ANTITRUST SETTLEMENTS AND TRIAL OUTCOMES

Jeffrey M. Perloff, Daniel L. Rubinfeld, and Paul Ruud*

Abstract—Risk aversion plays an important role in explaining why antitrust cases settle instead of going to trial. Using a jointly estimated model of settlement and trial outcome, we find that a 1% increase in the probability that the plaintiff wins at trial raises the probability of a settlement by 0.13%. We also find that reputation effects are not a significant factor for defendants, so the risk aversion of the defendants does not play a dominant role in determining whether the parties settle. Plaintiffs are more likely to win in certain jurisdictions, which encourages venue shopping by plaintiffs.

I. Introduction

WHETHER parties to private antitrust lawsuits settle or go to trial depends on their beliefs about the likely trial outcome and on their attitudes toward risk. We develop and estimate a model of the determinants of both trial outcomes and settlements using data for private antitrust cases involving firms. An important feature of the model is that the likelihood of settlement depends on the parties' beliefs about trial outcomes. Specifically, settlements are a function of the expected *distribution* of outcomes conditional on the case going to trial. Our model allows us to estimate how much an increase in the probability that the plaintiff wins at trial and how much an increase in the variance of the trial outcome affect the probability of a settlement prior to trial. We use this information to determine the extent to which parties are risk averse, which encourages settlement. We also test the hypothesis that defendants view the stakes in the case as greater than do plaintiffs, which would occur if defendants are concerned how their reputations might affect potential future cases.

Our empirical results have important implications for public policy. For example, knowing which factors increase the probability of settlement allows governments to design policies that encourage settlements and hence places less stress on the judicial system (Cooter and Rubinfeld (1989); Spier (1992)). Further, our model can be used to examine the effects on settlement behavior of changes in the rule that awards antitrust plaintiffs treble damages (Perloff and Rubinfeld (1988)).

In addition, our determination of the degree to which trial outcomes vary by jurisdiction raises intriguing questions for policy makers. Are these differences due to different legal rules, to different enforcement of similar legal rules, or to different attitudes toward plaintiffs by judges and juries? Such differences can encourage forum shopping (choosing which district court in which to file suit) by plaintiffs.

We believe that this study is the first econometric analysis of trials and settlements in antitrust cases in which plaintiffs and defendants are firms, though there are many studies of settlements in product liability and medical malpractice cases, where plaintiffs are individuals.[1] To our knowledge, this study is also the first explicitly to estimate a trial equation and the link between the probability and variance of a plaintiff winning at trial and the probability of settlement. Many earlier empirical studies, however, have examined how risk aversion affects the probability of settlement and shown that the cases that go to trial reflect self-selection by plaintiffs and defendants.[2] That is, the distribution of trial outcomes conditional on trial occurring may be different than the unconditional pretrial distribution.

The model of settlement that is most similar to ours is Viscusi (1988), which focuses on the decisions to drop and to settle product liability claims. Viscusi was the first to measure the effect of the expected value of a claim and its variance on behavior. He concludes that the expected award had from two to nine times the influence of the variance, and that risk aversion, though statistically significant, plays a relatively minor role. Where we estimate a trial equation to obtain information about the probability of winning a particular case at trial and the associated variance, Viscusi measures the expected payoff and variance using data on trial outcomes and in settlements for many cases in 19 different accident categories.

Fournier and Zuehlke (1989) estimate a plaintiff's settlement demand equation that explicitly accounts for self-selection. Like Viscusi, they use summary data on recently completed civil trials as indicators of expected trial information (including the mean trial award, the variance of trial awards, and the odds of a plaintiff victory at trial). They find that higher trial awards and increased variance both increase the probability of settlement. They do not model risk aversion explicitly, but interpret their results as consistent with the view that the parties are risk averse.

Lillard and Viscusi (1990) account for selection effects at both the drop and settlement stages of litigation using a large number of product liability cases. They incorporate information about the likelihood that plaintiff will win at trial and the expected verdict at trial on individual offers made by defendants and requests made by plaintiffs during settlement bargaining. In contrast to Fournier and Zuehlke's results, their results appear to be consistent with risk neutrality. Lillard and Viscusi, however, find that higher trial awards have a greater (positive) effect on the defendant's settlement offer than on the plaintiff's request. Conversely, higher probabilities of winning at trial have a greater effect on the plaintiff's

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* University of California, Berkeley.

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[1] For example, Viscusi (1986, 1988) analyze product liability issues, while Danzon and Lillard (1983), Hughes (1989), Hughes and Snyder (1989), Sloan and Hoerger (1991), and Farber and White (1991) study medical malpractice.

[2] In fact, if self-selection is sufficiently important (as in the strongest version of the Priest-Klein (1984) case-selection hypothesis), trial outcomes will not vary by jurisdiction. According to this particular Priest-Klein hypothesis, if the payoffs to plaintiffs and defendants are identical, differences in settlement rates and drop rates offset jurisdictional differences so that the probability that a plaintiff wins at trial is everywhere 50%.

request than on the defendant's offer. The first result is consistent with a defendant that is more risk averse than a plaintiff, whereas the second result suggests the converse.

Lillard and Viscusi do not model the settlement bargaining process explicitly. Danzon and Lillard (1983) estimate a model that simultaneously determines whether cases are dropped, settled, or taken to trial and the trial outcomes of tried cases using equations that explain (1) the probability of the plaintiff winning; (2) the trial award; and (3) the settlement offers of plaintiffs and defendants. They do not, however, take into account the feedback between the probability that the plaintiff wins and the settlement offers of the parties.

In section II, the settlement-trial outcome model is presented, along with additional comments about the literature. Section III contains a description of the antitrust database and provides some summary information. Section IV describes the estimation of the econometric model. The empirical results are presented in section V, along with a series of statistical tests. Section VI contains brief concluding comments.

II. The Model

Whether parties settle or go to trial depends on their expectations about the outcome if the case goes to trial.[3] Because of this interdependence between settlement and trial, it is clearer to work backwards, starting with the behavior of the parties at trial and then examining their decisions whether to settle before trial.

Trial

Strategic bargaining considerations aside, all else the same, greater efforts to win at trial are made by a party that (1) has a higher marginal productivity of effort; (2) is a repeat litigant who fears future trials; or (3) is relatively risk averse (Rubinfeld and Sappington (1987)). But, strategy is important. If one party expects the other to expend more effort, it may change the level of effort it would choose, ignoring strategic considerations.

Thus, trial outcomes are determined by the interaction between the effort that the parties make at trial, their relative costs and resources, the underlying facts and law of the case, and differences in judges and juries across jurisdictions. Unfortunately, our data set does not include specific information that would allow us to build a structural model of trial behavior. Instead, we use a reduced-form specification of the trial outcome that explicitly accounts for differences in legal issues, jurisdictions, and choices of fact-finder, while using other variables to proxy for the parties' effort at trial. In the model, the probability that the plaintiff wins at trial,

$$p_t = \Phi_t(z'_t\beta_t), \quad (1)$$

is a function of the characteristics of the case and the relevant parties z_t and coefficients β_t.

Settlement

Why do parties to a suit fail to settle and go to trial? Failure to settle may occur for at least three reasons. First, the plaintiff's expected gains may outweigh the defendant's expected losses either because the plaintiff believes its probability of winning is greater than does the defendant, or because the plaintiff expects a larger award at trial than does the defendant. Second, one or both parties might enjoy taking risks, or their lawyers may have a financial interest in the additional hours generated by a trial. Third, as the recent game-theoretic literature emphasizes, "breakdowns" of the settlement bargaining process may occur when parties have informational asymmetries and there are settlement offers made by one or both parties.

We assume that the expected utilities of both plaintiff and defendant depend on only the mean and variance of their respective incomes, y_p and y_d:[4]

$$EU_j(y_j) = \mu_j - \delta_j\sigma_j^2, \quad (2)$$

where μ_j is the mean of the random variable y_j, σ_j^2 is the variance, and $\delta_j > 0$ reflects the degree of risk aversion for $j = p$ or d. If the probability that each party $j = p$ or d places on the plaintiff winning is p_j, then $\sigma_j^2 = p_j(1 - p_j)$. Thus, the parties are most uncertain (the variance is greatest) if they place the probability of winning at trial at 0.5.

To focus on the conditions that lead to trial (and implicitly to the corresponding conditions for settlement), we assume that the parties hold identical probabilities that the plaintiff wins at trial, conditioned on the data that are known to us: $p_p = p_d \equiv p_t$. As a result, the variance is $\sigma^2 \equiv p_t(1 - p_t)$.

Given our limited data, we cannot model and estimate the settlement bargaining process explicitly.[5] Instead, we incorporate the possibility of strategic behavior indirectly in the stochastic specification of the model.[6]

Let D_p be the plaintiff's subjective estimate of the damage award if the plaintiff prevails, D_d be the defendant's subjective estimate, c_p be the plaintiff's estimate of expenditures at trial, and c_d be the defendant's estimate of expenditures at trial. The defendant's expected loss from going to trial is

[3] Our model of settlement and trial combines and extends some of the ideas in Landes (1971), Gould (1973), Posner (1973), and Shavell (1982).

[4] This mean-variance formulation is consistent with expected utility maximization if the utility function is quadratic or if individuals have constant absolute risk aversion (exponential) utility functions, and the stochastic component of income is independently, normally distributed (Ingersoll (1987), ch. 4).

[5] Our model focuses on whether the parties reach settlement or not. There is a substantial theoretic literature that models how parties reach settlement through bargaining, including Bebchuck (1984), P'ng (1983), Ordover and Rubinstein (1986), Reinganum and Wilde (1986), Nalebuff (1987), Schweizer (1989), and Meurer (1989).

[6] Meurer (1989) applies such a model of strategic behavior to patent law. Grossman and Katz (1983) and Reinganum (1988) focus on plea bargaining games. Froeb (1993) examines whether plea bargains reveal information about trial outcomes using criminal defendant data from U.S. District Courts and finds a positive correlation between trial rates and trial outcomes.

$$p_t D_d + \delta_d \sigma^2 D_d^2 + c_d, \tag{3}$$

which is the defendant's expected utility loss at trial plus the defendant's expenditures at trial. Similarly, the plaintiff's expected benefit of going to trial is

$$p_t D_p - \delta_p \sigma^2 D_p^2 - c_p. \tag{4}$$

The expected gain to both parties from settling rather than going to trial, the *settlement gap*, G, is the difference between the defendant's expected loss at trial and the plaintiff's expected gain,

$$\begin{aligned} G &= [D_d - D_p]p_t + [\delta_d D_d^2 + \delta_p D_p^2]\sigma^2 + [c_p + c_d] \\ &\equiv \alpha p_t + \gamma\sigma^2 + [c_p + c_d], \end{aligned} \tag{5}$$

where $\alpha \equiv D_d - D_p$ and $\gamma \equiv \delta_d D_d^2 + \delta_p D_p^2$.

The expected gain to settling is higher

- the higher is α (the more the defendant's expected loss, D_d, exceeds the plaintiff's expected gain, D_p),
- the higher is σ^2 (the uncertainty about the trial outcome),
- the higher is γ (the more risk averse are the parties),[7]
- the greater is $c_d + c_p$ (the costs of going to trial).

The probability a case settles rather than is tried, p_s, is an increasing function of the settlement gap: The greater the gap, the greater the mutual gains if a settlement agreement is reached (Perloff and Rubinfeld (1988)). Because there is some uncertainty associated with the settlement bargaining process, settlement may not occur even though there is a positive gain from settling ($G > 0$). Thus, the probability of settling,

$$p_s = \Phi_s(G) = \Phi_s(\alpha p_t + \gamma\sigma^2 + z'_s\beta_s), \tag{6}$$

is a function Φ_s of the gap, where $z'_s\beta_s$ reflects the costs of going to trial and any systematic variations in bargaining that are related to the characteristics of the parties.

If the coefficient on the probability of going to trial, ($\alpha = D_d - D_p$), is positive, the defendant's damages are greater than the plaintiff's, $D_d > D_p$, so settlement is more likely all else the same. For example, if both parties believe that the damages that will be awarded are D_p if the plaintiff prevails, but the defendant believes that a loss at trial in this case would harm it in future cases (adverse reputation effect), $D_d > D_p$. Thus, the greater the potential loss of reputation to the defendant from a trial defeat, the more likely the case will settle. In contrast, if the defendant feels that settling gives a bad signal, then the defendant might go to trial to develop a reputation for toughness. As a result, $D_d < D_p$ so settlement is less likely all else the same.

If the coefficient on the variance term in the settlement-trial equation, γ, is positive, the case is more likely to settle other factors equal. For example, if $\alpha = 0$ (both parties expect the same transfer: $D_d = D_p \equiv D$), $\gamma = D^2(\delta_d + \delta_p)$ and is larger the more collectively risk averse are the parties. The more risk averse are the parties, the greater the probability of settlement. If $D_d = D_p$, it does not matter whether the two parties are equally risk averse or one is much more risk averse then the other—what matters is the sum of their risk aversion coefficients. If the two parties are equally risk averse, $\delta_d = \delta_p \equiv \delta$, then $\gamma = \delta(D_d^2 + D_p^2)$ and settlement is more likely the greater is the sum of the squares of the expected awards.

If γ is positive, any change in the rules of evidence or in the characteristics of the case that cause the probability that the planitiff will win at trial to move away from 0.5 decreases the variance of the trial outcome and increases the probability of a trial.[8] Correspondingly, anything that moves that probability towards 0.5 decreases the probability of a trial.

III. The Antitrust Database

We use the Georgetown University Antitrust Database (described in Teplitz (1988)), which we supplemented with other data on firm size (as described in Perloff and Rubinfeld (1988)). The database includes all private antitrust suits filed from 1973 to 1983 in five federal district courts (Southern District of New York, Northern District of Illinois, Northern District of California, Western District of Missouri, and Northern District of Georgia). These 2,900 suits represent about one-fifth of all federal antitrust suits filed in the United States during this period. Of the 2,357 cases in the sample, we dropped 398 that were consolidated into multidistrict litigations, leaving 1,959. We also dropped cases that were remanded or transferred to state courts (5.6%), were consolidated (2%), or had missing files or unknown outcomes (3.5%).

We then dropped all cases for which the outcome was unclear because both some plaintiffs and some defendants won (0.1%) or the case was still pending or on appeal (5.8%). We then dropped those cases in which the size of a firm involved could not be determined, which reduced our sample to 1,442. Our sample is further restricted to those cases involving firms (not individuals, nonprofit institutions, or government agencies) that were settled or were tried with a known outcome. Nonfirms were 16.8% of the plaintiffs and 17.6% of the defendants. After these deletions, we are left with a sample of 1,014 cases.

Once an antitrust case is filed, it can follow a number of different paths before a resolution is reached. Of all cases filed, a relatively small proportion actual go to trial; those that do involve claims for damages, injunctive relief, or both. Further, those cases that do not go to trial can be withdrawn by plaintiff (leaving the plaintiff the option to file again at

[7] Because $D_d, D_p > 0$, the larger are the risk aversion parameters δ_d and δ_p, the larger is the term $\delta_d D_d^2 + \delta_p D_p^2$.

[8] We do not have a reliable measure of D, so we estimate a single parameter γ. Because Viscusi (1988) has an explicit damage measure, he is able to separately estimate the effects of D and the variance on the probability of settlement.

a later date), dropped as the result of a pretrial order or stipulation resulting from various pretrial motions such as a motion by defendant, by summary judgment (the plaintiff may not file again), or dropped after the defendant agrees to make some form of monetary or nonmonetary payment to the plaintiff. Because there are numerous paths that a case can follow, the characterization of a case as having "settled" rather than been "dropped" is difficult to make.[9]

We label as a "settlement" cases that closed due to a pretrial stipulation and order, pretrial withdrawal, settlement, or that were statistically closed.[10] We kept those cases that were judgments for all or some plaintiffs and those that were judgments for all or some defendants. Next, we dropped cases in which there was a judgment for the defendant on a counterclaim, or there was a settlement after judgment, or a key explanatory variable was missing, which reduced our sample to 934 observations. Finally, we dropped a case if, in the opinion of the paralegal who collected the data, antitrust was not a significant issue in the case, which left us with our final sample of 741 observations.[11]

Of these 741 cases, 99 (13.4%) went to trial. Of those that went to trial, plaintiffs won 31 (31.3%). The districts with the most cases in our sample are the Southern District of New York (37.9%), the Northern District of Chicago (27.3%), and the Northern District of California (23.9%). Most filings included a number of antitrust and non-antitrust claims. Those that appeared most often were refusals to deal (29.0%), tying (25.9%), price fixing (24.4%), price discrimination (22.4%), and vertical restraints (19.6%).

Defendants tended to be larger firms than plaintiffs. In the sample, 19.2% of plaintiffs were midsize firms (sales revenues over a million dollars but not in the Fortune 500), and an additional 2.0% were Fortune 500 firms. In contrast, 51.7% of defendants were midsize firms and 19.4% were Fortune 500 firms.

IV. Estimation

We estimated the trial equation (1) and the settlement equation (6) jointly using maximum likelihood techniques, assuming the errors are jointly normally distributed. In equation (1), z_t is a vector of variables associated with the characteristics of the parties, the jurisdictions, the type of case, and other factors that influence the cost of litigating and the outcome of the case.

The probability that the case is settled, equation (6), may be rewritten as

$$p_s = \Phi_s(\alpha\Phi_t + \gamma\Phi_t[1 - \Phi_t] + z'_s\beta_s), \tag{7}$$

where Φ_t is the probability, p_t, expected by both parties that the plaintiff will win if the case goes to trial, $\Phi_t(1 - \Phi_t)$ is the associated variance, and the z_s variables are characteristics of parties and other factors that serve as proxies for the differences in costs of the parties if the case goes to trial rather than settling.

There are three possible outcomes for the $N = 741$ observations. For $n_s = 642$ observations, the case settles. For $N - n_s = 99$ observations, the case goes to trial. In $n_p = 31$ cases, the plaintiff wins at trial. In the remaining cases that go to trial, $N - n_s - n_p = 68$, the defendant wins. The likelihood function, then, is

$$\mathcal{L} = (\Phi_s)^{n_s}(1 - \Phi_s)^{N-n_s}(\Phi_t)^{n_p}(1 - \Phi_t)^{N-n_s-n_p}. \tag{8}$$

V. Results

We first discuss the maximum likelihood estimates. Next, we report various hypothesis tests. Then, we calculate how changes in the variables would affect the probability that the plaintiffs win at trial and the probability of a settlement.

A. *The Estimates*

The maximum likelihood coefficients and the asymptotic t-statistics associated with tests of the hypothesis that each coefficient equals zero are shown in table 1.[12] All the explanatory variables except for p_t and σ^2 are dummy variables. A positive coefficient implies that the probability that the plaintiff wins at trial is increased, all else the same, if that dummy variable equals one.

One measure of the goodness of fit of our estimates is to compare the predicted classifications of cases to the actual distribution, as shown at the bottom of table 1. If the predicted probability of going to trial is greater than 0.5, we classify the case as going to trial; otherwise we classify it as settled (and similarly for the trial outcome). The estimated model correctly predicts 85.8% of the cases. It predicts that 7.3% of cases would go to trial, which is lower than the actual 13.4%. It also predicts that 3.4% of cases would be won by plaintiff, which is lower than the 4.2% that were actually won at trial.

Of the cases that actually settled, the model predicts that

[9] For a discussion of the importance of cases dismissed prior to trial, see Kritzer (1986). Eisenberg (1991) shows that, for a large set of antitrust cases, plaintiff success rates are lower in cases resolved by pretrial motion than at trial.

[10] We dropped cases that were dismissed pretrial on motion or for other reasons than those listed in the text. By doing so, we reduce the likelihood that a case classified as settled was actually dismissed on other grounds. Our settlement equation, however, is not very sensitive to the definition used. Similar results are obtained in our settlement equation with a broader definition that includes cases dismissed on pretrial, on a motion, or for other reasons (Perloff and Rubinfeld (1988)).

[11] The paralegals who collected the data using the entire court record recorded if a case did not deal with antitrust issues extensively. The paralegals were given instruction as to how to identify antitrust cases by consulting antitrust counsel.

[12] The reason that patent, breach, Fortune 500 plaintiffs, and some of the industry dummies are not included in the trial equation is that, because there were so few cases that went to trial, either there were no cases involving these variables or all the cases involving these variables had the same outcome, so that the variables were perfect indicators. The "Jury Demanded by Plaintiff" and "Class Action Requested" variables were not included in the settlement equation because they related only to trial outcomes.

TABLE 1.—COEFFICIENT ESTIMATES

	Trial Equation		Settlement Equation	
Variable	Coefficient	Asymptotic t-statistic[a]	Coefficient	Asymptotic t-statistic[a]
p_t			−0.541	−1.55
$\sigma^2 \equiv p_t(1 - p_t)$			8.559	3.27
$\sigma^2 \times$ Midsize Plaintiff			−1.723	−0.18
$\sigma^2 \times$ Midsize Defendant			7.722	1.18
$\sigma^2 \times$ Fortune 500 Defendant			−2.459	−0.45
Intercept	−6.513	−7.02	−2.031	−4.37
Jury Demanded by Plaintiff	3.725	6.42		
Class Action Requested	−5.362	−7.14		
Jurisdiction (San Francisco)				
Atlanta	−1.163	−1.07	0.372	0.92
New York	0.963	1.84	−0.100	−0.34
Chicago	−2.852	−5.92	−0.074	−0.24
Kansas City	−9.071	−5.95	−0.035	−0.09
Geographic Market (State)				
United States	2.996	3.28	0.638	1.71
Regional	4.685	5.51	0.647	1.64
World	7.099	5.98	0.293	0.45
Local	2.473	2.53	0.411	1.02
Alleged Violation (Antitrust Complaint Unknown)				
Price Fixing	2.237	4.15	0.212	0.91
Merger	3.208	2.11	−0.286	−0.43
Price Discrimination	6.003	8.09	0.301	1.34
Predation	−9.209	−5.98	−0.432	−1.08
Tying	12.736	14.60	0.208	0.84
Refusal to Deal	−5.762	−7.28	0.268	1.15
Vertical Restraints	−6.813	−9.23	−0.102	0.38
Dealer Termination	3.873	5.56	0.284	1.09
Boycott			0.248	0.74
Monopolization			0.204	0.53
Fraud			0.872	1.71
Patent			−0.186	0.37
Breach			−0.068	−0.10
Size of Parties (Small Firms)				
Midsize Plaintiff	2.023	4.17	−0.249	−0.75
Fortune 500 Plaintiff			0.641	1.09
Midsize Defendant	−0.615	−1.32	−0.213	−0.94
Fortune 500 Defendant	−0.448	−0.62	0.402	1.42
Plaintiff's Industry (Service)				
Construction			0.609	0.78
Manufacturing	4.905	4.93	0.012	0.03
Transportation			0.359	0.59
Utilities			−0.373	−0.40
Wholesale	4.976	4.68	−0.063	−0.13
Retail	−8.743	−7.89	0.084	0.17
Finance, Insurance, Real Estate			0.647	1.41
Defendant's Industry[b] (Service)				
Manufacturing	−2.240	−2.26	0.017	0.04
Transportation	−5.628	−4.90	0.016	0.02
Utilities			0.339	0.50
Wholesale	11.584	8.85	0.189	0.35
Retail	−4.951	−3.77	−0.285	−0.52
Finance, Insurance, Real Estate	2.646	2.04	0.257	0.55

		Actual		
			Trial	
Predicted		Settle (642)	Plaintiff Wins (31)	Plaintiff Loses (68)
Settle	687	618	14	55
Plaintiff Wins	25	12	11	6
Plaintiff Loses	29	12	6	7

Note: Percent correctly predicted is 85.8. Unrestricted log likelihood = −240.6.

[a] The null-hypothesis is that the coefficient equals zero. The asymptotic standard errors are computed from the covariance of analytic first derivatives (Berndt-Hall-Hall-Hausman).

[b] There are no defendants in the construction industry.

92.3% would settle and, had they not settled, the plaintiff would have won 43.0% of the cases. In contrast, of the cases that actually went to trial, it predicts that 69.7% settled and that, if all these cases had gone to trial, plaintiffs would have won 45.5% of the cases.

B. *Tests*

For most of the individual variables and groups of variables in the trial equation, we reject the null hypothesis of no effect at the 0.05 level using individual asymptotic t-tests, likelihood ratio, Wald, and score (Lagrange multiplier) tests.[13] Other than γ (the coefficient on σ) and the coefficient on the constant, no individual coefficient in the settlement equation is asymptotically statistically significantly different from zero. We also tested whether the slope coefficients of the settlement equation except the intercept, α, and γ were collectively zero. The likelihood-ratio test statistic is 50, the Wald test statistic is 47, and the score (Lagrange multiplier) test statistic is 74. Because the critical value $\chi^2_{.05}(39) = 55$, these test results are ambiguous: We can reject on the basis of the score test but not on the basis of the other test results.

The expected damages, D, play a potentially important role in our model. If we had a measure of damages, we would express γ as a function of D. Unfortunately, our data set does not include a reliable measure of these damages. If we were to use a constant γ in our specification, we would be implicitly assuming that the damages do not vary across cases. Rather, we choose a more plausible specification that allows γ to vary with the size of the defendant because damages or risk aversion may vary with defendant firm size. The noninteractive term is asymptotically statistically significantly different from zero at the 0.05 level. The positive and statistically significant coefficient on the noninteractive γ term in the settlement equation implies that risk aversion matters. The individual interactive terms are not statistically significant. Based on a likelihood-ratio test statistic of 9.9, however, we can reject the hypothesis that these terms are collectively equal to zero: $\chi^2_{.05}(3) = 7.8$. Other things equal, the more substantial the joint risk facing the plaintiff and defendant, the greater the likelihood that a case will settle.[14]

It is possible that the entire specification—not just the γ term—varies with D or firm size. To test this possibility, we conducted a score test that all the coefficients vary with defendant firm size (small defendants versus larger ones). The score test statistic is 57 with 73 degrees of freedom, which is well below the critical $\chi^2_{.05}(73)$ of approximately 93. Therefore, we did not alter the specification to allow for further firm-size interactions.

Another possibility is that expected damages are a function of the alleged violation. Because a score test of the hypothesis that γ does not vary with the alleged violations was rejected, we reestimated the model allowing γ to vary with defendant firm size and the nature of the alleged violations. We included interactions with five of the alleged violations that might be associated with large damages: price fixing, price discrimination, predation, tying, and monopolization. With this modified specification, we cannot reject the hypothesis that these interaction terms of γ with the alleged violations are collective and individually zero: The likelihood-ratio test statistic that the interactive terms are collective zero is 7.2, which is less than the critical $\chi^2_{.05}(5)$ of 11.1. As we believe that the likelihood-ratio test is more appropriate and powerful than the score test, we reject this specification in favor of the one reported in table 1.

In the settlement equation, the coefficient α on p_t is negative but not statistically significantly different from zero at the 0.05 level according to an asymptotic t-test. We also considered interactive terms on α similar to those reported for γ; however, the asymptotic t-statistics on these terms were no higher than one in absolute value and were collectively insignificant on the basis of a likelihood-ratio test. Because we cannot reject the hypothesis that $\alpha = 0$, we conclude that the damages perceived by the defendant are insignificantly different from the award received by the plaintiff. Moreover, if $\alpha = 0$, then $D_d = D_p$, so $\gamma = D^2(\delta_d + \delta_p)$. Thus, we conclude from the positive γ coefficient that the parties are collectively risk averse in the sense that the sum of their risk aversion coefficients $(\delta_d + \delta_p)$ is positive.[15]

C. *Size of Effects*

How large are the effects of changes in firm type and case characteristics on the probability of the plaintiff winning at

[13] Were case selection bias to be consistent with the strongest form of the Priest-Klein (1984) hypothesis, one would expect that the probability of success at trial would be insignificantly different from 0.5 for all parties, and that none of the trial equation explanatory variables would be statistically significant. We reject that hypothesis. In fact, we would expect that differences in expectations concerning trial outcomes or in risk aversion may alter the selection of cases that go to trial and, therefore, the trial probability. For further analysis of the Priest-Klein hypothesis, see Wittman (1985), Priest (1985), Viscusi (1986), and Wittman (1988).

[14] This result is generally consistent with Viscusi (1988), who found that the greater the variance in payoffs for a type of accident, the more likely a product liability case will settle.

[15] We also considered sample selection problems. Sample selection arises if there is a nonzero correlation, ρ, between the unobserved errors in the trial and settlement equations. The score test statistic against the null hypothesis of no sample selection ($\rho = 0$) is 10.5, which is greater than $\chi^2_{.05}(1) = 3.84$.

Unfortunately, it is extremely difficult to estimate our model with a nonzero ρ because of our incorporation of the mean and variance of the probability of winning at trial into the settlement equation. If we add a feedback effect from the trial equation (ρ times the unobservable error component in the settlement equation that is uncorrelated with the trial error) into the settlement equation, we leave open the possibility that there will be a series of intervals over which the probit takes on positive values and another series over which the values are negative, which makes integration difficult.

As a diagnostic check of the importance of sample selection, we looked at the *first* step from our estimated values in table 1 after relaxing the assumption that $\rho = 0$. We found, for example, that α decreased by 0.60 and that γ fell by 8.2 (though the interaction terms did not change greatly). The new γ term is not measured very precisely. These results suggest that a model that allowed for sample selectivity would not substantially change the major conclusions of our paper.

TABLE 2.—EFFECTS OF EACH VARIABLE ON THE PROBABILITIES

	Trial Probability (p_t)	Settlement Probability (p_s)
Jury Demanded by Plaintiff	39.6	80.8
Class Action Requested	−14.9	−43.7
Jurisdiction (San Francisco)		
Atlanta	−5.1	−4.6
New York	12.0	33.5
Chicago	−18.4	−55.4
Kansas City	−10.8	−31.0
Geographic Market (State)		
United States	51.2	90.1
Regional	97.9	3.8
World	97.6	−8.2
Local	59.5	82.8
Alleged Violation (Antitrust Complaint Unknown)		
Price Fixing	49.3	82.8
Merger	87.7	−2.2
Price Discrimination	99.7	−2.9
Predation	−34.6	−84.1
Tying	100.0	−3.8
Refusal to Deal	−49.8	−77.3
Vertical Restraints	−36.6	−81.1
Dealer Termination	94.1	2.1
Boycott		7.4
Monopolization		6.0
Fraud		30.8
Patent		−4.8
Breach		−1.8
Size of Firms (Small Firms)		
Midsize Plaintiff	46.4	64.5
Fortune 500 Plaintiff		21.7
Midsize Defendant	−6.3	−11.6
Fortune 500 Defendant	−3.5	−0.5
Plaintiff's Industry (Service)		
Construction		20.5
Manufacturing	98.0	−4.4
Transportation		11.2
Utilities		−8.7
Wholesale	98.5	−6.1
Retail	−68.6	−69.0
Finance, Insurance, Real Estate		22.1
Defendant's Industry (Service)		
Manufacturing	−24.9	−67.2
Transportation	−9.5	−25.6
Utilities		10.6
Wholesale	99.8	−4.5
Retail	−11.9	−38.3
Finance, Insurance, Real Estate	75.5	51.7

Note: The elements of the table are the difference in the probability p_i evaluated when the given variable equals one minus the probability when that variable equals zero, holding all other variables at their mean values.

trial or settling is shown in table 2. The table reports how much these probabilities change if a given variable is set at one rather than at zero and all other variables are held constant at their mean values.

The possibility that the jurisdiction in which an antitrust filing takes place will affect the probability of settlement or the trial outcome is directly relevant to the ongoing debate about the practical importance and policy relevance of forum-shopping—the process by which plaintiffs choose the particular geographic location in which to file a suit. It is commonly believed that some jurisdictions are pro-plaintiff and others pro-defendant, but, to our knowledge, no earlier study has tested whether jurisdictional effects are significant, other things equal.

Our results show statistically significant and substantial jurisdictional effects on the probability that the plaintiff wins at trial. A plaintiff would much prefer to be tried in San Francisco or New York than in Chicago or Kansas City. For example, if the trial is located in Chicago (rather than in the omitted jurisdiction, San Francisco), the probability that the plaintiff wins at trial holding other factors constant decreases by 18.4 percentage points (and the likelihood of getting a settlement is reduced as well). New York, on the other hand, may be a welcome choice for plaintiffs, where the probability of winning at trial is 12.0 percentage points greater than San Francisco, although statistically insignificant at the 5% level (the probability of obtaining a settlement is higher as well). Similarly, plaintiffs are more likely to win, all else the same, if the geographic market is international, national, regional, or local (rather than in a single state).

Plaintiffs also make choices concerning the type of antitrust complaint to file or the range of violations that they pursue. As the law evolves and the political makeup of courts changes from federal district to federal district, the likelihood of a plaintiff's success may also change. We find that a plaintiff's probability of success depends on the alleged violation: A plaintiff is more likely to win if the case involves an allegation of price fixing, mergers, price discrimination, tying, or dealer termination, and less likely to win if the case concerns allegations of predation, refusal to deal, or vertical restraints.

The relationship between the size of firm and antitrust success has been a subject of much popular debate. One view is that small plaintiff firms have little or no success against large defendants because of the substantial resources available to the defendants. A contrary "David vs. Goliath" view holds that juries bend over backwards to favor a smaller plaintiff facing a large defendant. We find that size does matter: Smaller plaintiff firms are less successful than midsize plaintiff firms, having a 46 percentage point lower probability of winning at trial (48% versus 2%). Similarly, a midsize (Fortune 500) defendant has a 6.3 (3.5) percentage point higher probability of winning than does a small defendant.

The probability of settlement and the likelihood of success at trial also vary from industry to industry. We find that plaintiffs in the manufacturing and wholesale industries are more likely to win than those in service industries, and retail plaintiffs are more likely to lose. Defendants in manufacturing, transportation, and retail are less likely to win than those in service industries, and defendants in wholesale and finance, insurance, and real estate are more likely to win. We speculate that plaintiffs are less likely to win in industries in which information is particularly asymmetric and that principal–agent problems are prevalent.

In the American legal system either the plaintiff or the defendant can usually opt for a jury trial.[16] It has long been believed that juries are more likely to favor plaintiffs, other things equal.[17] For this reason, many plaintiffs request jury trials, which tend to be more costly than trials in which a judge makes the decision. Our results confirm that plaintiffs do better when they demand a jury trial: The probability of winning at trial increases by 40%. This trial effect filters through to settlements as well. The settlement probability increases by nearly 81 percentage points when a jury trial is demanded.

One might expect that class action cases would settle more readily than others, as plaintiffs' lawyers try to minimize their costs. We find, however, that, if a class action is requested, the probability of settlement falls by nearly 44 percentage points. The reason is that the plaintiffs in a class action suit have a 15% lower probability of winning at trial.

Our model can also be used to estimate the effects of a broad array of policy options that affect the probability of plaintiff's or defendant's success at trial. Suppose, for example, that the probability of the plaintiff winning, p_t, increases because of a change in the law (such as the rules on discovery) which increases the constant term in the trial equation. An increase in p_t has a direct effect on settlement (which is negligible because $\alpha \approx 0$) and an indirect effect through the variance term $p_t(1 - p_t)$. Because the average probability that the plaintiff wins is below a half (31.3%) for the sample, an increase in the trial constant that raises p_t by 1% increases the variance by 0.37%. The combination of the effects on p_t and the variance is a 0.13 percentage point increase in the probability of a settlement.

VI. Conclusions

In our econometric model, settlements in antitrust cases are functions of the mean and variance of the parties' beliefs about their success at trial. Our results show that the likelihood of plaintiffs' success in antitrust trials varies substantially by jurisdiction, by antitrust allegation, by size of firm, by industry, and by whether or not a jury trial occurs.

In terms of legal process, we draw two important conclusions. First, defendants do not worry about reputation effects, contrary to speculation in earlier articles. That is, we find that defendants do not put a higher value on their potential losses at trial than plaintiffs put on their potential gains. This result has important implications. If defendants worried about reputation effects, then defendants' attitudes toward risk would play a more important role than those of plaintiffs in determining whether a settlement occurs.

Second, we find that risk aversion plays an important (qualitative and quantitative) role in explaining why cases settle instead of going to trial. For every 1% increase in the probability that the plaintiff wins, the probability that the case settles rises by nearly 0.13%.

Thus, changes in rules on discovery or other changes that affect the probability that a plaintiff will win at trial may substantially affect the share of cases that settle, and hence the burden on the court system. Moreover, because the size of the risk aversion effect increases with the size of damages awarded, trebling antitrust damages has a dramatic effect on the probability of a settlement. Were we to stop trebling antitrust damages, the fraction of cases litigated would increase substantially.

[16] Defendants could demand a jury trial, but did so in only 2% of the cases, whereas plaintiffs demanded a jury trial in 59%.

[17] Early evidence was provided in the Chicago jury project undertaken by Harry Kalven and Hans Zeisel. For example, Kalven (1964) found that civil juries awarded damages 20% higher than did judges.

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