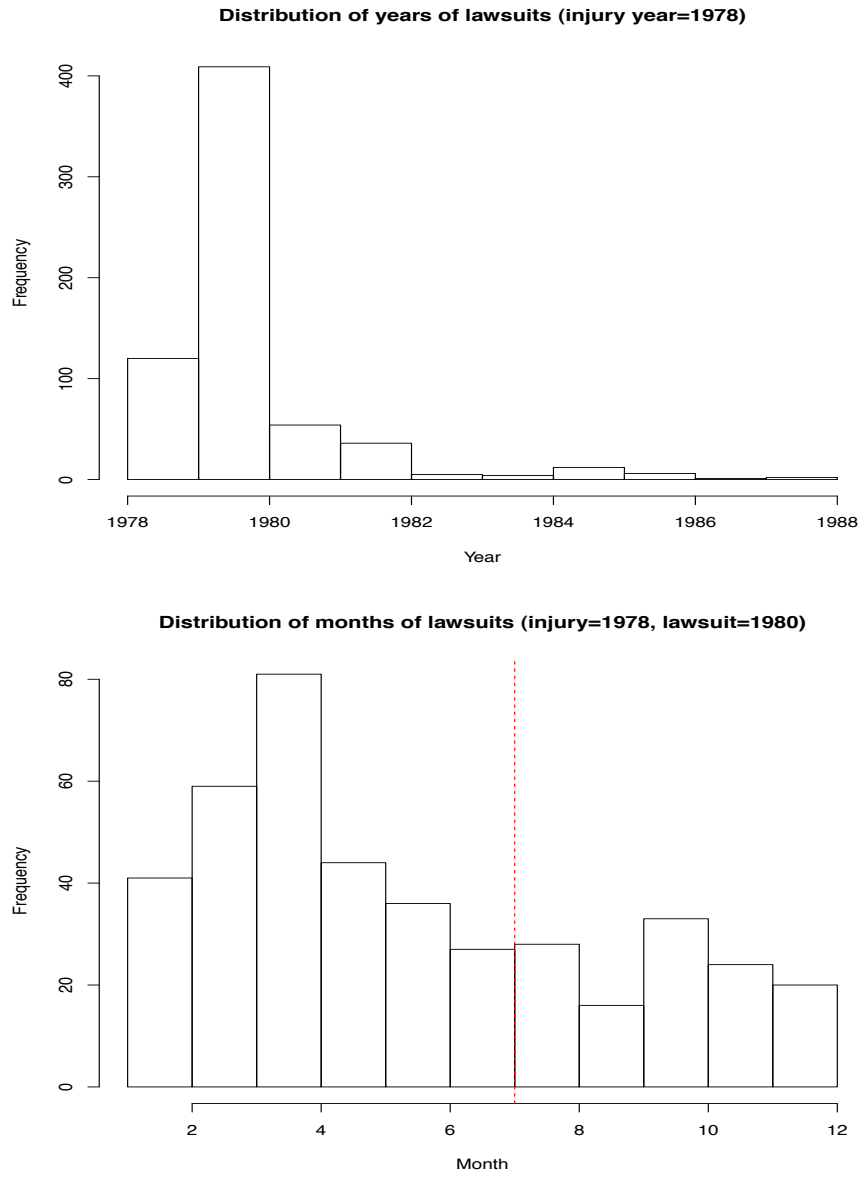
The top panel shows the distribution of years of lawsuit when injury year is 1979. The bottom panel shows the distribution of months of lawsuit when injury year is 1979 and lawsuit year is 1980.

FIGURE 3. Timing of lawsuits when injury year is 1983



The top panel shows the distribution of years of lawsuit when injury year is 1983. The bottom panel shows the distribution of months of lawsuit when injury year is 1983 and lawsuit year is 1985.

FIGURE 4. Timing of lawsuits when injury year is 1978



The top panel shows the distribution of years of lawsuit when injury year is 1978. The bottom panel shows the distribution of months of lawsuit when injury year is 1978 and lawsuit year is 1980.

FIGURE 5. Decision Tree

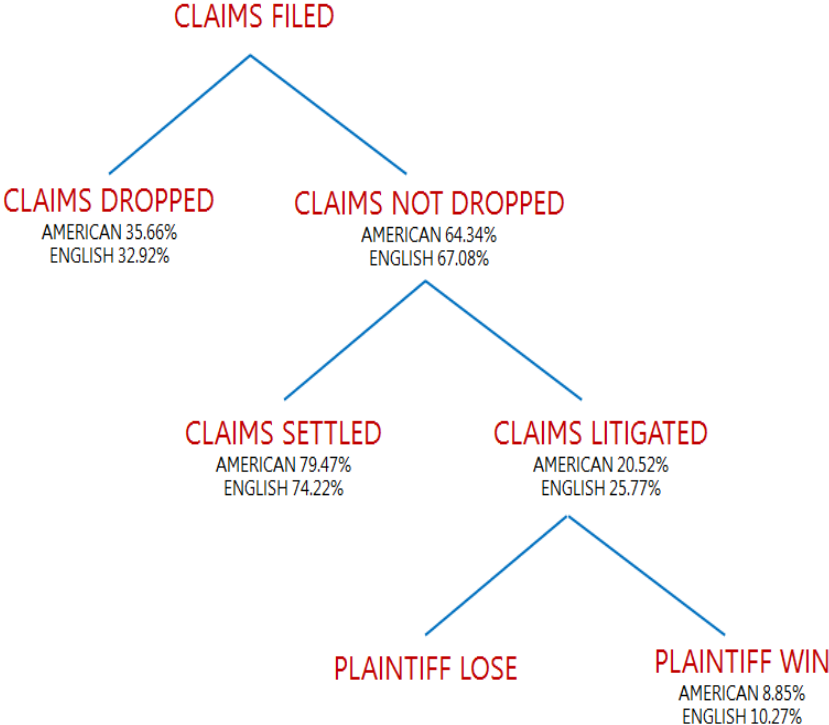
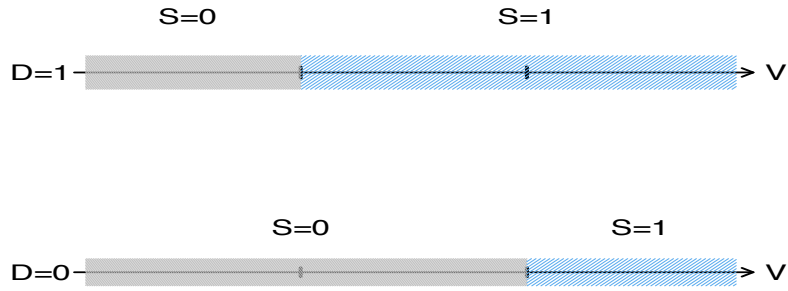
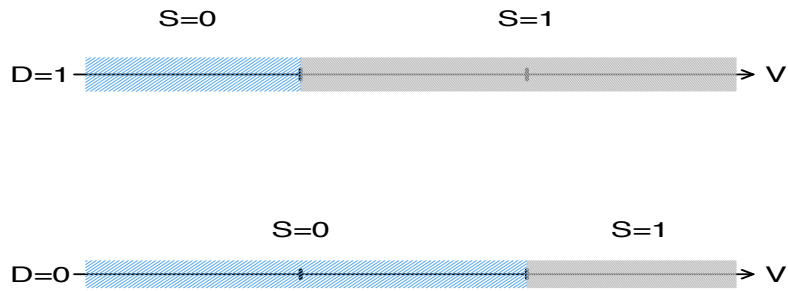


FIGURE 6. Trial Decisions under English and American rules



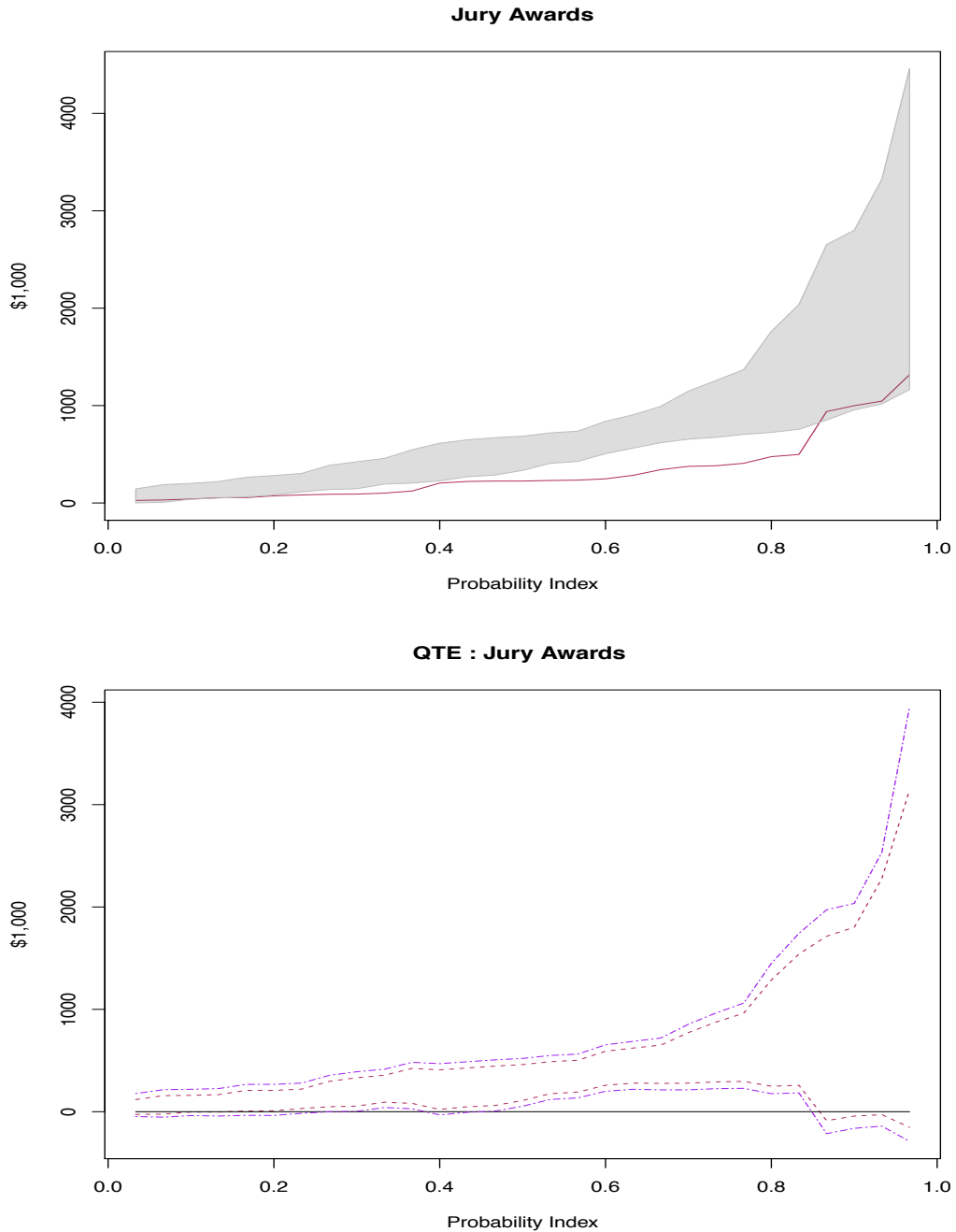
Under the English rule, we observe trial outcomes for both switchers and always-trials. Under the American rule, we observe trial outcomes only for always-trials. When outcomes are observed, it is indicated by blue shaded areas.

FIGURE 7. Settlement Decisions under English and American rules



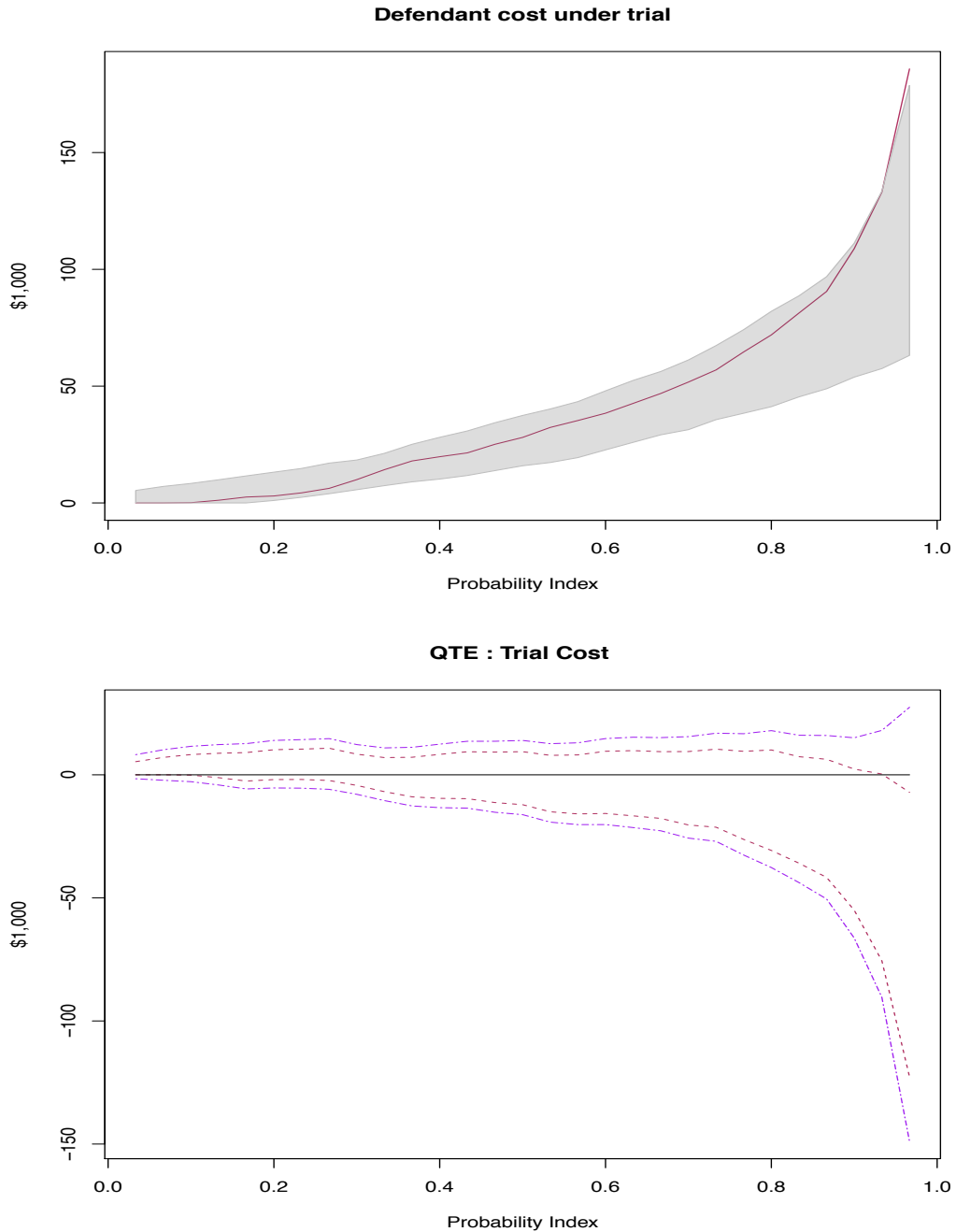
Under the English rule, we observe settlement outcomes only for never-trials (blue shaded area). Under the American rule, we observe settlement outcomes for both switchers and never-trials (blue shaded area).

FIGURE 8. Quantile Effects of Jury Awards



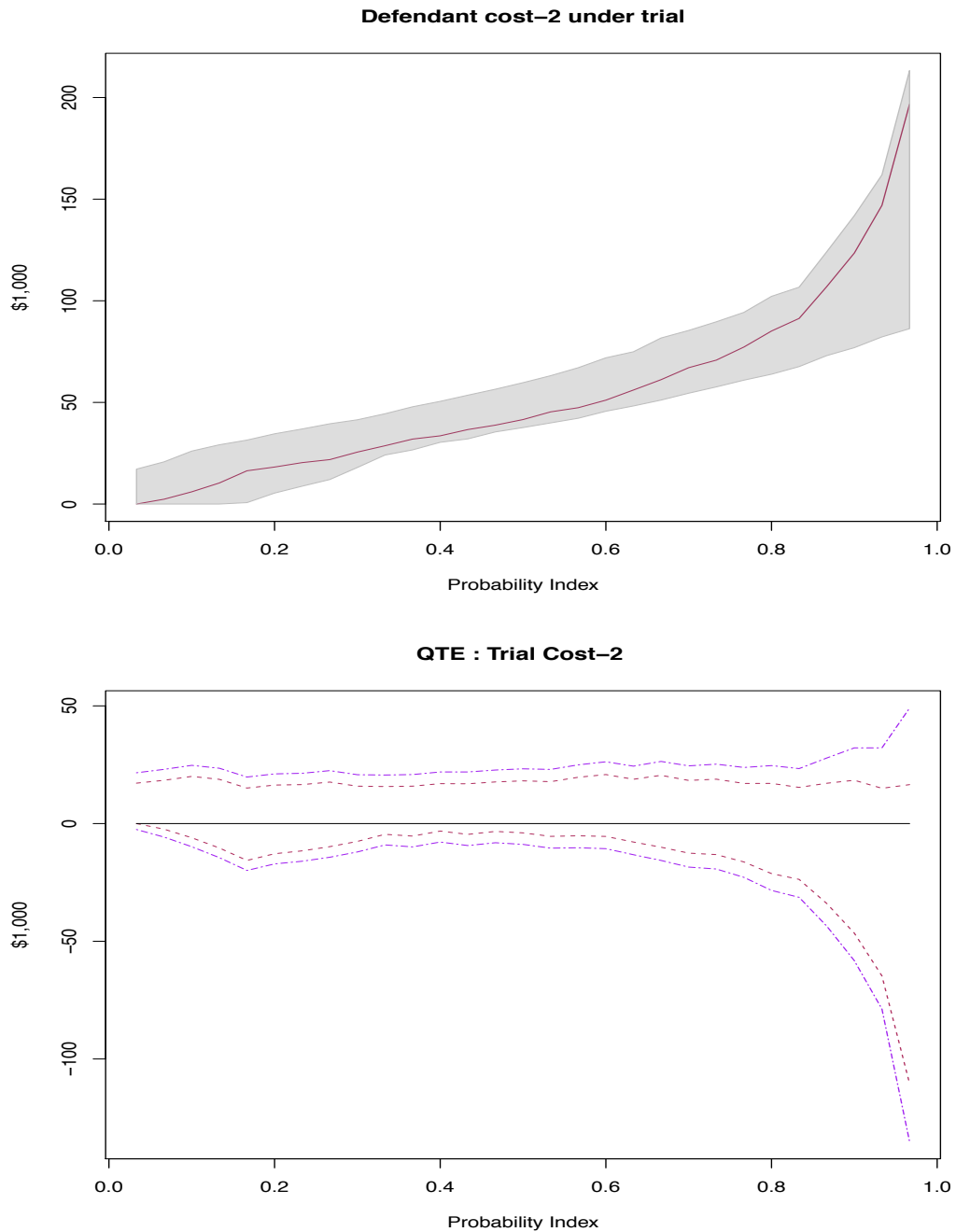
In the top panel, the solid maroon line shows quantiles of jury awards under the American rule. The grey shaded area shows the bounds of quantiles of jury awards under the English rule. In the bottom panel, the dashed maroon lines show the bounds of the QTE and the two-dashed purple lines show their 95% confidence intervals.

FIGURE 9. Quantile Effects of Defendant's Trial Cost



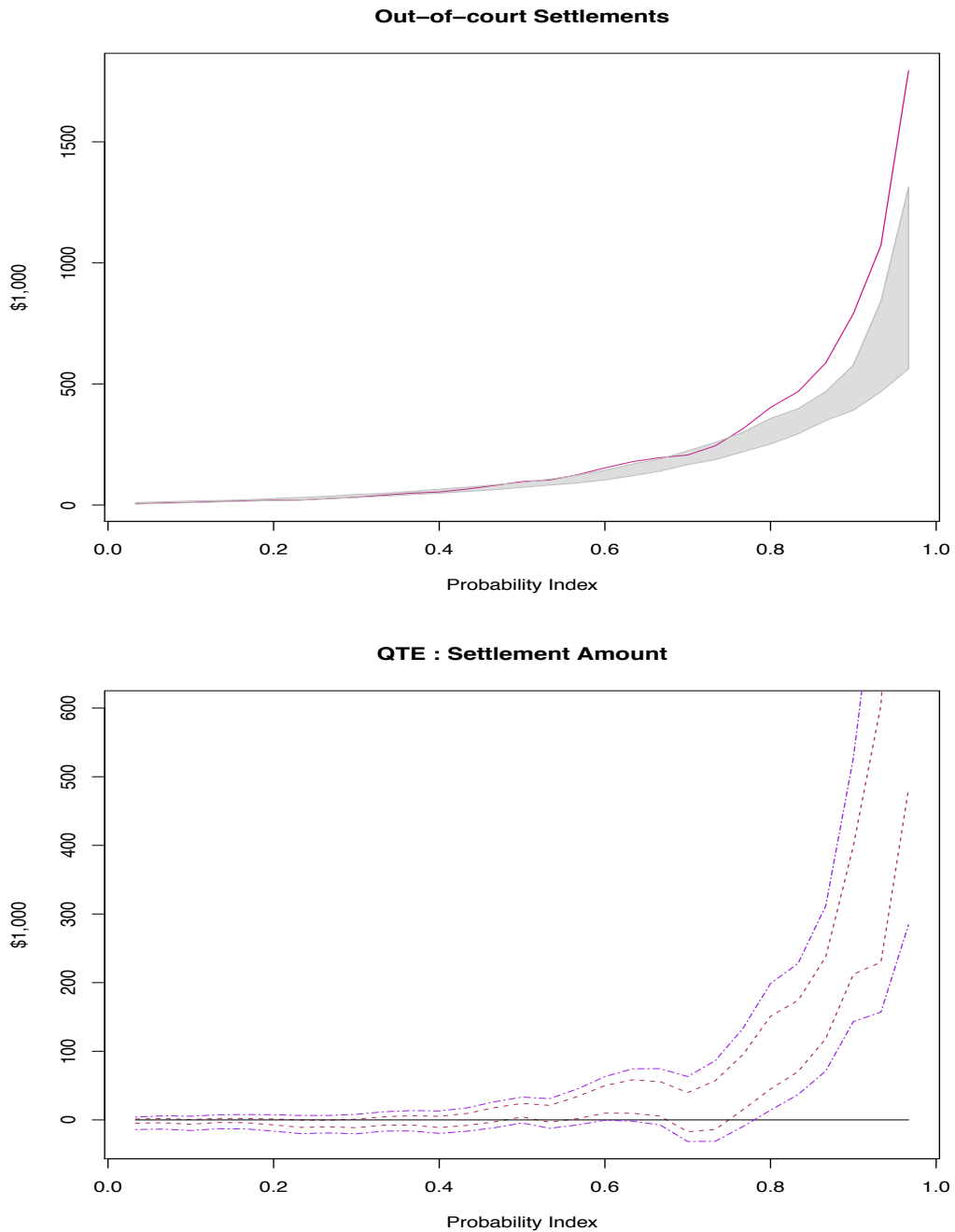
In the top panel, the solid maroon line shows quantiles of defendant litigation cost (when plaintiffs lose) under the American rule. The grey shaded area shows the bounds under the English rule. In the bottom panel, the dashed maroon lines show the bounds of the QTE and the two-dashed purple lines show their 95% confidence intervals.

FIGURE 10. Quantile Effects of Defendant's Trial Cost-2



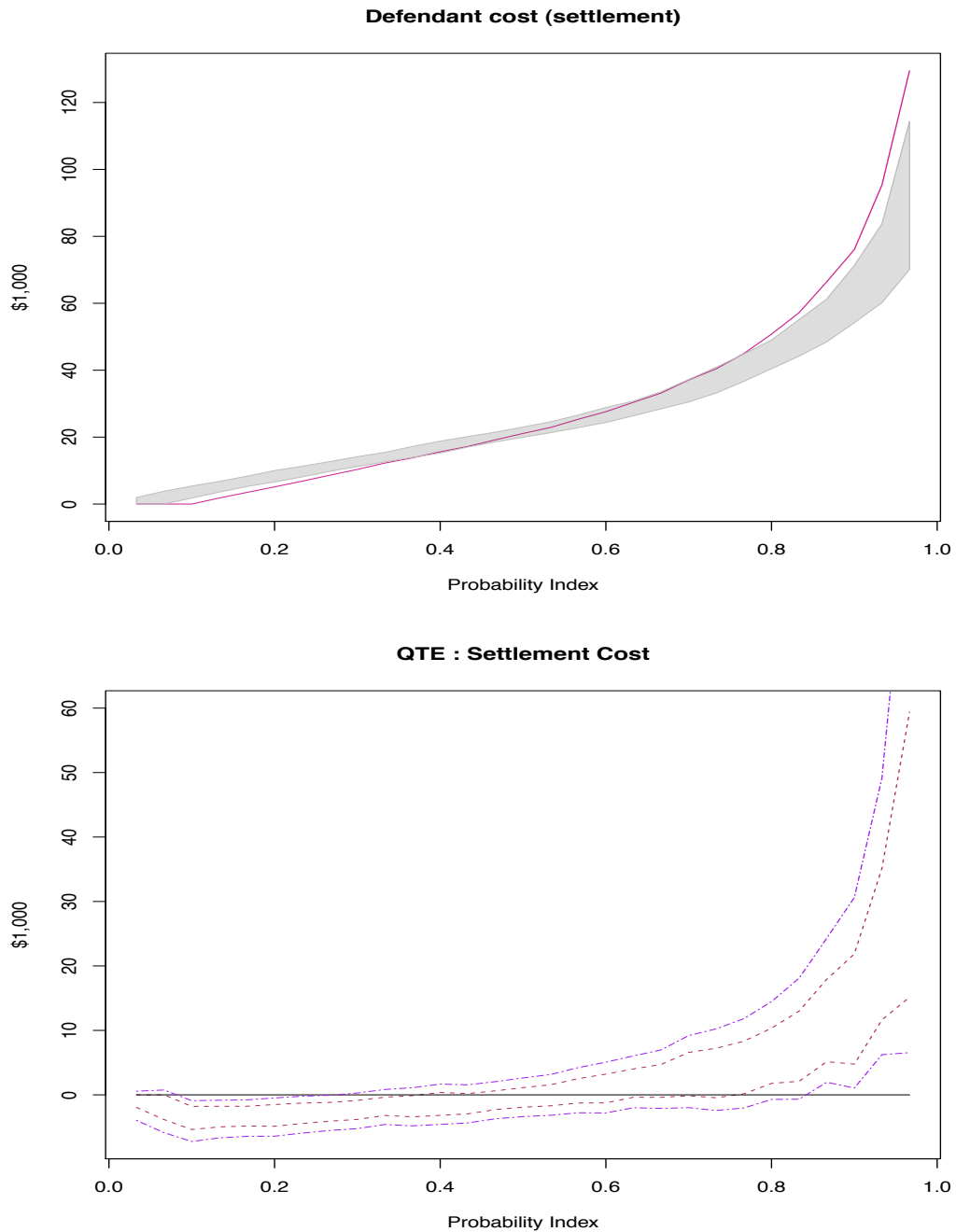
In the top panel, the solid maroon line shows quantiles of defendant litigation cost (when plaintiffs lose) under the American rule. The grey shaded area shows the bounds under the English rule. In the bottom panel, the dashed maroon lines show the bounds of the QTE and the two-dashed purple lines show their 95% confidence intervals.

FIGURE 11. Quantile Effects of Out-of-court Settlements



In the top panel, the solid violet line shows quantiles of out-of-court settlements under the English rule. The grey shaded area shows the bounds of quantiles of jury awards under the American rule. In the bottom panel, the dashed maroon lines show the bounds of the QTE and the two-dashed purple lines show their 95% confidence intervals.

FIGURE 12. Quantile Effects of Defendant cost for settlement



In the top panel, the solid violet line shows quantiles of defendant cost for settlements under the English rule. The grey shaded area shows the bounds of quantiles of jury awards under the American rule. In the bottom panel, the dashed maroon lines show the bounds of the QTE and the two-dashed purple lines show their 95% confidence intervals.