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Why do Plaintiffs Lose Appeals? Biased Trial Courts, Litigious Losers, or Low Trial Win Rates?*

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Abstract

Multiple studies find that plaintiffs who lose at trial and subsequently appeal are less successful on appeal than are losing defendants who appeal. The studies attribute this to a perception by appellate judges that trial courts are biased in favor of plaintiffs. However, at least two alternative explanations exist. First, losing plaintiffs may appeal at higher rates independent of the potential merits. Second, if plaintiffs tend to pursue to trial lawsuits where they should win on the merits less than half the time, then errors at trial will be more likely to adversely affect defendants. This study revisits the analysis of the appellate process with a theoretical model that has implications not only for appellate outcomes but for the rate of appeal. By tying together win rates at trial, appeals rates, and success rates on appeal, the model can distinguish the competing explanations for differential appellate success rates. We estimate this model using matched data on Federal District Court trials and appeals to the U. S. Circuit Courts of Appeal. We provide evidence that the lower plaintiff success rate on appeal is due to plaintiffs' pursuing lawsuits where they should win on the merits (which we define to be an outcome that will not be reversed or remanded on appeal) less than half the time. We also provide evidence against explaining asymmetric success on appeal being attributable to trial courts favoring plaintiffs and evidence against juries being favorable to plaintiffs compared to judges.

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1 Introduction

Clermont and Eisenberg (2001, 2002) and Eisenberg (2004) find that plaintiffs who lose cases in Federal District Court and subsequently appeal are less successful on appeal than are losing defendants who appeal. They attribute this to a perception by appellate judges that trial courts are biased in favor of plaintiffs. Eisenberg and Heise (2009) find similar results in appeals from state court jury trials. However, there are at least two alternative explanations. First, it may be that losing plaintiffs appeal at higher rates independent of the potential merits. Second, on a strictly mechanical basis, if plaintiffs tend to pursue lawsuits where they should win on the merits less than half the time, then random errors at the trial will be more likely to adversely affect defendants. (Eisenberg 2004, p. 677). In this study, we develop and illustrate a theoretical approach that accounts for three important stages in the litigation process: the outcome at trial, the decision to appeal, and the outcome of the appeal. By tying together win rates at trial, appeals rates, and success rates on appeal, the model can help distinguish the two explanations for differential appellate success rates. We estimate this model using matched data on Federal District Court trials and appeals to the U. S. Circuit Courts of Appeal. We provide evidence, that the lower plaintiff success rate on appeal can be due to plaintiffs' pursuing lawsuits where they should win on the merits (which we define to be an outcome that will not be reversed or remanded on appeal) less than half the time.

Section 2 briefly reviews the relevant theoretical and empirical litetarure. Section 3 describes the data we use and section 4 contains a discussion of issues that determine what parameters of the trial and appeals processes are identified with the available data. Section 5 develops our statistical model of the trial and appellate processes, and section 6 reports and discusses our results. Section 7 concludes.

2 Literature

Prior theoretical literature on the relation between trial and appellate outcomes is limited. Some of the literature is of interest with respect to other issues but does not distinguish between plaintiffs and defendants on appeal (Shavell 2010), the topic of prime interest here. Other theoretical work focuses on the general social desirability of havng an appellate process (Shavell 1995, 2006). In forecasting appellate outcomes based on their theoretical model of selection, Priest and Klein (1984) suggested that appellate success rate should be near 50 percent, a suggestion that finds little empirical support for many categories of cases.

Prior empirical literature on the relation between trial outcomes and appellate outcomes is limited to a handful of articles that use information, rarely available, about both trial outcomes and appeals stemming from those trials. Clermont and Eisenberg (2001, 2002) and Eisenberg (2004) use data on federal trials and appeals and employ regression models to estimate appellate outcomes. Eisenberg and Heise (2009) use state court trial and appellate data collected by the National Center for State Courts to do the same and Cohen (2006) uses these data to describe the pattern of trial and related appellate outcomes. Unlike the more theoretical work, the research that employs models to estimate appellate outcomes focuses primarily on differences between plaintiff and defendant success on appeal. The models consistently find evidence of asymmetric reversal rates favoring defendants, though this pattern was not found in a study of the Israel Supreme Court's appellate cases (Eisenberg, Fisher, and Rosen-Zvi 2011).

To the extent this research models the selection of cases for appeal, estimation of the relation between trial outcomes and appellate outcomes is limited to probit selection models that account for the decision to pursue to completion an appeal and the outcome of completed appeals. To our knowledge, no prior work addresses the richer set of outcomes, including simultaneously accounting for dropped or settled appeals (which account for approximately half of all appeals from trials) that we model here. In addition, no prior article employs models that develop and demonstrate the important influence on observed appellate outcomes of the rate of trials that plaintiff should win.

3 Data

We discuss the data before presenting the statistical model because there are important features of the data that need to be incorporated into the statistical framework.

Data gathered by the Administrative Office of the United States Courts, assembled by the Federal Judicial Center, and disseminated by the Inter-university Consortium for Political and Social Research convey details of all cases terminated in the federal courts since fiscal year 1970.[1] When a civil case terminates in a federal district court or court of appeals, the court clerk transmits a form containing information about the case to the Administrative Office. The form includes: data regarding the names of the parties, the subject matter category, the jurisdictional basis, the case's origin in the district as original, removed, or transferred, the amount demanded, the dates of filing and termination in the district court or the court of appeals, the procedural stage of the case at termination, the procedural method of disposition, and, if the court entered judgment or reached decision, who prevailed. Thus, the computerized database, compiled from these forms, contains all of the millions of federal civil cases over many years from the entire country.

Data are available through fiscal year 2008, but we limited the analysi to cases terminated in Federal District Court in fiscal years 1988-1998. This is because the identity of the appellant is not available for appeals terminated after fiscal year 2000.[2] Many cases terminated in Federal Court after 1998 and appealed had not had enough time to be resolved at the appellate level by 2000.

An important dimension along which cases vary is the case category. The Administrative Office data include several categories of tort, contract, and ciivl rights cases, as well as miscellaneous other categories. We divide our cases into 22 case categories, combining some categories defined in the original data into a residual category ("Uncategorized") in order to ensure sufficient sample sizes within categories.[3] We eliminated duplicate case records, and adjusted for cross, consolidated, and reopened appeals, as has previously been done with these data (Clermont and Eisenberg 2001). We made these refinements to limit the data set to include only cases for which we could reliably match district and appellate data. We also dropped patent cases because appeals in these cases was to a different forum.

We matched the district court data to the appellate data by matching the district court's docket number and filing date in the district data set with the corresponding information in the appellate data set. We attempted to match all cases in district court that were tried to verdict with an express judgment for either the plaintiff or defendant. If we found a case on

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[1] See Administrative Office of the U.S. Courts (1985, 1989) and Inter-university Consortium for Political and Social Research (2000) for details.

[2] The appealing party (plaintiff or defendant) might seem self-evident from the identity of the party for whom a judgment was entered in the District Court, but, as we discuss below, many appeals were filed by plaintiffs who nominally won in District Court.

[3] The full list of case categories used is in table 6 below.

the appellate court docket (i.e., we were able to match the case), then we assumed that the trial verdict was appealed. Inversely, if we did not find a case on the appellate court docket (i.e., we were not able to match the case), then we assumed that the trial verdict was not appealed. There were 81,012 cases tried to a verdict. In 70,473 of these cases, judgment was entered for either the plaintiff or defendant. In the remaining 10,539 cases judgment was entered for both parties or the data were not available, and we dropped these cases from our analysis. Appeals were filed in 20,961 of the 70,473 cases, but the identity of the appellant was unknown in 357 cases. These cases were dropped from the analysis. A further 143 cases with appeals pending at the end of the 2000 fiscal year were dropped from the data set. The remaining sample has 69,973 trial outcomes which were appealed in 20,461 cases.

There are two data issues that have the potential to greatly affect the analysis:

1. Initially, if judgment was entered for one party at trial, we assumed that the appellant was the other party. However, an examination of the parties' names revealed that in 9.8 percent of the cases (2,983 of 30,104) where a judgment was entered for the plaintiff, the plaintiff filed an appeal. The underlying problem is ambiguity in the meaning of a recorded judgment for the plaintiff at trial. Presumably, these judgments were nominally in favor of the plaintiff but, in fact, were unsatisfactory. We handle this problem in the statistical model by assuming that, among trial cases recorded as plaintiff wins, there is some probability (to be estimated) that the outcome is, in fact, a defendant win. Interestingly, there are no cases in which there was a trial judgment for the defendant that was appealed by the defendant. This suggests that no trial cases recorded as defendant wins were, in fact, plaintiff wins.

2. Fully 46.7 percent (9,563 of 20,461) of appeals that were filed were dropped before an appellate ruling was issued. This rate of filed appeals not reaching the merits on appeal is consistent with that reported in the other studies that match comprehensive databases of trial outcomes with appeals. (E.g., Eisenberg and Heise 2009). In these cases, we have no measure of what the appeals court would have ruled. These appeals presumably were simply dropped or a settlement was reached that differed from the terms decided by the trial court. We handle these cases by assuming a certain fraction (to be estimated) of appeals by each party are resolved without an appellate court ruling.

Table 1: Observable Outcomes, All Case Categories Combined

	Outcome	Percentage
1	Trial recorded as plaintiff win, no appeal	29.01%
2	Plaintiff wins at trial, defendant appeals and wins appeal	1.44%
3	Plaintiff wins at trial, defendant appeals and loses appeal	2.83%
4	Plaintiff wins at trial, defendant appeals and no decision on appeal	5.00%
5	Trial recorded as plaintiff win, plaintiff appeals and wins appeal	0.75%
6	Trial recorded as plaintiff win, plaintiff appeals and loses appeal	1.37%
7	Trial recorded as plaintiff win, plaintiff appeals and no decision on appeal	2.11%
8	Defendant wins at trial, no appeal	41.75%
9	Defendant Wins at Trial, plaintiff appeals and wins appeal	1.13%
10	Defendant Wins at trial, plaintiff appeals and loses appeal	8.05%
11	Defendant wins at trial, plaintiff appeals and no decision on appeal	6.56%

There are 11 combinations of trial and appeals outcomes that can be observed in the data. The increase in the number of outcomes over simple affirmance and reversal is attributable to accounting for decisions not to appeal (informally accounted for in the illustration in the Appendix), decisions to appeal but later settle or drop appeals (not previously accounted for), and cases appealed by plaintiffs that are formally recorded as trial wins by plaintiffs (not previously accounted for). These 11 outcomes are listed in table 1 with their sample average values, and all inferences will be based on probabilities of these outcomes. The observable outcomes include the identity of the trial litigant for whom judgment was entered (plaintiff or defendant), whether or not an appeal was filed, the identity of the appellant (plaintiff or defendant) in cases where an appeal was filed, and the outcome of the appeal (appellant win, appellant loss, no decision).[4]

The simple tabulation in table 1 show clearly that less than half of trial outcomes are recorded as plaintiff wins (42.51 percent), and, given that plaintiffs appeal some of these "plaintiff wins," the true plaintiff win rate is likely lower. Given the ambiguity in identifying plaintiff losses, we cannot calculate the appeals rates directly from these data. However, we can calculate plaintiff and defendant win rates on appeal (ignoring appeals that are dropped

[4] A win by the appellant is defined as the trial decision reversed or vacated, affirmed in part or reversed in part, or remanded. A loss by the appellant is defined as the trial decision being affirmed or decree enforced or the case being dismissed. No decision on appeal results when the appeal is dropped or the parties reach agreement to settle the case without a ruling on the appeal.

or settled without an appeals court decision). The plaintiff win rate on appeal is 16.57 percent while the defendant win rate on appeal is 33.72 percent. It is this relative lack of success on appeal that motivates our analysis.

4 Identification of the Role of Appeals in the Litigation Process

Before developing our statistical model of the appeals process, we discuss problems in identifying all relevant parameters of the process. Our conception of the appeals process is that the role of the appellate court is to evaluate claims by parties to a case in district court that an "error" has been made at trial and to correct those "errors."

Despite the possibility of error at the appellate level (reverse or remand a trial court outcome where there has been no error at trial or fail to reverse or remand a trial court outcome where there has been an error at trial), one assumes appellate courts usually reach correct conclusions; if they do not, their existence is hard to justify. Note that in considering appellate court outcomes it is important to distinguish between appellate courts, such as the U.S. Courts of Appeal, that have mandatory jurisdiction and appellate courts, such as the U.S. Supreme Court, that have discretionary jurisdiction (Shavell 2010). Courts with discretionary jurisdiction choose their cases and substantial evidence indicates that they select for review cases with which they disagree, leading to high reversal rates compared to appellate courts with mandatory jurisdiction (Eisenberg, Fisher, and Rosen-Zvi 2011; Eisenberg and Miller 2009). In our data, the selection of cases for appeal is by the litigants only, not by the litigants plus the reviewing court.[5]

In order to be clear about what can be learned from the data on trial and appeals outcomes, we need to distinguish between what is observable and the parameters that underlie the process. As shown in table 1, there are 11 observationally distinct outcomes. These differ from the underlying rates that govern the litigation and appeals process. These rates include

1. the rate at which plaintiffs should win at trial (if there were no trial court errors),

2. the trial court error rate adverse to plaintiffs (the rate at which plaintiffs lose trials

[5] In a very small percentage of cases, involving interlocutory appeals, an appellate court can decide whether to adjudicate the appeal.

they "should" have won),

3. the trial court error rate adverse to defendants (the rate at which defendants lose trials they "should" have won),

4. the appeal rate by losing plaintiffs when no trial court error has occurred,

5. the appeal rate by losing defendant when no trial court error has occurred,

6. the appeal rate by losing plaintiffs when there has been a trial court error adverse to plaintiffs,

7. the appeal rate by losing defendants when there has been a trial court error adverse to defendants,

8. the appeals error rate adverse to plaintiffs (the rate at which the appeals court fails to correct a trial court error adverse to plaintiffs),

9. the appeals error rate adverse to defendants (the rate at which the appeals court fails to correct a trial court error adverse to defendants),

10. the settlement/drop rate of plaintiff appeals, and

11. the settlement/drop rate of defendant appeals.

Not all of the 11 underlying rates can be identified from the observable outcomes listed in table 1, and it will be necessary to make some identifying assumptions. The central problem is that there is no objective measure of the correct trial outcome so that we cannot determine 1) whether or not an error was made at trial or 2) whether or not the appeals court made an error. To see the problem, consider a case where the plaintiff lost at trial, appeals, and the appeals court reverses the trial outcome. This outcome is consistent with two possible scenarios. First, it may be that there was an error at trial, the plaintiff appealed and the appeals court corrected the error. Second, it may be that there was not an error at trial, the plaintiff appealed, and the appeals court erred in reversing the trial outcome. Clearly, we can never identify when the appeals court makes an error or measure the distinct rates of appeal in cases where there has and has not been a trial error. This is because we do not know when a trial error has been made.

Given our earlier discussion of the role of the appellate courts, we proceed assuming that the appeals courts never make errors.[6] While this is not literally true, it is a reasonable approximation, and we can reinterpret the remaining rates accordingly. In this context, an appellate reversal does not mean that there was an error at trial. It means only that the appellate court disagreed with the trial court. Similarly, the lack of an appellate reversal does not mean that there the trial was error free. It means only that the appellate court did not disagree with the trial court. Thus, we proceed by defining a trial court error as anything that the appellate court would reverse. There is no objective way to determine that an error has occurred at a trial in any absolute sense. It is in this relative sense that we use classify as a trial error any outcome that the appellate court would reverse (or remand).

Our (necessary) assumption that the appeals court makes no errors implies that the notion of a correct outcome in trial court and the implied the rate at which plaintiff should win at trial (the "true" plaintiff win rate) have a particular meaning. In this context, a correct outcome in trial court is simply an outcome that will not be reversed or remanded by the appeals court. And the "true" plaintiff win rate is simply the rate at which the trial court will rule for the plaintiff and would not be reversed or remanded on appeal. These rates do *not* represent what "should" happen in some objective sense.

The assumption of an infallible appeals court does not help identification of the relative rates of appeals from trial outcomes where there has and has not been an error. Either party can appeal cases that are lost at trial. It is reasonable to expect that parties will appeal with higher probability when there has been a reversible error at trial than when there has not been such an error (Shavell 1995). However, the fact that there is no independent measure of whether there was a reversible error at trial implies that the probabilities of appeal when there has been a reversible error are not identified separately from the error rates at trial. The appellant win rates reflect appeals both where there was no trial error and where there was a trial error. The mix of appeals is the result of both the rate at which errors are made at trial and the relative rate at which "good" and "bad" appeals are filed.

In order to address this identification problem, we make two alternative assumptions that, in our view, bound the range of reasonable outcomes.

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[6] This fixes the appeals error rate adverse to plaintiffs and the appeals error rate adverse to defendants at zero, reducing the number of free parameters in the model by two.

1. Cases that are lost through error are appealed with probability one and that cases that are lost where there has been no error at trial are appealed with probability less than one.. This is an extreme version of the reasonable view that losses as the result of error are appealed with higher probability than losses that are not the result of error.

2. Cases that are lost through error are appealed at the same rate as cases that are lost where there has been no error at trial. This denies the view that losses as the result of error are appealed with higher probability than losses that are not the result of error.

Intuitively, the first assumption (that errors are appealed with probability one) will yield a lower estimate of the trial error rates than will the second assumption (that the probability of appeal is independent of the merit of the appeal).[7] But, because this is an identifying assumption, the fit of the model will be unaffected, and the estimates of the parameters will provide useful bounds on the true values.[8]

5 A Statistical Model

We now develop a model that enumerates and accounts for the eleven different mutually exclusive possible outcomes of the post-trial/appellate process. In order to implement a reasonably manageable model, because no objective way exists to determine that an error has occurred in any absolute sense, as discussed above we define a trial court error as anything that the appellate court would reverse.[9]

Consider a case filed in Federal District Court that is resolved through a trial verdict by either judge or jury.[10] If there were no errors at trial in a given case (defined by what

[7] Either of these identifying assumptions reduces the number of free parameters in the model by two. The first assumption fixes the two appeals rates where there has been no trial error at one. The second assumption 1) restricts the plaintiff appeals rates where there has and has not been an error at trial to be equal (one restriction) and 2) restricts the defendant appeals rates where there has an has not been an error at trial to be equal (another restriction).

[8] Further variation on the issue of appeal rates can arise if one regards plaintiffs and defendants as behaving differently with respect to decisions to appeal. See Barclay (1999); Posner (1985). Below, we find little evidence that differing appeals rates explain appellate outcome variation.

[9] A possible alternative identification assumption, not implemented here, would be to assume that the appeals court makes errors in a fixed fraction of cases, perhaps ten percent. As we show in the Appendix through a numerical example, allowing for a rate of erroneous appellate court reversal does not affect the key implications of the model.

[10] Eisenberg and Farber (1997) analyze the process through which cases are selected for litigation and how

the appellate court would have decided), the plaintiff would win at trial with probability π^*. The value of π^* can vary by category of case and other case-specific characteristics. If there were no errors at trial and all wins were recorded as being for the appropriate party, then the observed plaintiff win rate at trial would also be π^*. We term π^* the true plaintiff win rate.

Now suppose that 1) in cases where the plaintiff should win, the trial court is in error with probability λ_p and 2) in cases where the defendant should win, the trial court is in error with probability λ_d. Next, assume that, in cases where the defendant prevailed at trial, the data show a trial judgment for plaintiff with probability α_p. This might be the case, for example, where the plaintiff received a very small monetary recovery. On this basis, the probability that a trial outcome is recorded as a plaintiff win (π) is

$$\pi = [\pi^*(1-\lambda_p) + (1-\pi^*)\lambda_d] + \alpha_p[(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p]. \tag{5.1}$$

The first term in brackets is the probability that a plaintiff wins at trial, composed of "correct" plaintiff wins (probability $\pi^*(1-\lambda_p)$) and "reversible" plaintiff wins (probability $(1-\pi^*)\lambda_d$). The second term in brackets, multiplied by the probability (α_p) that a defendant win at trial is recorded as a plaintiff win, is the probability that the defendant wins at trial, composed of "correct" defendant wins (probability $(1-\pi^*)(1-\lambda_d)$) and "reversible" defendant wins (probability $\pi^*\lambda_p$). The probability that a trial outcome is recorded as a defendant win is

$$1-\pi = (1-\alpha_p)[(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p], \tag{5.2}$$

which is the probability that a defendant win at trial is recorded correctly as a defendant win $(1-\alpha_p)$ times the probability that the defendant wins at trial $((1-\pi^*)(1-\lambda_d)+\pi^*\lambda_p)$.

The observed plaintiff win rate at trial (π) is not an accurate reflection of what should be the "true" plaintiff win rate at trial (π^*). The difference is

$$\Delta_\pi = \pi - \pi^* = (1-\pi^*)\lambda_d - \pi^*\lambda_p + \alpha_p[(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p]. \tag{5.3}$$

The first term in this expression is the probability that a trial error results in a plaintiff win when the defendant should have won. This increases π relative to π^*. The second term is the probability that a trial error results in a defendant win when the plaintiff should have

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this process affects case outcomes.

won. This reduces π relative to π^*. The last term (α_p times the expression in brackets) is the probability that a defendant substantive victory is recorded as a plaintiff win, and this increases π relative to π^*. Interestingly, Δ_π varies inversely with π^*:

$$\begin{aligned}\frac{\partial \Delta_\pi}{\partial \pi^*} &= (\lambda_p + \lambda_d) - \alpha_p(1 - \lambda_p - \lambda_d) \\ &= (\alpha_p - 1)(\lambda_p + \lambda_d) - \alpha_p < 0 \end{aligned} \quad (5.4)$$

Where the true plaintiff win rate at trial is high, π tends to underestimate π^*. This is because when π^* is large there is relatively more opportunity for trial errors adverse to the plaintiff ($\lambda_p\pi^*$) than trial errors adverse to the defendant ($\lambda_d(1 - \pi^*)$). Conversely, where the true plaintiff win rate at trial is low, π tends to overestimate π^* because there is relatively more opportunity for trial errors adverse to the defendant than trial errors adverse to the plaintiff. A natural implication is that variation in observed win rates across case categories will tend to underestimate variation in the true win rates.

In order to complete the statistical model, we need to account for the fact that many appeals are resolved without a decision by the appeals court. We assume that appeals by plaintiffs are resolved without a formal decision with probability η_p. Analogously, we assume that appeals by defendants are resolved without a formal decision with probability η_d. We assume that these probabilities are independent of the merit of the appeal.

The top panel of table 2 lists the 8 parameters of the model along with their definitions. These 8 parameters determine the probabilities of each of the 11 observationally distinct case outcomes listed in table 1. The expressions for probabilities of each of these outcomes depend on the identifying assumption regarding the probabilities of appeal. The bottom two panels of table 2 contain the specification of the 11 probabilities for each of the two alternative assumptions regarding the probability of appeal.

While it is possible to calculate the overall appeal rate ($1 - P_1 - P_8 = 0.2924$) directly from table 1, it is not possible to calculate the plaintiff appeal rate or the defendant appeal rate. This is because of the positive probability that trial outcomes recorded as plaintiff wins are, in fact, cases in which the defendant substantially prevailed ($\alpha_p > 0$). Without an estimate of α_p it is not possible to calculate the denominator in the appeal rate.

The plaintiff and defendant win rates on appeal are calculated relying on the assumption that the probability that an appeal is resolved without a decision is independent of what the ultimate outcome of the appeal would have been. Plaintiffs appealed 13,972 times in

Table 2: Parameters and Specifications of Probabilities:

Parameter	Description
π^*	True plaintiff win rate at trial
γ_p	Probability of plaintiff appeal*
γ_d	Probability of defendant appeal*
λ_p	Probability of trial error resulting in plaintiff loss
λ_d	Probability of trial error resulting in defendant loss
η_p	Probability that plaintiff appeal results in no appeals decision
η_d	Probability that defendant appeal results in no appeals decision
α_p	Probability that defendant trial win is recorded as plaintiff win

$*$ The appeal probabilities (γ_p and γ_d) refer to losing appeals (no reversible error) in case 1 and to both winning and losing appeals in case 2. Winning appeals are filed with probability one in case 1.

Case 1: Trial errors appealed with probability one

Trial Win	Appeal	Outcome	Probability
Plaintiff	None		$P_1 = (1-\gamma_d)\pi^*(1-\lambda_p)$ $+\alpha_p(1-\gamma_p)(1-\pi^*)(1-\lambda_d)$
Plaintiff	Defendant	Win	$P_2 = (1-\eta_d)(1-\pi^*)\lambda_d$
Plaintiff	Defendant	Lose	$P_3 = (1-\eta_d)\gamma_d\pi^*(1-\lambda_p)$
Plaintiff	Defendant	No decision	$P_4 = \eta_d[(1-\pi^*)\lambda_d + \gamma_d\pi^*(1-\lambda_p)]$
Plaintiff	Plaintiff	Win	$P_5 = (1-\eta_p)\alpha_p\pi^*\lambda_p$
Plaintiff	Plaintiff	Lose	$P_6 = (1-\eta_p)\gamma_p\alpha_p(1-\pi^*)(1-\lambda_d)$
Plaintiff	Plaintiff	No decision	$P_7 = \eta_p\alpha_p[\pi^*\lambda_p + \gamma_p(1-\pi^*)(1-\lambda_d)]$
Defendant	None		$P_8 = (1-\alpha_p)(1-\gamma_p)(1-\pi^*)(1-\lambda_d)$
Defendant	Plaintiff	Win	$P_9 = (1-\eta_p)(1-\alpha_p)\pi^*\lambda_p$
Defendant	Plaintiff	Lose	$P_{10} = (1-\eta_p)(1-\alpha_p)\gamma_p(1-\pi^*)(1-\lambda_d)$
Defendant	Plaintiff	No decision	$P_{11} = \eta_p(1-\alpha_p)[\pi^*\lambda_p + \gamma_p(1-\pi^*)(1-\lambda_d)]$

Case 2: Trial outcomes appealed with probability independent of a trial error

Trial Win	Appeal	Outcome	Probability
Plaintiff	None		$P_1 = (1-\gamma_d)(\pi^*(1-\lambda_p) + \lambda_d(1-\pi^*))$ $+\alpha_p(1-\gamma_p)(\lambda_p * \pi^* + (1-\pi^*)(1-\lambda_d))$
Plaintiff	Defendant	Win	$P_2 = (1-\eta_d)\gamma_d(1-\pi^*)\lambda_d$
Plaintiff	Defendant	Lose	$P_3 = (1-\eta_d)\gamma_d\pi^*(1-\lambda_p)$
Plaintiff	Defendant	No decision	$P_4 = \eta_d\gamma_d[(1-\pi^*)\lambda_d + \pi^*(1-\lambda_p)]$
Plaintiff	Plaintiff	Win	$P_5 = (1-\eta_p)\gamma_p\alpha_p\pi^*\lambda_p$
Plaintiff	Plaintiff	Lose	$P_6 = (1-\eta_p)\gamma_p\alpha_p(1-\pi^*)(1-\lambda_d)$
Plaintiff	Plaintiff	No decision	$P_7 = \eta_p\gamma_p\alpha_p[\pi^*\lambda_p + (1-\pi^*)(1-\lambda_d)]$
Defendant	None		$P_8 = (1-\alpha_p)(1-\gamma_p)(\pi^*\lambda_p + (1-\pi^*)(1-\lambda_d))$
Defendant	Plaintiff	Win	$P_9 = (1-\eta_p)\gamma_p(1-\alpha_p)\pi^*\lambda_p$
Defendant	Plaintiff	Lose	$P_{10} = (1-\eta_p)\gamma_p(1-\alpha_p)(1-\pi^*)(1-\lambda_d)$
Defendant	Plaintiff	No decision	$P_{11} = \eta_p(1-\alpha_p)\gamma_p[\pi^*\lambda_p + (1-\pi^*)(1-\lambda_d)]$

our sample. Of these, there was a decision on the appeal in 7,906 cases, and the plaintiff-appellant won 1,320 of these decisions for a win rate on appeal of 0.167. The settlement plus dropped case rate on appeal by plaintiffs is $\eta_p = 6066/13972 = 0.434$. Defendants appealed 6,489 times in our sample. Of these, there was a decision on the appeal in 2,992 cases, and the defendant-appellant won 1009 of these decisions for a win rate on appeal of 0.337 percent. The settlement plus dropped case rate on appeal by defendants is $\eta_d = 3497/6489 = 0.539$.

These calculations illustrate the motivating fact of our analysis, that plaintiffs who appeal have much lower win rates on appeal than do defendants who appeal. However, without estimates of the parameters of the model, it is not possible to determine if this is due to 1) higher error rates at trial against defendants than against plaintiffs ($\lambda_d > \lambda_p$), 2) higher appeal rates in cases where there was no error at trial by losing plaintiffs than by losing defendants ($\gamma_p > \gamma_d$), or 3) plaintiffs filing lawsuits which they should win on the merits less than half the time ($\pi^* < 0.5$).

More aggregated outcomes can also be expressed as functions of the eight underlying parameters of the model listed in table 2, and these highlight the identification issues and differences between cases 1 and 2 regarding the likelihood of filing appeals.

- The plaintiff's probability of appeal (conditional on a loss at trial) is

$$\begin{aligned} \text{Case1} \quad P_{A_p} &= \gamma_p(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p \\ \text{Case2} \quad P_{A_p} &= \gamma_p[(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p], \end{aligned} \tag{5.5}$$

- The plaintiff's probability of winning an appeal (conditional on filing an appeal) is

$$\begin{aligned} \text{Case1} \quad P_{w_A|A_p} &= \frac{\pi^*\lambda_p}{\gamma_p(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p} \\ \text{Case2} \quad P_{w_A|A_p} &= \frac{\pi^*\lambda_p}{(1-\pi^*)(1-\lambda_d) + \pi^*\lambda_p} \end{aligned} \tag{5.6}$$

- The defendant's probability of appeal (conditional on a loss at trial) is

$$\begin{aligned} \text{Case1} \quad P_{A_d} &= \gamma_d\pi^*(1-\lambda_p) + (1-\pi^*)\lambda_d \\ \text{Case2} \quad P_{A_d} &= \gamma_d[\pi^*(1-\lambda_p) + (1-\pi^*)\lambda_d] \end{aligned} \tag{5.7}$$

- The defendant's probability of winning an appeal (conditional on filing an appeal) is

$$\text{Case1} \quad P_{w_A|A_d} = \frac{(1-\pi^*)\lambda_d}{\gamma_d\pi^*(1-\lambda_p) + (1-\pi^*)\lambda_d}$$

$$\text{Case2} \quad P_{w_A|A_d} \;=\; \frac{(1-\pi^*)\lambda_d}{\pi^*(1-\lambda_p)+(1-\pi^*)\lambda_d} \tag{5.8}$$

The plaintiff's probability of appeal is positively related to the probability that the trial court made an error against the plaintiff (λ_p) and positively related to the probability that a losing plaintiff in a case will file an appeal (γ_p). The plaintiff's win rate on appeal is positively related to λ_p. The plaintiff's win rate on appeal is negatively related to γ_p in case 1 and unrelated to γ_p in case 2. Similarly, the defendant's probability of appeal is positively related to the probability that the trial court made an error against the defendant (λ_d) and positively related to the probability that a losing defendant in a case with no error at trial will file an appeal (γ_d). The defendant's win rate on appeal is positively related to λ_d. The defendant's win rate on appeal is negatively related to γ_d in case 1 and unrelated to γ_d in case 2. The reason for the contrast in win rates on appeal between the two cases is that the set of appeals in case 1 includes all trials with a reversible error and only a fraction of the trials without a reversible error. In contrast, the set of appeals in case 2 includes the same proportion of trials with and without reversible errors as does the entire set of trial outcomes regardless of the appeal rate.

5.1 The Three Hypotheses

The three potential explanations for the observed higher win rates by defendants on appeal can be demonstrated clearly from equations 5.5 - 5.8. For case 1 (trial errors appealed with probability one), the difference between the defendant win rate on appeal and the plaintiff win rate on appeal is proportional to (and so has the sign of)

$$P_{wA|Ad}-P_{wA|Ap} \propto (1-\pi^*)\lambda_d[\gamma_p(1-\pi^*)(1-\lambda_d)+\pi^*\lambda_p]-\pi^*\lambda_p[\gamma_d\pi^*(1-\lambda_p)+(1-\pi^*)\lambda_d]. \tag{5.9}$$

For Case 2 (probability of appeal independent of merit of appeal), the difference between the defendant win rate on appeal and the plaintiff win rate on appeal is proportional to (and so has the sign of)

$$P_{wA|Ad} - P_{wA|Ap} \propto (1-\pi^*)^2\lambda_d(1-\lambda_d) - \pi^{*2}\lambda_p(1-\lambda_P). \tag{5.10}$$

Now consider each of the three explanations for the higher defendant win rate on appeal.

1. Trial courts have pro-plaintiff bias ($\lambda_d > \lambda_p$). In order to highlight this relationship, assume that plaintiffs and defendants should be equally likely to prevail at trial ($\pi^* =$

$(1 - \pi^*) = 0.5$) and that plaintiffs and defendants are equally likely to appeal when there has been an adverse error at trial ($\gamma_p = \gamma_d$; necessary only for case 1). In this situation, equations 5.9 and 5.10 both reduce to

$$P_{wA|Ad} - P_{wA|Ap} \propto \lambda_d(1 - \lambda_d) - \lambda_p(1 - \lambda_P) > 0 \tag{5.11}$$

when $\lambda_d > \lambda_p$ and as long as the trial error rates are less than 0.5 (a reasonable assumption).

2. Losing plaintiffs are more likely to file appeals ($\gamma_p > \gamma_d$). This has no effect on the plaintiff win rate on appeal in case 2 because good and bad appeals are filed with the same probability. However, in case 1 γ_p and γ_d refer to the probabilities of filing only losing appeals. In this case, assuming again that $\pi^* = (1 - \pi^*) = 0.5$ and assuming that there is no trial court bias ($\lambda_p = \lambda_d$), equation 5.9 reduces to

$$P_{wA|Ad} - P_{wA|Ap} \propto (\gamma_p - \gamma_d) > 0 \tag{5.12}$$

when $\gamma_p - \gamma_d > 0$.

3. Plaintiffs pursue lawsuits where they should win on the merits less than half the time ($\pi^* < 0.5$). In order to highlight this relationship assume that plaintiffs and defendants are equally likely to appeal when there has been an adverse error at trial ($\gamma_p = \gamma_d$; necessary only for case 1) and that there is no trial court bias ($\lambda_p = \lambda_d$). In this situation, equations 5.9 and 5.10 both reduce to

$$P_{wA|Ad} - P_{wA|Ap} \propto (1 - 2\pi^*) > 0 \tag{5.13}$$

when $\pi^* < 0.5$.

Equations 5.11-5.13 illustrate that each of the hypothesized explanations for the higher plaintiff win rate on appeal could theoretically be accounted for by a different configuration of the estimated parameters of the model without any difference in other parameters between plaintiffs and defendants. We turn next to maximum likelihood estimation of the model.

6 Estimation of the Model

There are eight parameters determining the 11 observed probabilities defined in table 2. Together with the restriction that the the probabilities sum to one, the parameters of the model are over-identified by two for a group of cases with common values for the parameters.

Table 3: Maximum Likelihood Estimates of Parameters of Appeals Model

Parameter	Definition	Case 1	Case 2
π^*	"true" pl win rate at trial	0.2724	0.3010
		(0.0034)	(0.0044)
γ_p	pl losing app rate	0.2389	0.2737
		(0.0022)	(0.0022)
γ_d	def losing app rate	0.2571	0.3429
		(0.0049)	(0.0049)
λ_p	error rate, pl "should" win	0.1223	0.4045
		(0.0031)	(0.0076)
λ_d	error rate, def "should" win	0.0430	0.1305
		(0.0012)	(0.0035)
η_p	no decision rate, pl apps	0.4341	0.4341
		(0.0042)	(0.0042)
η_d	no decision rate, def apps	0.5389	0.5389
		(0.0062)	(0.0062)
α_p	prob def trial win rec. for pl	0.2121	0.2120
		(0.0035)	(0.0035)

Note: Maximum Likelihood Estimates computed using the probabilities in table 2. Asymptotic standard errors are in parentheses. The maximized log-likelihood value is -115,316.7. $N = 69,973$. Case 1: All cases where there was an error at trial appealed. Losing appeals filed with probability γ. Case 2: Appeals filed with probability γ independent of whether there was an error at trial.

A straightforward approach to estimation is to write the log-likelihood function associated with the probabilities in table 2. Given a set of N cases that are resolved in one of the 11 defined ways, we can write the log-likelihood function for the probability of observing the case outcomes as

$$LnL = \sum_{i=1}^{N} \sum_{j=1}^{11} D_{ji} ln(P_j), \tag{6.1}$$

where i indexes individual cases, j indexes the potential outcomes, and D_{ji} is an indicator variable for case i that equals one if case i has outcome j and is zero otherwise.

Assuming that all observations have the same values for the parameters of the model, the maximum likelihood estimates are contained in table 3 for each of the two cases. The maximized log-likelihood of this model, is -115,316.7 regardless of the assumption regarding

Table 4: Fit of Model of Observed Outcomes

Outcome	Trial Win	Appeal	Outcome	P	$\hat{P}$	$P-\hat{P}$	$(P-\hat{P})/P$
1	Plaintiff	No	–	0.2901	0.2900	0.00004	0.00015
2	Plaintiff	Defendant	Win	0.0144	0.0144	0.00000	0.00001
3	Plaintiff	Defendant	Lose	0.0283	0.0283	-0.00000	-0.00013
4	Plaintiff	Defendant	No decision	0.0500	0.0500	-0.00000	-0.00004
5	Plaintiff	Plaintiff	Win	0.0075	0.0040	0.00355	0.47008
6	Plaintiff	Plaintiff	Lose	0.0137	0.0200	-0.00630	-0.46145
7	Plaintiff	Plaintiff	No decision	0.0211	0.0184	0.00275	0.13024
8	Defendant	No	–	0.4175	0.4176	-0.00005	-0.00012
9	Defendant	Plaintiff	Win	0.0113	0.0149	-0.00354	-0.31235
10	Defendant	Plaintiff	Lose	0.0805	0.0742	0.00629	0.07814
11	Defendant	Plaintiff	No decision	0.0656	0.0683	-0.00274	-0.04176

Note: P is the observed sample fraction for each of the 11 possible outcomes. $\hat{P}$ is the predicted sample fraction based on the maximum likelihood estimates presented in table 3 calculated using the probabilities in table 2.

the likelihood of appeal.[11] This model is nested in an unconstrained model which estimates the 11 probabilities directly as their sample averages. This model has 10 free parameters since the 11 probabilities are required to sum to one. The log-likelihood of the unconstrained model is -115,083.3.

The two restrictions embedded in the model can be rejected at reasonable levels of significance using a likelihood-ratio test. This raises the question whether the model obviously substantially mis-predicts the observed sample fractions for the eleven outcomes. In order to investigate this, table 4 contains the observed and predicted probabilities of each of the 11 possible outcomes, along with their nominal and proportional differences.[12] Clearly, the model predicts the probabilities quite closely. In no case is the absolute value of the difference even one percentage point. However, for a few of the less frequent outcomes, the proportional difference between the observed and predicted probabilities (table 4's last column) is substantial. These large differences are primarily in cases involving the ambiguous

[11] This is a demonstration that the relative appeal rate of trial outcomes with and without reversible error is not identified.

[12] Note that the predicted probabilities are unaffected by the choice of identifying assumption regarding appeals rates. The fit of the model is the same in case 1 and case 2.

category of cases in which plaintiffs are recorded as having won at trial and plaintiffs appeal. Still, we conclude that the model does not do terrible violence to the data, and we proceed to interpret the results accordingly.

Table 3 shows that the contrast between the parameter estimates using the two sets of identifying assumptions is as expected. The estimated no decision rates (η_p and η_d) and the estimated probability that a defendant win at trial is recorded as a plaintiff win (α_p) are identical in the two cases. The estimates of the true plaintiff win rate at trial (π^*) are close, though not identical. The estimate of π^*, is 27 percent in case 1 and 30 percent in case 2. These estimates are much lower than the observed plaintiff win rate at trial of 42.5 percent. This reflects almost entirely the substantial probability ($\hat{\alpha}_p = 0.212$ in both cases) that a defendant trial win is recorded as a win for the plaintiff. Given the estimates of π^* and α_p and assuming no errors at trial ($\lambda_p = \lambda_d = 0$), the plaintiff win rate at trial would be $\hat{\pi}^* + \alpha_p(1 - \hat{\pi}^*) = 0.427$ in case 1 and 0.449 in case 2, matching the observed plaintiff win rates quite closely.

Not surprisingly, the estimates of the appeals rates (γ_p and γ_d) differ systematically since they represent different quantities in the two cases. In case 1 the appeals rate represents the probability of appeal from trial outcomes that would not be reversed on appeal while reversible trial outcomes are appealed with probability one. In case 2 the appeals rates represents the probability of appeal from all trial outcomes. As a result, the estimates of γ_p and γ_d are larger in case 2.

The same reasoning affects the estimates of the trial error rates (λ_p and λ_d). These are much higher in case 2 than in case 1. This is "necessary" in order to generate the observed reversal rate on appeal. In case 1 reversible trial outcomes are all appealed so that the trial error rate can be relatively low and still generate enough appeals with merit. In case 2 reversible trial outcomes are appealed with probability $\gamma < 1$, so that the trial error rate can be "needs" to be higher to generate enough appeals with merit.

6.1 Implications of Results

We now discuss the implications of our results for the three potential explanations for the fact motivating the analysis, that plaintiffs are more likely to lose appeals than are defendants.

1. It does not appear to be the case that trial courts are biased in favor of plaintiffs

($\lambda_d > \lambda_p$). In fact, the estimates of λ_p and λ_d imply quite the opposite ($\lambda_d < \lambda_p$). This is true in both case 1 and case 2. In the first case, trial courts are estimated to make errors adverse to plaintiffs in 12.2 percent of cases, while they are estimated to make errors adverse to defendants in only 4.3 percent of cases. In the second case, trial courts are estimated to make errors adverse to plaintiffs in fully 40.5 percent of cases, while they are estimated to make errors adverse to defendants in only 13.1 percent of cases. This result is conservative in an important respect. Our analysis assumes that appellate courts, with their observed reversal rates being higher for plaintiff appeals, are always correct. Even on that assumption, we find no evidence of pro-plaintiff bias in the trial courts. It is thus unlikely that higher plaintiff reversal rates on appeal result from pro-plaintiff bias in trial courts.

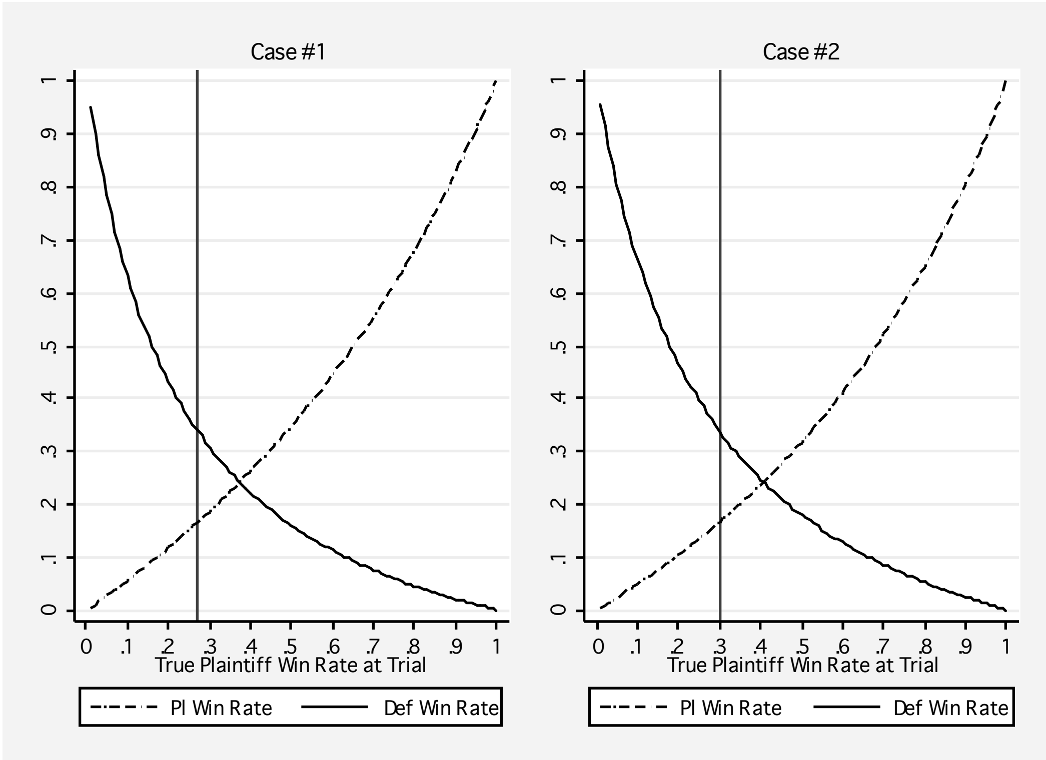
2. It does not appear to be the case that plaintiffs appeal at higher rates than do defendants ($\gamma_p > \gamma_d$). In fact, in both cases, defendants appeal at a higher rate than do plaintiffs ($\gamma_d > \gamma_p$), though the differences are not large.

3. It does appear that the true plaintiff win rate at trial (π^*) is substantially less than 0.5. This means that plaintiffs have much more opportunity to file losing appeals than do defendants. This is because plaintiffs lose appropriately in about 70 percent of cases while defendants lose appropriately in only about 30 percent of cases.[13] This differential is only partially offset by the higher trial error rate against plaintiffs than against defendants ($\lambda_p > \lambda_d$).

Formally, as demonstrated in equation 5.13, the difference between the defendant win rate on appeal and the plaintiff win rate on appeal is positive when $\pi^* < 0.5$ and increasing in $0.5 - \pi^*$. This is confirmed by figure 1, which plots the plaintiff and defendant win rates on appeal (equations 5.6 and 5.8) for a range of values of π^* at the estimated values of the other parameters of the models in table 3. At the estimated values of π^* of 0.274 for case 1 and 0.301 for case 2, the plaintiff win rate on appeal is predicted to be 0.167 and the defendant win rate on appeal is predicted to be 0.337. These match the observed values for

[13] Consider case 1. Errors against plaintiffs are made in only about 4.3 percent ($\lambda_p = 0.043$) of the 27.2 percent of cases where the plaintiff should have won (1.17 percent of all cases). Appeals in these cases will succeed. However, plaintiffs file losing appeals in 23.9 percent ($\gamma_p = 0.2389$) of the 72.8 percent of cases where the defendant should have won (17.4 percent of all cases).

Figure 1: Plaintiff and Defendant Win Rates on Appeal by π^*.
Calculated at estimated values of parameters in table 3.



these win rates.

To summarize, assuming appellate court correctness on the merits, we find no evidence in the aggregate estimates that the relatively low plaintiff win rate on appeal is the result of either pro-plaintiff bias in the trial courts or relatively high appeal rates by losing plaintiffs. The low plaintiff win rate on appeal results from the low plaintiff true win rate at trial which yields more opportunity for losing appeals.

6.2 Are Appeals from Jury Trials Different?

One argument that has been made is that juries are overly sympathetic to plaintiffs (e.g., Clermont and Eisenberg 1992, p. 1125), which should result in a higher error rate against defendants. This has direct implications for the parameters of the model (particularly λ_d) as well as for the observed outcomes. In order to investigate this, we estimated the model separately for bench trials and jury trials, and the results are contained in table 5. Given the similar qualitative nature of the results from the case 1 and case 2 models, we restrict

Table 5: Maximum Likelihood Estimates of Appeals Model,by Bench or Jury Trial

Parameter	Definition	Bench	Jury	Difference
π^*	"true" pl win rate at trial	0.2929	0.2518	-0.0410
		(0.0045)	(0.0053)	(0.0069)
γ_p	pl losing app rate	0.2583	0.2215	-0.0366
		(0.0033)	(0.0029)	(0.0044)
γ_d	def losing app rate	0.2300	0.2899	0.0597
		(0.0059)	(0.0083)	(0.0102)
λ_p	error rate, pl "should" win	0.1005	0.1468	0.0459
		(0.0039)	(0.0050)	(0.0063)
λ_d	error rate, def "should" win	0.0383	0.0465	0.0082
		(0.0017)	(0.0017)	(0.0024)
η_p	no decision rate, pl apps	0.4165	0.4503	0.0336
		(0.0061)	(0.0058)	(0.0084)
η_d	no decision rate, def apps	0.5475	0.5322	-0.0153
		(0.0093)	(0.0083)	(0.0125)
α_p	prob def trial win rec. for pl	0.1732	0.2473	0.0738
		(0.0047)	(0.0052)	(0.0070)
Log-Likelihood		-53035.8	-62182.5	
Sample Size		32534	37439	

Note: Maximum Likelihood Estimates computed using the probabilities defined in table 2 for case 1. Asymptotic standard errors are in parentheses.

further analysis to case 1, where reversible trial errors are appealed with certainty.

There are statistically significant differences between the parameters of the bench and jury trial models, but the general pattern is consistent.[14] The true plaintiff trial win rate is small in both cases. Plaintiff and defendants file losing appeals in about one quarter of cases where the bench trial outcome was correct. There is some difference in jury trials where defendants are more likely to file losing appeals than are plaintiffs (0.29 vs. 0.22 respectively). Contrary to the conventional wisdom, both the bench and juries appear to make relatively more errors adverse to plaintiffs than adverse to defendants ($\lambda_p > \lambda_d$). The rate of error adverse to defendants (λ_d) does not vary much by type of trial, with $\hat{\lambda}_d = 0.038$ for bench trials and $\hat{\lambda}_d = 0.047$ for jury trials. However, the rate of error adverse to plaintiffs (λ_p) is substantially higher for jury trials ($\hat{\lambda}_p = 0.147$) than for bench trials ($\hat{\lambda}_p = 0.101$).

[14] A likelihood-ratio test of the hypthesis that the judge and jury trials have the same parameters can be rejected with p-value $= 3.0 \cdot 10^{-38}$.

Interestingly, the probability that a defendant trial win is recorded as a plaintiff win is substantially higher in jury trials than in bench trials ($\hat{\alpha}_p$ is 0.247 and 0.173 respectively). This may reflect juries that grant a judgment for the plaintiff but provide relatively little in the way of damages.

6.3 Differences by Case Category

Given that there is substantial variation in plaintiff win rates at trial across case categories (verified in this section), the aggregate finding suggests that plaintiff win rates on appeal will be positively correlated with "true" plaintiff trial win rates across case categories. Table 6 contains the distribution of the 11 possible outcomes for each of 22 case categories.[15] It is difficult to interpret these numbers due to the large number of possible outcomes, but it is clear there is substantial variation across categories. A χ^2 test of independence of case category and outcome strongly rejects independence (p-value $< 10^{-60}$).

Given the large variation in the distribution of outcomes across case categories, we investigate the extent to which defendant win rates on appeal are higher than plaintiff win rates on appeal within specific case categories. Table 7 contains the observed plaintiff trial win rate, the defendant appeal win rate, the plaintiff appeal win rate, and the difference in appeal win rates by case category. The results are interesting in several dimensions. First, there is substantial variation across case categories in observed trial win rates, from a low of 0.1 for Prisoner-Civil Rights cases to a high of 0.78 for Other Forfeit, Penalty cases. Second, defendants are more successful on appeal than plaintiffs in all but three case categories (Other Payment, Other Land Torts, and Other Forfeit, Penalty) making up only 5 percent of the sample of lawsuits. Interestingly, the simple correlation (weighted by number of cases) of the observed trial win rate and the difference between the defendant and plaintiff win rates on appeal is -0.86, suggesting that plaintiffs' failure to win many lawsuits is related to the difference in win rates on appeal. However, this is only suggestive since the relative win rates on appeal depend on the true trial win rates (π^*).

In order to investigate this further, we re-estimated the model defined in table 2 separately for each of the 22 case categories. These estimates are presented in table 8, and they show

[15] There are 75 case categories identified in the data. We combine 64 categories with less than 750 cases into 11 broader categories (the "Uncategorized" category in table 6).

Table 6: Distribution of Outcomes by Case Category

Case Category	N	P_1	P_2	P_3	P_4	P_5	P_6	P_7	P_8	P_9	P_{10}	P_{11}
Insurance	3358	0.3648	0.0164	0.0399	0.0518	0.0054	0.0155	0.0286	0.3434	0.0149	0.0691	0.0503
Other Contract	6823	0.4187	0.0205	0.0550	0.0882	0.0084	0.0185	0.0331	0.2481	0.0110	0.0485	0.0500
Other Payment	1797	0.5003	0.0167	0.0518	0.0735	0.0089	0.0161	0.0301	0.2254	0.0083	0.0351	0.0339
Other Land Torts	908	0.4251	0.0099	0.0529	0.0683	0.0110	0.0220	0.0253	0.2654	0.0154	0.0683	0.0363
Fed Employers' Liab.	979	0.5240	0.0072	0.0266	0.0838	0.0051	0.0245	0.0184	0.2298	0.0082	0.0501	0.0225
Marine	1642	0.4068	0.0091	0.0238	0.0451	0.0152	0.0323	0.0438	0.3051	0.0097	0.0658	0.0432
Motor Vehicle	3808	0.5326	0.0045	0.0121	0.0378	0.0039	0.0179	0.0244	0.2967	0.0037	0.0431	0.0234
Other Personal Inj.	5843	0.3233	0.0111	0.0281	0.0457	0.0050	0.0137	0.0193	0.4568	0.0067	0.0520	0.0383
PI-Med. Mal.	1635	0.2165	0.0080	0.0128	0.0758	0.0073	0.0080	0.0128	0.5321	0.0086	0.0740	0.0440
Other Torts	1983	0.3691	0.0151	0.0277	0.0696	0.0111	0.0146	0.0267	0.3722	0.0096	0.0464	0.0378
Product liab, agg cat	3987	0.2340	0.0166	0.0291	0.0434	0.0233	0.0120	0.0178	0.4861	0.0103	0.0722	0.0552
Other Civil Rights	7364	0.1871	0.0204	0.0183	0.0356	0.0071	0.0124	0.0187	0.5094	0.0166	0.0967	0.0778
Jobs	9576	0.1713	0.0190	0.0250	0.0547	0.0056	0.0120	0.0189	0.4687	0.0100	0.1270	0.0878
Other Banking	1554	0.4093	0.0116	0.0148	0.0405	0.0097	0.0103	0.0180	0.3662	0.0161	0.0598	0.0438
Prisoner – Civil Rights	8730	0.0706	0.0041	0.0053	0.0064	0.0014	0.0065	0.0070	0.6407	0.0081	0.1245	0.1254
Other Prisoner	972	0.1060	0.0072	0.0247	0.0165	0.0072	0.0031	0.0123	0.5010	0.0113	0.1553	0.1553
Other Forfeit, Penalty	891	0.6207	0.0067	0.0651	0.0640	0.0034	0.0090	0.0135	0.1717	0.0067	0.0123	0.0269
ERISA of 1974	1245	0.3173	0.0177	0.0394	0.0635	0.0096	0.0201	0.0249	0.3614	0.0145	0.0803	0.0514
Other Labor	1736	0.3151	0.0225	0.0513	0.0611	0.0127	0.0144	0.0259	0.3554	0.0161	0.0645	0.0611
Tax Suits	897	0.3099	0.0145	0.0401	0.1249	0.0067	0.0145	0.0279	0.3222	0.0156	0.0725	0.0513
Other Statutory	1682	0.4114	0.0238	0.0482	0.0731	0.0101	0.0178	0.0256	0.2473	0.0226	0.0612	0.0589
Uncategorized	2563	0.3804	0.0191	0.0336	0.0496	0.0101	0.0121	0.0246	0.3274	0.0226	0.0648	0.0558
All	69973	0.2901	0.0144	0.0283	0.0500	0.0075	0.0137	0.0211	0.4175	0.0113	0.0805	0.0656

P_1 = P(Pl trial win, no appeal)
P_2 = P(Pl trial win, def appeals and wins appeal)
P_3 = P(Pl trial win, def appeals and loses appeal)
P_4 = P(Pl trial win, def appeals and no appeal decision)
P_5 = P(Pl trial win, pl appeals and wins appeal)
P_6 = P(Pl trial win, pl appeals and loses appeal)
P_7 = P(Pl trial win, pl appeals and no appeal decision)
P_8 = P(Def trial win, no appeal)
P_9 = P(Def trial win, pl appeals and wins appeal)
P_{10} = P(Def trial win, pl appeals and loses appeal)
P_{11} = P(Def trial win, pl appeals and no appeal decision)

Table 7: Distribution of Outcomes by Case Category

Category	(1) Trial Pl Win	(2) Appeal Def Win	(3) Appeal Pl Win	(4) Appeal Diff
Insurance	0.5223	0.2910	0.1932	0.0978
Other Contract	0.6424	0.2718	0.2241	0.0477
Other Payment	0.6973	0.2439	0.2520	- 0.0081
Other Land Torts	0.6145	0.1579	0.2264	- 0.0685
Fed Employer' Liability	0.6895	0.2121	0.1512	0.0610
Marine	0.5761	0.2778	0.2030	0.0748
Motor Vehicle	0.6331	0.2698	0.1111	0.1587
Other Personal Injury	0.4462	0.2838	0.1504	0.1334
PI-Medical Malpractice	0.3413	0.3824	0.1625	0.2199
Other Torts	0.5340	0.3529	0.2531	0.0999
Prod Lib, agg cat	0.3762	0.3626	0.2851	0.0775
Other Civil Rights	0.2996	0.5263	0.1781	0.3482
Jobs	0.3065	0.4323	0.1013	0.3310
Other banking	0.5142	0.4390	0.2685	0.1706
Prisoner–Civil Rights	0.1013	0.4390	0.0676	0.3714
Other Prisoner	0.1770	0.2258	0.1047	0.1212
Other Forfeit, Penalty	0.7823	0.0938	0.3214	- 0.2277
ERISA of 1974	0.4924	0.3099	0.1935	0.1163
Other Labor	0.5029	0.3047	0.2674	0.0373
Tax Suits	0.5385	0.2653	0.2041	0.0612
Other Statutory	0.6100	0.3306	0.2926	0.0380
Uncategorized	0.5295	0.3630	0.2989	0.0640

Note: Column (1) is the observed plaintiff trial win rate. Column (2) and (3) are the defendant and plaintiff win rates on appeal calculated dropping the appeals that not formally decided. Column (4) is the difference between column (2) and column (3).

dramatic differences across case categories in several parameters. Most importantly, they show substantial variation in the true plaintiff win rate at trial (π^*) across categories. These range from a low of 0.061 for Prisoner-Civil rights cases to a high of 0.670 for Other Forfeit, Penalty cases. The three categories shown in table 8 to have higher plaintiff than defendant win rates on appeal (Other Payment, Other Land Torts, and Other Forfeit, Penalty) have among the five highest estimated values of π^*. The losing appeal rate for plaintiffs exceeds that for defendants ($\gamma_p > \gamma_d$) in only seven of the 22 categories. In only two categories is the trial error rate against defendants greater than the trial error rate against plaintiffs ($\lambda_d > \lambda_p$), and the absolute difference is small in these two cases. In most categories λ_p

Table 8: Maximum Likelihood Estimates, of Parameters by Case Category

Case Category	π^*	γ_p	γ_d	λ_p	λ_d	η_p	η_d	α_p
Insurance	0.3503	0.2398	0.2434	0.1012	0.0484	0.4287	0.4793	0.2694
Other Contract	0.4402	0.2553	0.2961	0.0860	0.0795	0.4902	0.5389	0.3533
Other Payment	0.4806	0.2044	0.2399	0.0694	0.0666	0.4831	0.5176	0.4157
Other Land Torts	0.4471	0.2594	0.2713	0.0903	0.0374	0.3456	0.5210	0.3266
Fed Employers Liab	0.4993	0.2297	0.1929	0.0388	0.0498	0.3175	0.7130	0.3729
Marine	0.2720	0.2373	0.2451	0.1559	0.0297	0.4141	0.5781	0.4336
Motor Vehicle	0.3898	0.1737	0.1053	0.0330	0.0240	0.4105	0.6957	0.3969
Other Personal Inj.	0.2254	0.1528	0.2964	0.0901	0.0311	0.4272	0.5383	0.2815
PI - Med Mal.	0.1824	0.1662	0.3785	0.1371	0.0452	0.3673	0.7854	0.1824
Other Torts	0.2711	0.1585	0.3105	0.1357	0.0545	0.4408	0.6188	0.3581
Product Liab, agg cat.	0.1569	0.1684	0.5532	0.3461	0.0383	0.3825	0.4873	0.2791
Other Civil Rights	0.1614	0.2357	0.2916	0.2526	0.0466	0.4211	0.4790	0.1664
Jobs	0.1775	0.3013	0.3709	0.1490	0.0519	0.4082	0.5545	0.1399
Other Banking	0.3730	0.1928	0.1127	0.1139	0.0469	0.3922	0.6067	0.2407
Prisoner – Civil Rights	0.0609	0.2730	0.2088	0.3030	0.0074	0.4851	0.4058	0.0545
Other Prisoner	0.1446	0.3652	0.3455	0.2505	0.0128	0.4866	0.3404	0.0654
Other Forfeit, Penalty	0.6704	0.1539	0.1901	0.0344	0.0386	0.5628	0.4711	0.3595
ERISA of 1974	0.3043	0.2461	0.3131	0.1272	0.0537	0.3796	0.5267	0.2718
Other Labor	0.3285	0.2267	0.3386	0.1575	0.0612	0.4466	0.4530	0.2709
Tax Suits	0.3672	0.2562	0.4011	0.1048	0.0753	0.4204	0.6957	0.2597
Other Statutory	0.4731	0.2901	0.2332	0.1207	0.0910	0.4305	0.5040	0.2723
Uncategorized	0.3954	0.2350	0.1922	0.1431	0.0614	0.4228	0.4847	0.2459
All	0.2724	0.2389	0.2571	0.1223	0.0430	0.4341	0.5389	0.2121

Note: Maximum Likelihood Estimates computed separately by case category. Standard errors, all very small relative to the estimated parameter values, are not presented.

π^* – "true" pl win rate at trial
γ_p – pl losing app rate
γ_d – def losing app rate
λ_p – error rate, pl "should" win
λ_d – error rate, def "should" win
η_p – settlement rate, pl apps
η_d – settlement rate, def apps
α_p – prob def trial win rec. for pl

substantially greater than λ_d, as summarized by the aggregate estimate in the last row.

The model estimates by case category lend strong support to the conclusion that the relative success of defendants on appeal derives from low values for π^*, the true plaintiff win rate at trial. The relative lack of success of plaintiffs on appeal is caused neither by a higher appeal rate for losing plaintiffs nor by a pro-plaintiff trial court bias.

7 Final Comments

We generated three hypotheses that could account for why plaintiffs who appeal Federal District Court decision in the Court of Appeals are less successful on appeal than are defendants who appeal:

1. District Court bias in favor of plaintiffs,
2. A higher rate of appeal by plaintiffs who lose in District Court, and
3. A lower plaintiff win rate at the District Court level.

In order to examine which of these hypotheses can account for the relatively low plaintiff win rate on appeal, we estimated a statistical model of the appeals process using a data set that merged data on cases terminated in Federal District Court between 1988 and 1998 with data from the U.S. Circuit Courts of Appeal.

Our statistical model, estimated using a maximum likelihood model based on the probabilities of the 11 observed post-trial outcomes of tried cases, fits the observed data quite well. Of our three hypotheses, only the generally low rate at which plaintiffs should win at trial appears to be the driving force behind asymmetric appellate reversal rates. The other two hypotheses account for none of the difference in win rates on appeal. In fact, the trial courts are estimated to err in favor of defendants more than they err in favor of plaintiffs, and losing plaintiffs are estimated to have a lower rate of appeal than losing defendants. Thus, our estimates imply that asymmetric appellate reversal rates can be observed despite judicial behavior that is neither pro- nor anti-plaintiff. A simple illustration (presented in the Appendix), using plausible assumptions about appeal rates and appellate behavior, suggests that our modeling choices are not driving our results.

As we noted above, there is substantial variation across case categories in the estimated rate at which plaintiffs "should" win at trial (π^* in table 8), and some categories have very low "true" plaintiff win rates. This results in a large gap between the plaintiff and defendant appellate win rates. For example, for Jobs (employment discrimination) cases, estimate of $\pi^* = 0.1775$ in table 8 supports the 30 percentage point gap between plaintiff and defendant appellate win rates (10.13 percent vs. 43.23 percent, respectively, in table 7).

Such a low "true" win rate may seem surprising but it is important to understand that these are not, even conceptually, the observed win rates. The "true" win rate is the fraction of cases that the plaintiff would win and that the appeals court would not reverse. As we noted above (equation 5.3), the observed plaintiff win rate at trial differs systematically from π^*. Intuitively, this is because 1) trial courts make errors (i.e., differ from what the appeals court would decide) and 2) some cases that are classified as plaintiff wins are actually plaintiff losses (the fraction α_p). We also noted (equation 5.4) that, where the true plaintiff win rate is low, the observed plaintiff win rate tends to be larger than the "true" plaintiff win rate. In the example of Jobs cases, where the "true" plaintiff win rate is only 17.75 percent, the observed plaintiff win rate (table 7) is substantially larger at 30.65 percent. A substantial part of this difference is due to our finding (the estimate of α_p in table 8) that about 14 percent of outcomes in Jobs cases classified as plaintiff wins are in fact, plaintiff losses.

The general pattern of our results, both overall and by case category, is that plaintiffs tend to lose at trial. Whether the observed pattern of trial and appellate outcomes is driven by judicial behavior or by plaintiffs selecting which cases to file (or a combination of the two), accompanied by the filtering of cases that reach trial by the pretrial motion and settlement process, cannot be fully resolved. This is because we lack data about what the plaintiff trial win rate should be.[16]

Nevertheless, our earlier work, Eisenberg and Farber (1997), provides a possible explanation for why plaintiffs tend to lose at trial. The short answer is that this results from the systematic selection of cases by plaintiffs for litigation. Our model is based on the idea that potential plaintiffs vary in their cost of litigation (or their litigiousness) and where the merits of a potential claim is distributed independently of the cost. Only those plaintiffs whose expected value of claim exceeds the litigation cost file a suit. Potential plaintiffs with the lowest litigation costs (most litigious) are those who file lawsuits, and these plaintiffs are

[16] Outside the area of medical malpractice, where ex post third party analysis of medical records can reveal the merits of claims (see, for example, Cranberg et al. 2007; Farber and White 1991, 1994), objective information about the merits of plaintiffs claims is largely unavailable.

willing (on average) to file relatively low quality cases. This is in contrast to defendants who, as the targets of plaintiffs, are selected close to randomly with regard to their litigation costs. The result of this asymmetric selection is a relatively low success rate in District Court for plaintiffs, and, as we show here, a relatively low success rate on appeal.

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Appendix: Sensitivity to Identifying Assumptions

In this Appendix, we illustrate how assumptions about relevant case processing rates lead to our core result: that the appellate reversal rate is strongly associated with the rate of trials that plaintiffs should win.[17] The illustration helps motivate the model and provides some evidence that model results are not sensitive to key assumptions necessary to the modeling process.

To illustrate the importance influence of the rate of trials that the plaintiff should win on the observed appellate reversal rate, assumptions about four rates are necessary: (1) rates of trial court success, (2) rates of trial court error, (3) rates of appeals, and (4) rates of appellate court error. We use plausible assumptions about these rates to illustrate how they can generate asymmetric reversal rates for appealing plaintiffs and defendants. This exploration of assumptions suggests that our key results are not strongly sensitive to modeling assumptions.

First, as we show above, the trial win rate substantially influences the appellate win rates one might expect to observe. Second, it is reasonable to assume that the trial court's rate of error is associated with the appellate court's reversal rate. Appellate courts presumably do not randomly reverse trial court decisions. Third, the rate of appeal obviously influences the expected reversal rate. If parties only appeal cases in which the trial court erred (by an objective standard discernable by the appellate court), then 100 percent of appeals would lead to reversals. Similarly, a high trial court error rate might result in a low reversal rate if parties tend not to appeal erroneous rulings but do tend to appeal appropriate rulings. Fourth, one needs to specify a rate at which appellate courts err. They may reverse when they should affirm and they may affirm when they should reverse.

Trial Court Error Rates. As we noted above, despite the possibility of error, one assumes appellate courts usually reach correct conclusions. Assume that trial courts err in ten percent of tried cases. By err, we mean issue a ruling that an appellate court could justifiably use to reverse the ruling. Ten percent is not merely a guess. Parties appeal to conclusion about 20 percent of tried cases and that about one-third of those concluded appeals lead to reversals (Eisenberg 2004). This yields a preliminary trial court error rate of not less than about seven

[17] The discussion in this subsection is based on Eisenberg (2004), which referred to this ongoing work by us.

percent. Litigants, for cost or other reasons do not appeal all trial court errors and drop some appeals due to cost or settlement. So the seven percent rate is probably closer to a floor than a ceiling. In an absolute sense, a correct ruling rate of 90 percent is high, higher than the usual rate of expert agreement (Clermont & Eisenberg 1992).

Appeal Rates. It is sensible to assume two different rates of appeal; one for cases in which the trial court erred and a second rate for cases in which the trial court was correct (Shavell 1995, p. 390). One expects the second rate to be substantially lower than the first but neither rate is precisely known. Parties do not appeal randomly and it reasonable to think that they are more likely to appeal errors compared to correct judgments. We assume for purposes of this illustration an appeal rate of 20 percent in cases in which the trial court was correct. Parties are thus assumed to correctly decide against appeal in eighty percent of correct trial court rulings. But several reasons—high stakes, low costs, or just plain error—they are assumed to appeal in 20 percent of cases with correct trial court rulings.

For cases in which the trial court erred, we assume for illustrative purposes a 50 percent appeal rate. The costs of appeal, the demoralizing effect of a trial loss, the need for closure, and other factors should lead parties to appeal well under than 100 percent of the cases in which they correctly believe the trial court erred.

Appellate Court Error. One expects appellate courts to reverse a higher rate of cases appealed that contain true error than of cases appealed that are correct. We assume that the appellate court will reverse 80 percent of the cases with true error and 20 percent of the correct cases. The appellate court thus correctly resolves the vast majority of cases appealed to but is also capable of error. Disagreements with the trial court not be regarded as errors; they may be cases of legitimate appellate court-trial court disagreement with respect to close issues.

Using numbers of cases helps to illustrate the numerical processes and the influence of the trial win rate on appellate outcomes. Assume, for example, that plaintiff should win 35 percent of trials in a class of cases but that district courts err in 10 percent of the cases. Given 1,000 trials, plaintiffs should win 350 trials. Due to 10 percent error, plaintiffs in fact win 315 of those trials and lose 35. Defendants should win 650 trials. Due to 10 percent error, defendants win 585 of those trials and lose 65.

As stated above, the assumed appeal rate is 50 percent when the district court errs and 20 percent when the district court was correct. Assume, realistically based on known appeal rates, these appeal rates are the same for both plaintiffs and defendants. This leads to plaintiff appeals in 17.5 erroneous losses and 117 (20 percent of 585) accurate plaintiff losses, a total of 134.5 plaintiff appeals. The same assumptions lead to defendant appeals in 32.5 erroneous defendant losses and 63 (20 percent of 315) accurate defendant losses, a total of 95.5 defendant appeals.

We now apply assumptions about appellate court reversal rates to the 135 (rounded) plaintiff appeals and 96 (rounded) defendant appeals. The appellate court will reverse 80 percent of the 17.5 erroneous plaintiff losses (14 cases) and will reverse 20 percent of the 117 accurate plaintiff losses (23.4 cases). Thus, plaintiff appeals will yield 37.4 reversals out of the total of 134.5 plaintiff appeals, a reversal rate of 27.8 percent. With respect to defendant appeals, the appellate court will reverse 80 percent of the 32.5 erroneous defendant losses (26 cases) and 20 percent of the 63 appealed correct defendant losses (12.6 cases). Thus defendant appeals will yield 38.6 reversals out of 95.5 appeals, a reversal rate of 40.6 percent.

Applying the Assumptions. Defendants obtain reversals in 40.6 percent of appealed cases compared to plaintiffs reversal rate of 27.8 percent of appealed cases. This difference is not a consequence of either appellate courts treating plaintiff appeals less favorably than defendant appeals, or (2) trial court error rates favoring plaintiffs or defendants. By assumption in our example, we assumed symmetric treatment in the trial and appeals courts. The appellate court reversed and affirmed cases at similar rates for both parties; the trial court made errors at the same rates for both parties. The asymmetrical appellate reversal rates on appeal stem from the assumed correct trial court win rates. The assumed trial court error rates and the assumed appeal rates influence the magnitude of the plaintiff-defendant difference. But the difference is attributable to an assumed trial court win rate that differs from 50 percent.

Using the same assumptions about trial court error rates, appeal rates, and appellate court behavior, table 9 shows the plaintiff appeals reversal rate, the defendant appeals reversal rate, and the difference (plaintiff reversal rate minus defendant reversal rate) for assumed correct plaintiff trial win rates ranging from 20 percent to 80 percent, including the 35 percent rate used above for illustrative purposes. The table shows that, for any correct plaintiff trial win rate of less than 50 percent, the observed appeal reversal rates will favor defendants. Correspondingly, for any correct plaintiff trial win rate of more than 50 percent, the observed appellate court reversal rates will favor plaintiffs.

This illustration indicates that the modeling evidence we present below that supports

Table 9: Hypothesized Reversal Rates As A Function of Trial Win Rates

Objectively Correct Plaintiff Trial Win Rate	Reversal Rate in Plaintiff Appeals	Reversal Rate in Defendant Appeals	Plaintiff Minus Defendant Difference
.2	.24	.52	−.28
.25	.25	.47	−.22
.3	.26	.44	−.17
.35	.28	.40	−.13
.4	.29	.38	−.08
.45	.31	.35	−.04
.5	.33	.33	.00
.55	.35	.31	.04
.6	.38	.29	.08
.65	.4	.28	.13
.7	.44	.26	.17
.75	.47	.25	.22
.8	.52	.24	.28

Note: The table shows the expected difference in plaintiff and defendant reversal rates (fourth column) based on presumed objective rates at which plaintiff should win at trial (first column). See text for assumptions generating the hypothetical reversal rates. Table is from Eisenberg (2004).

the core result is likely not strongly sensitive to assumptions used to implement the model.