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SETTLEMENT OUT OF COURT: THE DISPOSITION OF MEDICAL MALPRACTICE CLAIMS

*PATRICIA MUNCH DANZON and LEE A. LILLARD**

I. Introduction

THE main purpose of this paper is to present empirical estimates of a model of the disposition of claims through the courts. Landes, Gould, Posner, and others have developed a theoretical model of the disposition process, in which the decision to settle and the size of settlement depend on the defendant's maximum offer (expected award at verdict plus litigation costs) relative to the plaintiff's minimum ask (expected award at verdict minus litigation costs).[1] Variants of this model have been applied in several contexts, but so far it has not been tested empirically with data on individual claims.[2] The obstacles to estimation by standard econometric techniques are twofold. First, the hypothesized determinants of the outcome—the potential verdict, ask, offer, and litigation costs—are all unobserved in the data available. Second, if the theory is correct, claims closed at each stage of disposition are not random samples but are "self-selected" on the basis of those case characteristics whose effect we wish to measure. Therefore, analysis of the observed outcome—size and probability of payment to the plaintiff, at verdict and in out-of-court settlement—cannot be generalized to the universe of claims as a whole. Param-

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[1] William M. Landes, An Economic Analysis of the Courts, 14 J. Law & Econ. 61 (1971); John P. Gould, The Economics of Legal Conflicts, 2 J. Legal Stud. 279 (1973); Richard A. Posner, An Economic Approach to Legal Procedure and Judicial Administration, 2 J. Legal Stud. 399 (1973).

[2] Landes, *supra* note 1, uses statewide data on criminal cases to analyze trial frequency. Patricia Munch, An Economic Analysis of Eminent Domain, 84 J. Pol. Econ. 473 (1976), estimates determinants of size of payment in eminent domain cases. William Baxter, The Political Economy of Anti Trust (Robert D. Tollison ed. 1980), discusses settlement of antitrust cases.

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eter estimates are valid conditional estimates for claims closed at each stage of disposition but are potentially biased estimates of population parameters. In particular, we cannot use information from claims actually closed at verdict to infer the *potential* verdict for claims actually settled.

In this study of the disposition of medical malpractice claims we develop maximum likelihood estimation procedures that, together with some simplifying theoretical and empirical assumptions, enable us to obtain unbiased estimates of population parameters and of the unobserved, latent variables—potential award at verdict, potential settlement, ask, and offer—for all claims, regardless of their stage of disposition. The model is estimated with data from two surveys of insurance company claim files closed in 1974 and 1976. Among the more interesting findings, we estimate that, on average, cases settle for 74 percent of their potential verdict and that settlement size is much closer to the maximum the defendant would be willing to offer than to the minimum the plaintiff would settle for. Since the estimates are constrained by the assumptions of the model, we cannot test the model directly. However, the plausibility of the estimates supports the plausibility of the model.

A second purpose of the paper is to provide evidence relevant to the policy debate over tort reform. The early 1970s witnessed a rapid increase in the frequency and size of claims in many lines of tort law: personal, product, professional, municipal, and automobile liability. The subsequent increases in liability insurance premiums led many states to enact changes in liability law, especially for medical malpractice and product liability. These tort "reforms" were intended to reduce the size of awards, limit the scope of liability, and reduce the cost of litigation.[3] More fundamental changes, such as replacing the negligence with a no-fault system for malpractice, were shelved pending the outcome of these tort reforms.[4]

Major criticisms of the system are that awards are either random or excessive; that the legal standard of negligence has little bearing on the outcome of the great majority of cases that settle out of court; that the costs of operating the system are exorbitant; and that these costs bar valid but small claims for recovery and induce "nuisance" claims on which insurance companies can be forced to pay, no matter how specious, in

[3] These measures include caps on awards, periodic payments of future damages, modification of the collateral source rule, limits on contingent fees, use of arbitration and pretrial screening panels, shorter statutes of limitations, etc. A listing of the changes, by state, is given in Patricia Munch Danzon, The Frequency and Severity of Malpractice Claims (Rand Corp. R-2870-HCFA/ICJ, 1982).

[4] For example, Clarke C. Havighurst, "Medical Adversity Insurance"—Has Its Time Come? 1975 Duke Law J. 1233.

order to avoid more costly litigation. These allegations are apparently lent some credibility by the observed outcome of the disposition process. For example, of medical malpractice claims closed in 1974 and 1976, less than 10 percent were tried to verdict; the remainder were settled out of court. In cases tried to verdict the plaintiff won 28 percent of the time, whereas the plaintiff received some payment in 51 percent of cases settled out of court. The average award at verdict was $102,000, compared to $26,000 at settlement. Roughly 50 percent of the total dollar payout was concentrated on less than 3 percent of all claims.

Our estimates show that the most extreme criticisms are unfounded. Legal standards appear to influence court verdicts directly and settlements indirectly. Lower plaintiff win rates and larger awards at verdict than at settlement are largely attributable to nonrandom selection of cases, by stage of disposition. However, outcomes do systematically depart from the legal standard in ways predicted by the economic model of claim disposition. Tort reforms designed to limit awards and limit contingent fees have had significant effects.

The model is also used to simulate the effects of hypothetical changes in the cost of litigating, such as might result from the introduction of arbitration or pretrial screening panels. We estimate that, under plausible assumptions, a 30 percent reduction per case in both plaintiff and defense costs of going to verdict would reduce total litigation costs by only 3 percent, because the percentage of cases going to verdict increases and the percentage dropped without payment decreases.

The structure of the paper is as follows. The theoretical model is described in Section II. Section III discusses estimation and describes the data. Section IV reports empirical results, including goodness of fit of the model and parameter estimates. Section V provides estimates of the probability of winning at verdict for cases settled out of court. Section VI analyzes the discrepancy between mean award at verdict and settlement and the extremely skewed distribution of dollar payout. Section VII discusses the effects of actual and hypothetical tort reforms and simulates their ramifications on the entire disposition process. Section VIII contains concluding remarks.

II. The Model

Under the law of medical malpractice, a medical practitioner is liable for damages if a patient suffers an injury linked causally to medical treatment that fell short of the "due" standard of care.[5] In our sample, 43

[5] Under the strict locality rule, due care is the customary practice of physicians in the same specialty and locality. Since the 1960s, this strict version has been expanded by many

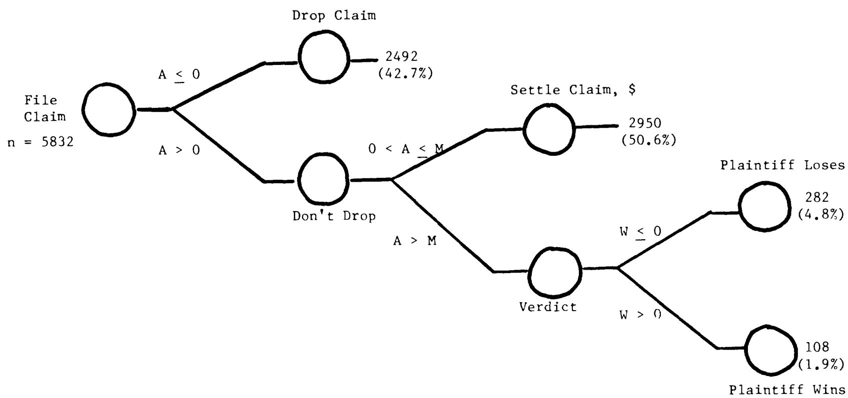

FIGURE 1.— Disposition of medical malpractice claims

percent of claims are dropped without payment, 51 percent are settled with payment out of court, and 7 percent are litigated to verdict with the plaintiff winning roughly one in four. This sequential disposition process is illustrated in Figure 1. Here we present a very simple variant of the underlying behavioral model. It is derived from a more complete model in which the litigants select utility-maximizing expenditure on litigation, subject to an expected payoff, in terms of influence over the outcome, and the cost of litigation inputs.[6] Because of the limited data available for this empirical study, we do not explicitly model the choice of litigation inputs and their influence on outcomes, bluff and gaming, expected yields in settlement and the modification of bargaining positions over time, or delay either as an input or as an outcome.

Except where otherwise stated, the notation and discussion below refer to log values, corresponding to the log transformation of dollar values used in estimation.[7] The following notation will be used:

V = potential award at verdict (log);
P = probability the plaintiff wins at verdict;
W = propensity to hold for the plaintiff at verdict (log);

courts to include similar localities for general practitioners and a nationwide standard for specialists.

[6] Patricia Munch Danzon, The Disposition of Medical Malpractice Claims (Rand Corp. R-2622-HCFA 1980).

[7] Since taking logs changes a multiplicative into an additive relationship, the log transform is appropriate for estimation if laws and other measured binary variables and all unmeasured factors included in the residual have proportional effects on awards. With our data, major unmeasured factors are litigation costs and the plaintiff's probability of winning, both of which plausibly have roughly proportional effects.

M = defendant's maximum offer (log);
A = plaintiff's minimum ask (log);
S = potential settlement (log);
$\mathbf{X}$ = vector of case and state characteristics;
g = weight of offer in settlement (''bargaining parameter'');

ζ, θ, γ, α, β, are parameters to be estimated; v, w, u, ϵ, are residuals reflecting unmeasured characteristics.

The Courts

For each claim there is a probability that the plaintiff will win and a potential award should the case go to verdict.

Potential Verdict (V). The potential award at verdict (V), conditional on winning, depends on the severity of the injury and the law defining compensable damages:

$$V = \zeta'\mathbf{X} + v, \tag{1}$$

where $\mathbf{X}$ is a vector of observed case and state characteristics such as severity of injury and laws of compensable damage and v is a residual reflecting all unobserved factors.

In general, the basic rules of damages for personal injury apply in medical malpractice cases. Compensable damage has two components: ''economic'' loss (wage loss, medical and other out-of-pocket expenses) and ''pain and suffering,'' which is a catchall for all nonpecuniary damages. Under the collateral source rule, awards are not reduced by compensation from other sources, such as medical or unemployment insurance. Typically, the award is paid in a lump sum, which includes damages incurred to date (without interest) and the present discounted value of expected future damages. Since 1975 many states have enacted statutory changes in the basic tort damage rules for cases of medical malpractice. These changes include dollar caps on either the total award or some component, admissibility of evidence of compensation from collateral sources, periodic rather than lump-sum payment of future compensation, and abolition of the plaintiff's ad damnum (the amount named as damages in the plaintiff's complaint).

Plaintiff's Probability of Winning (P). Under the negligence standard, the plaintiff must prove that he suffered an injury linked causally to substandard medical care. The probability of a verdict for the plaintiff (P) therefore depends on case and state characteristics ($\mathbf{X}$) such as the quality of the evidence and the law defining liability and the burden of proof. As is common in modeling discrete outcomes, empirically we work with a monotonic function of P, which we denote W and interpret as a propensity to hold for the plaintiff:

$$W = \theta'\mathbf{X} + w, \tag{2}$$

where the residual, w, is assumed to be normally distributed with unit variance ($\sigma_w^2 = 1$). If W exceeds zero, the plaintiff wins. Then P, the probability that W takes any positive value, may be represented by the cumulative normal function, $\phi(W)$:

$$P = 1 - \phi(-\theta'\mathbf{X}) = \phi(\theta'\mathbf{X}) \tag{3}$$

Settlement Out of Court

Because litigation is costly, both parties have incentives to settle. The minimum the plaintiff will settle for, the "minimum ask" (A), depends on his expected payoff from litigating to verdict, net of his incremental litigation costs:

$$\begin{aligned} A &= \gamma_1 W + \gamma_2 V - \alpha'\mathbf{X} + u_1 \\ &= (-\alpha' + \gamma_1\theta' + \gamma_2\zeta')\mathbf{X} + \epsilon_1, \end{aligned} \tag{4}$$

where $\alpha'\mathbf{X}$ is the discount factor due to plaintiff litigation costs and u_1 is a residual representing plaintiff prediction errors and other unobserved factors. Similarly, the maximum the defendant will offer (M) depends on his expected payoff at verdict plus his incremental litigation costs:

$$\begin{aligned} M &= \gamma_3 W + \gamma_4 V + \beta'\mathbf{X} + u_2 \\ &= (\beta' + \gamma_3\theta' + \gamma_4\zeta')\mathbf{X} + \epsilon_2, \end{aligned} \tag{5}$$

where $\beta'\mathbf{X}$ is the markup due to defense litigation costs and the residual u_2 reflects defense prediction errors and other unobserved factors.[8] Note that the ask and offer defined here are not the ask and offer actually made in pretrial negotiations. They are unobserved, latent values that implicitly define the potential range of bargaining and hence determine the disposition of claims, specifically:

Drop: If the ask becomes negative the case is dropped with zero payment:[9]

$$A < 0 \rightarrow \text{case is dropped.} \tag{6}$$

[8] In dollars, the ask is: $A = W^{\gamma^1}V^{\gamma^2}e^{-\alpha'\mathbf{X}+u^1}$. The ask and offer are formulated in terms of W rather than P for technical reasons. To simplify exposition here, we do not distinguish between the true value of W and the litigants' expectations. This is modeled explicitly in Patricia Munch Danzon & Lee A. Lillard, The Resolution of Medical Malpractice Claims: Modeling and Analysis (Rand Corp. R-2792-ICJ, 1982)

[9] A more plausible assumption would be that a case is dropped if the potential settlement

Settle: If the minimum ask is positive but less than the maximum offer, settlement occurs:

$$0 < A \leqslant M \rightarrow \text{settlement possible.} \quad (7)$$

Litigate: If the ask is positive and exceeds the offer, the case is tried to verdict:

$$0 < A \text{ and } M < A \rightarrow \text{litigate to verdict.} \quad (8)$$

Settlement Size: The potential settlement (S) is a weighted average of the ask and offer:[10]

$$S = gM + (1 - g)A \quad (9)$$

where g, the parameter that gives the weight attached to the offer, may be interpreted as a measure of the plaintiff's relative bargaining strength.

A major difference between this and similar models is the addition of the condition for a case to be dropped (eq. (6)). Most models posit an offer equal to the defendant's expected payoff plus litigation costs. Hence if litigation costs are always positive, the offer is always positive. This assumption cannot explain why many cases (43 percent in our sample) are closed with zero payment.[11] We adopt the simple hypothesis that cases are dropped if the (log) ask becomes nonpositive.

Predictions of the Model

This model implies that the disposition of all claims, including those settled out of court, is influenced by the legal standard of payment equal

is negative. This model could not be estimated with the data available. The two models are equivalent if in practice the defense does not make a positive settlement offer if the plaintiff's expected net payoff is negative. Equation (6), which is in log dollars, implies that a case is dropped if the ask in dollars is less than \$1.00. Assuming proportional costs, the ask in dollars cannot be negative as long as the expected payoff is positive.

[10] In dollars, the settlement is a weighted geometric mean, $S = M^g A^{(1-g)}$.

[11] In discussing "nuisance" suits, Posner, *supra* note 1, at 433 & n.46, abandons the formal model and hints at notions of bluff, strategic behavior, and plaintiff error. He concludes: "One is led to predict . . . that pure nuisance claims are infrequent, that when made they are usually turned down, and that when turned down the plaintiff does not pursue the matter in court. This is not to say that there are never fraudulent claims having a sufficiently large expected value to support a credible threat to litigate if the defendant refuses to settle . . . or claims that, while unlikely to prevail, are not so weak that they would not justify a nongaming claimant in expending some money on a lawsuit." This suggests, without explicitly predicting, that cases closed with zero payment (1) are infrequent and (2) typically have a low probability of winning and (3) large stakes. The evidence is consistent only with the second of these predictions.

to damages if and only if negligence occurred. However, certain systematic departures from this standard are also predicted. Specifically:

1. Settlements discount the potential verdict by the probability of a plaintiff verdict.

2. The discrepancy between settlement and potential verdict is larger (smaller) the larger are plaintiff's (defendant's) litigation costs. This is because the plaintiff will settle for less, and the defendant will offer more, the higher their respective costs of going to verdict.

3. The probability that a claim is dropped without payment to the plaintiff depends not only on the probability of proving liability in court but also on the size of the potential award (negatively) and plaintiff's litigation costs (positively).

4. Cases closed at each stage of disposition are not a random sample of all claims but are "selected" on the basis of case characteristics, which determine the expected payoff and prediction errors relative to the cost of litigation. Specifically, the sample of cases going to verdict will be a small atypical group in which the plaintiff's overestimate or the defendant's underestimate of the payoff at verdict is large relative to the costs of litigation.

If both parties are risk-neutral wealth maximizers with unbiased expectations ($\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = 1$), the general model reduces to the following special case (in dollars):

$$A = PVe^{-\alpha'(\mathbf{X}) + u_1}, \tag{10}$$

$$M = PVe^{\beta'(\mathbf{X}) + u_2}, \tag{11}$$

and

$$S = PVe^{g\beta'(\mathbf{X}) - (1-g)\alpha'(\mathbf{X}) + gu_1 + (1-g)u_2}. \tag{12}$$

This model yields the following additional predictions:

5. If expectations are unbiased on average, $E(u_1) = E(u_2) = 0$, and bargaining power and costs are equal, $g = .5$ and $\alpha = \beta$, then settlement is for the expected court award: in dollar terms, $S = PV$.

6. A necessary condition for going to verdict is

$$u_1 - u_2 > \alpha'(\mathbf{X}) + \beta'(\mathbf{X}) \rightarrow \text{litigate to verdict.} \tag{13}$$

Thus, if prediction errors are proportional to V, whereas costs are less than proportional, then cases involving large stakes are more likely to be litigated.[12] Similarly, if prediction errors fall relative to costs as P in-

[12] Posner, *supra* note 1, shows that the probability of litigation increases with the stakes, under the restrictive assumptions that (1) the parties disagree only on the probability of winning and (2) the costs of litigation are fixed and do not affect the outcome. Danzon, *supra* note 6, shows that eq. (13) holds even allowing that costs are endogenous and influence the outcome.

creases, claims where the plaintiff's case is strong are less likely to be litigated.

III. Methodology and Data

Estimation

A detailed account of the identification and estimation of the model is given in an earlier paper.[13] The assumptions outlined above relate the observed disposition to the unobserved ask and offer and hence to the unobserved potential outcome at verdict. First, the determinants of the stage of disposition—drop, settle, or go to verdict—are estimated.[14] Information from these estimates is then incorporated into estimation of the parameters of the V and S equations, to control for the fact that cases observed to have positive awards at verdict or settlement are not random samples of all claims. These techniques are an extension of those used in simple selection models.[15] Although we do not observe the ask, the offer, the potential verdict for cases settled or dropped, and the potential settlement for cases litigated or dropped, we obtain unconditional estimates of the structural parameters of the V, W, A, and M equations and the settlement parameter, g. Hence we obtain predicted values of these latent variables for all cases, regardless of their actual disposition.

This payoff is obtained at a price. In addition to the behavioral assumptions and the assumption that all residuals are lognormally distributed, certain zero coefficient restrictions in some equations are necessary for identification. The economic rationale for these coefficient restrictions is discussed below in the context of the estimates. While the identifying assumptions are restrictive, they seem plausible.

More troublesome is that we are forced by computational cost and lack of data on the evidence of negligence to assume that the plaintiff's propensity to win, W, does not affect the ask and the offer. Effectively this implies that the estimates of W are conditional, based on cases going to verdict only, and may be biased estimates of population parameters. Coefficients of variables in all other equations are unbiased, provided that they are uncorrelated with W.

Danzon reports estimates of the determinants of the plaintiff's probability of winning and size of award, at each stage of disposition (presuit, after filing suit but before verdict, and at verdict), using logit and ordinary least squares (OLS) estimators.[16] Those estimates do not control for selection

[13] See note 8 *supra*.

[14] Assuming log normality of the residuals, a sequential probit model may be used.

[15] For example, James J. Heckman, Sample Selection Bias as a Specification Error, 47 Econometrica 153 (1979).

[16] Danzon, *supra* note 6.

bias so must be interpreted as conditional on the stage of disposition. Where relevant, the results from that analysis are reported here.

Data

The data are drawn from two surveys of insurance company claims, one of files closed in 1974 and the other of files closed in 1976. These surveys are broadly representative but not strictly randomized samples of claims against physicians and hospitals.[17] Both report information on the injury (a severity index, the insurance company's estimate of economic loss), the plaintiff (age, sex, income, employment status), the defendant(s) (physician or hospital), and the outcome of the claim (stage of disposition and amount of payment, if any).[18] Claims against multiple defendants arising from the same injury have been combined so a "claim" refers to a plaintiff's claim against one or more defendants.

Information on the evidence of negligence is unfortunately sparse and not uniform between the two surveys. The 1974 survey reports specific allegations by the plaintiff—*res ipsa loquitur,* misdiagnosis, lack of informed consent.[19] The 1976 survey reports extensive information on the nature of the injury. We define broad categories of injuries that are likely to influence the ease of proving negligence: (1) an obvious error, such as treatment of the wrong part of the body; (2) an injury induced by treatment; and (3) lack of preventive care. Type 1 cases are categorized with 1974 res ipsa cases. Binary variables indicate if any one of these (not mutually exclusive) injury categories was mentioned at least once in the files relating to the incident.

The litigants' expected costs of going to court are also not reported and must be represented by proxy variables, which are discussed below.

[17] The 1974 survey instrument and data are described in American Insurance Association, Special Malpractice Review: 1974 Closed Claims Survey (1976). The 1976 survey instrument and data are described in Westat Inc., Medical Malpractice Closed Claim Study 1976 (1979).

[18] Response rates tend to be low on items not routinely collected by insurers, such as plaintiff's income. Income was dropped from the analysis after preliminary estimates showed no significant effects. Incidents were excluded from the analysis if data for key variables were missing or inconsistent. Claims involving severe injuries or payment to the plaintiff are more likely to have good data and hence are overrepresented in the analysis samples.

[19] In the case of an injury that would not normally occur in the absence of negligence, the plaintiff may invoke the doctrine of *res ipsa loquitur*—"the thing speaks for itself." This alleges prima facie evidence of negligence and shifts the burden of proof from the plaintiff to the defendant. It has also been invoked in situations where the plaintiff was not in a position to recognize that or by whom he was being injured because, for example, he was under anesthesia. Only 4 percent of cases in the 1976 sample involve obvious error, whereas 20 percent of cases in the 1974 sample allege res ipsa.

Data from other sources on characteristics of the legal environment of the state in which a claim occurred were merged with the basic claim files. The Appendix Table gives definitions, sources, and means by stage of disposition for all variables.

IV. Empirical Results

Goodness of Fit

Table 1 reports full information maximum likelihood estimates of the structural equations. Before discussing parameter estimates, we briefly consider the explanatory power of observed variables and goodness of fit of the model. Goodness of fit in this context has a slightly unusual meaning because the variables to be explained—the potential award (*V*) and propensity to win (*W*) at verdict, the minimum ask (*A*), maximum offer (*M*), and potential settlement (*S*)—are not directly observed for some or all claims. The methodology yields two estimates of each variable for each claim, one based on observed characteristics (**X**) only, and the second incorporating the residual (unmeasured characteristics) implied by the stage of disposition, given the behavioral and distributional assumptions. For example, if two claims have identical observed (**X**) characteristics but one is dropped while the other settles, the model will impute to the former a more negative residual in the ask, because of the assumption that cases are dropped because the ask is negative. The variance of the predicted values, based on observed characteristics only, is the "explained variance." The "total variance" is the sum of the variance of the predicted values based on observed characteristics plus the variance of the residual (unmeasured characteristics). The ratio of explained to total variance we term R^2. It measures the percentage of total variance accounted for by observed characteristics.

This quasi analysis of variance is reported in Table 2. The explanatory power of observed characteristics is fairly high for *V* (43 percent), *S* (52 percent), and *M* (37 percent). Explanatory power is much lower (16 percent) in *A*, because both explained and residual variance are larger. The large variance of *A* relative to *M* suggests but cannot prove that plaintiffs are less predictable than defendants. Contributing to the large variance of *A* is the role it plays in the behavioral model, together with the empirical facts. Recall that 43 percent of claims are dropped. For these claims, by assumption, the ask is negative. Seven percent of claims are litigated to verdict. For these claims, by assumption, the ask exceeds the offer. Consequently the assumptions which constrain the estimates force the pre-

TABLE 1
PARAMETER ESTIMATES OF STRUCTURAL MODEL

VARIABLE	EQUATION								
	Verdict (*V*)		Win (*W*)		Ask (*A*)*		Offer (*M*)*		Settlement (*S*)
	ζ	|t|	θ	|t|	α	|t|	β	|t|	$g\beta + (1 - g)\alpha$
CONSTANT	4.603	10.3	−.995	6.3	−7.28	7.4	3.93	20.4	2.45
CALIFORNIA	−.204	1.3	.187	.9					
PERMANENT PARTIAL DISABILITY (PPD)	.465	3.2	.345	1.9	. . .	. . .	. . .	. . .	. . .
PERMANENT TOTAL DISABILITY (PTD)	.604	2.5	.325	1.0	. . .	. . .	. . .	. . .	. . .
DEATH	.682	3.8	.644	3.0	. . .	. . .	. . .	. . .	. . .
DEFENDANTS (log)	. . .	. . .	.448	3.2	. . .	. . .	.44	7.8	.38
INDUCED BY TREATMENT	. . .	. . .	.357	1.4	. . .	. . .	. . .	. . .	. . .
LACK OF PREVENTION	. . .	. . .	−.096	.2	. . .	. . .	. . .	. . .	. . .
RESIPSA	. . .	. . .	−.048	.2	. . .	. . .	. . .	. . .	. . .
LOSS (log)	.441	8.7	. . .	. . .	. . .	. . .	. . .	. . .	. . .
DLOSS (<$100)	2.048	7.1	. . .	. . .	. . .	. . .	. . .	. . .	. . .

LIFE	−.006	2.5	. . .	. . .	. . .	. . .	. . .	. . .	. . .
PPD × LIFE	.019	4.3	. . .	. . .	. . .	. . .	. . .	. . .	. . .
PTD × LIFE	.029	4.3	. . .	. . .	. . .	. . .	. . .	. . .	. . .
DEATH × LIFE	.013	2.8	. . .	. . .	. . .	. . .	. . .	. . .	. . .
1976	.623	2.3	−.640	2.5	−1.66	3.9	.08	5.0	−.15
LID	.010	.1	. . .	. . .	. . .	. . .	. . .	. . .	. . .
LID × 76	−.355	3.7	. . .	. . .	. . .	. . .	. . .	. . .	. . .
COLLATERAL SOURCE (COLR)	.397	2.3	. . .	. . .	. . .	. . .	. . .	. . .	. . .
COLR × 76	−.165	.9	. . .	. . .	. . .	. . .	. . .	. . .	. . .
ATTORNEY	. . .	. . .	. . .	. . .	1.90	6.6	. . .	. . .	.25
FEE LIMIT	. . .	. . .	. . .	. . .	.71	2.7	. . .	. . .	.09
FEELIM × 76	. . .	. . .	. . .	. . .	−.69	1.9	. . .	. . .	−.09
LAG IN REPORTING	. . .	. . .	. . .	. . .	.03	.5	. . .	. . .	.004
COURT DELAY	. . .	. . .	. . .	. . .	−.15	2.0	−.15†	2.0	−.15†
CLAIM FREQUENCY	. . .	. . .	. . .	. . .	−.06	1.7	−.06†	1.7	−.06†
PRESUIT	. . .	. . .	. . .	. . .	−1.20	17.8	−1.20†	17.8	−1.20†
PHYSICIAN	. . .	. . .	. . .	. . .	. . .	. . .	.35	5.4	.30
POTENTIAL VERDICT (V)	. . .	. . .	. . .	. . .	1.14	9.4	.70	6.5	.77
R^2	.43		.17		.16		.37		.52

* t-statistics are calculated from the normalized coefficient estimates, $\alpha/\sigma_{\epsilon_1}$ and $(\beta - \alpha)/\sigma_{\epsilon_2-\epsilon_1}$.
† Coefficients constrained to be equal in *A* and *M*.

TABLE 2
EXPLANATORY POWER OF OBSERVED CHARACTERISTICS (**X**)

Source	*V*	*S*	*A*	*M*	*W*
X	1.56	2.04	4.05	1.83	.21
Residual	2.08	1.85	20.83	3.12	1.00
R^2	.43	.52	.16	.37	.17
Total	3.64	3.89	24.88	4.95	1.21

NOTE.—R^2 is the ratio of the variance due to observed characteristics (**X**) relative to the total variance.

dicted values of *A* to exhibit large variance and a low mean.[20] Explanatory power of observed characteristics is also low in the *W* equation (17 percent), partly due to lack of relevant data and because *W* is estimated from the small subsample of cases actually going to verdict. Therefore low explanatory power in *W* relative to *V* suggests but cannot prove that courts are less predictable on the issue of liability than damages.

Parameter Estimates

1. *Potential Award at Verdict* (V) *(Table 1, Col. 1).* The evidence is strong that courts are influenced by the basic law of compensable damages and recent modifications.

Compensable damages. The law of compensable damages provides for compensation of economic loss and pain and suffering. We have data only on the insurer's estimate of economic loss. If courts awarded a uniform markup over economic loss for pain and suffering, the elasticity of *V* with respect to loss would be unity. In fact, the estimated elasticity of *V* with respect to loss is .44. In other words, if economic loss increases by $1,000, the potential verdict increases by only $440. In principle the difference between the total award and economic loss should measure compensation for pain and suffering. If so, the estimate that awards do not increase in proportion to economic loss might seem to imply that cases with relatively large economic loss receive proportionately less for pain and suffering. In fact, no such inference should be drawn because the

[20] These perhaps implausible results for *A* may cast doubt on the assumption that a negative ask is a necessary and sufficient condition for a case to be dropped. Alternatively, the assumption of log normality may be incorrect. The importance of distributional assumptions in the context of estimating unreported census incomes is shown in Lee A. Lillard, James P. Smith, & Finis R. Welch, What Do We Really Know about Wages? The Importance of Non-Reporting and Census Imputation (1981).

TABLE 3
EFFECT OF SEVERITY OF INJURY

	Type of Disability			
	Temporary	Permanent Partial	Permanent Total	Death
Probability of dropping, $A \leq 0$	.500	.317	.248	.317
Probability of settling, $0 < A \leq M$	.451	.617	.677	.619
Settlement, $S(\mathbf{X})$, log $	7.13	8.75	9.53	8.85
Probability of going to verdict, $A > M$	.049	.066	.075	.064
Probability of win, $W > 0$	.143	.261	.285	.368
Award, $V(\mathbf{X})$, log $	7.53	9.13	10.03	9.23

estimate is biased toward zero by measurement error in loss.[21] Similarly, the common conclusion that the tort system tends to overcompensate small cases and undercompensate large cases cannot be supported or refuted with the data available.[22]

Table 3 shows how severity of injury affects the outcome. The potential verdict for cases of permanent total disability is more than twice as large as for cases of death. This is consistent with the law of compensable damages, which provides no compensation for a decedent's pain and suffering, or medical and living expenses had he lived. Table 3 clearly shows that potential verdict affects size of settlement and stage of disposition. We return to this later.

For permanent injuries, awards are greatest for very young plaintiffs, increasing roughly 2 percent for each year of life expectancy. For temporary injuries awards peak in the late thirties or early forties, suggesting that these awards are influenced primarily by current wage loss.[23]

[21] The error in loss is of two types: (1) missing or erroneous data, which are imperfectly controlled for by including the dummy variable, *DLOSS*, for cases reporting a loss less than $100; (2) the loss reported in insurance company files is usually not discounted, and therefore overestimates the present discounted value used by the courts. Using bivariate regressions, Danzon, *supra* note 6, shows that the apparent regressivity (elasticity < 1) may be due solely to error in reported loss.

[22] For example, American Insurance Association (AIA), *supra* note 17.

[23] These estimates are from Danzon, *supra* note 6, using a quadratic function of life expectancy. The interactions between the severity indicators and life expectancy were introduced to control for potential discounting bias. If reported loss is undiscounted but awards reflect a discounted present value, the coefficient of the undiscounted loss variable would be downward biased. The coefficients of the interaction variables should be negative, and their introduction should raise the coefficient of loss. In fact, the interaction coefficients are positive and the coefficient of loss is essentially unaffected. We interpret this as further evidence of reporting error in loss, due to factors other than discounting.

Tort reforms. Our estimates of the impact of tort reforms are tentative for several reasons. Although we include only laws enacted before the earliest closure date of claims in our sample, some of these claims may have been exempt if filed prior to the effective date of the changes. This would bias the estimated effects downward. On the other hand, we cannot control for all changes in law and possibly in jury attitudes following the 1974–75 malpractice "crisis." To the extent that the laws we measure pick up the effects of these unmeasured factors, the estimated effects are upward biased.

We include two indicators of tort reforms: modification of the collateral source rule to admit evidence of collateral compensation; and a compound variable, *LID,* which indicates passage of a law to limit awards, institute periodic payments, or limit the plaintiff's ad damnum.[24] In order to distinguish the net impact of these statutes from the fact that they were more likely to be enacted in states where awards were relatively high in 1974, we include an indicator (0 or 1) for states in which a law was ever passed (for example, *LID*) and an interaction between the indicator and the 1976 indicator (*LID**76). The coefficient of a law variable alone indicates the difference in 1974 between states that did and states that did not subsequently pass the law. The sum of this coefficient plus the coefficient of the interaction measures this differential in 1976. Thus the coefficient of the interaction measures the net effect of changing the law.

Taken at face value, the estimates imply that in states that subsequently modified the collateral source rule awards were 49 percent higher in 1974, confirming that tort reform was a response to the crisis.[25] Modification of the collateral source rule reduced this differential by 15 percent by 1976 but the significance level is low. Measures to reduce awards by limiting the plaintiff's ad damnum, limiting the award, or instituting periodic payments (*LID*) are estimated to have reduced awards by 30 percent on average.[26] Conventional wisdom and other empirical evidence suggest

[24] The *LID* variable measures the average effect of the three laws. By July 1976, six states limited recoveries, five allowed periodic payments, and sixteen limited the ad damnum. Since the number of states passing a law is the number of degrees of freedom available to estimate its effects, it is impossible to estimate accurately the effects of each law separately. The indicator for a law permitting periodic payment is included (by interaction) only for claims involving permanent injury, since temporary injuries should not be affected.

[25] Since the equations in Table 1 are estimated in logs, to obtain the percentage effect of an indicator (0 or 1) variable on the dependent variable, exponentiate and subtract 1. For example, $e^{.397} - 1 = .49$.

[26] Periodic payments will reduce awards if the insurer can establish a trust fund yielding a higher rate of discount than a jury would have used to discount future payments to a present value. Ken Gepfart, Awards in Injury Cases Spread Out, *Los Angeles Times,* February 5, 1981, at 1, reports an increase in firms who specialize in establishing structured settlements

that, of the three, ceilings on awards have a greater impact than limits on the ad damnum or periodic payments.[27] The feedback of laws limiting awards on the outcome at earlier stages of disposition is discussed later.

State and year effects. We include a dummy variable for California, since California courts are, allegedly, atypically proplaintiff, and one-third of the claims in our sample occur in California. We find no California effect. However, this simply implies that California is no different from the frequency-weighted mean for other states. The few litigious states that dominate this mean may be no different from California, although the majority of states may differ.

The estimates imply that, compared to 1974, verdicts were 83 percent higher in 1976 in states which passed no laws to constrain awards, 30 percent higher in states which did pass such laws. Explaining this trend in malpractice awards in excess of that predicted by changes in the rate of inflation is beyond the scope of this study. These estimates are consistent with evidence that tort recoveries for other liability lines outpaced the general rate of inflation during the early seventies.[28] However we caution that our estimates of trends may be affected by the nonreporting of certain other variables in one of the two years.[29] Bias in the estimate of year effects could bias the estimates of effects of tort reforms, which are essentially year effects in states that changed a law.

2. *Plaintiff's Probability of Winning* (W) *(Table 1, Col. 2).* The estimates of the determinants of the plaintiff's probability of winning are severely limited by lack of data. Because technical difficulties force us to estimate W from cases going to verdict only, the estimates are conditional estimates for cases actually going to verdict but may be biased estimates of population parameters.

Evidence of negligence. The estimates imply that the plaintiff's probability of winning is higher in cases of severe injury, particularly death. This does not necessarily imply that courts relax the negligence standard

and presents statements by attorneys that they are able to settle for less using structured settlements than if required to pay a lump sum.

[27] Cross-sectional analysis of the effect of tort reforms on mean frequency and severity of claims, by state, shows that of the three laws grouped together here, only ceilings on awards have a significant effect. Patricia Munch Danzon, The Frequency and Severity of Malpractice Claims (Hoover Institution Working Paper E-82-23, 1982).

[28] Between 1974 and 1976, the consumer price index increased 15.4 percent and the medical care component increased 22.7 percent; the overall rate of inflation fell from 11.0 percent to 5.8 percent and the yield on three-year bonds fell from 7.9 percent to 5.3 percent. Trends in claim frequency and severity are analyzed in Danzon, *supra* note 27.

[29] Of the variables with data for one year only, attorney representation is the most significant. Although it is included only in the ask, because all equations are estimated simultaneously, it could affect coefficients in other equations.

in favor of no-fault compensation in cases of severe injuries, as is commonly alleged. Obviously, the more severe the injury, the easier it is to show damages. Further, evidence from a study of injuries shows that the more severe the injury, the more likely it is due to negligence rather than within the normal risk of good care.[30] The courts may simply be reflecting that fact.

Recall that the 1974 data indicate allegations made by the plaintiff, whereas the 1976 data give information on the injury. Although these estimates based on pooled 1974 and 1976 data show no significant effect of type of injury or allegation, these coefficients are biased toward zero, because the nonuniformity of the data effectively introduces measurement error. Estimates for each year separately show that cases alleging *res ipsa* typically settle and have a 50 percent higher probability of payment to the plaintiff.[31] Cases involving obvious treatment error show similar effects. Cases alleging lack of informed consent or misdiagnosis have a 34 percent and 21 percent lower probability, respectively, of winning at verdict. Cases of injury induced by treatment are more likely to win in settlement, suggesting a higher probability of winning in court. Thus there is some evidence that the malpractice system tends to penalize obvious errors disproportionately.

Number of defendants. The plaintiff's probability of winning is almost twice as high in cases involving multiple defendants (.30) as in single defendant cases (.16).[32] These estimates are almost certainly too low, because estimation uses only cases tried to verdict, but the relative magnitude is interesting. It tends to confirm the hypothesis that the incentive facing multiple defendants to shift liability to each other effectively aids the plaintiff.[33]

3. *Why Are Cases Dropped? The Plaintiff's Minimum Ask* (A) *(Table 1, Col. 3).* By assumption, a claim is dropped if the ask becomes negative, which depends on the plaintiff's expected litigation costs relative to his expected payoff. Although the explanatory power of observed charac-

[30] California Medical Association, Medical Insurance Feasibility Study (1977). This study of injuries arising from medical care in twenty-four California hospitals found that the percentage attributable to negligence increases from 12 percent from minor, temporary injuries to 83 percent for permanent total disability, 43 percent for fatal injury. Comparison between these injury data and the data on claims is at most suggestive and strictly valid only if claims are representative of injuries, which cannot be determined with the data available.

[31] Danzon, *supra* note 6.

[32] The estimated elasticity of W with respect to number of defendants is .46.

[33] The effect of multiple defendants is expected to be less under a rule of pro rata contribution, since the payoff to shifting blame falls to zero for all defendants expecting to be found negligent. Danzon, *supra* note 6, finds no significant difference in awards in states adopting comparative negligence, a proxy for contribution in proportion to fault.

teristics is low (R^2 = .16), most are statistically significant with expected signs. The mean predicted probability of being dropped is .49 for cases actually dropped, compared to .37 for cases receiving some payment.

Potential verdict (V). The elasticity of A with respect to V is 1.12, that is, a $1,000 increase in the potential verdict results in a $1,120 increase in the ask. This suggests substantial fixed costs of going to court, independent of the stakes, such that the net payoff to litigation is proportionately less on small cases. Thus cases with small stakes are more likely to be dropped. For example, for minor injuries the probability of being dropped is .5, compared to .25 for permanent total disability (see Table 3).

Plaintiff's litigation costs. Since the plaintiff bears the burden of proving negligence, delay which results in decay of evidence and reduces compensation, due to forgone interest, is costly to the plaintiff. We use two measures of delay: the lag in reporting the claim and court congestion. Court congestion has the expected negative effect, consistent with Landes's finding that the settlement rate in criminal cases is positively related to court delay.[34] Lag in reporting has no significant effect. Cases with attorney representation are much less likely to be dropped.[35]

Limits on contingent fees. Limits on contingent fees tended to be passed in states with a relatively high litigation rate (only 34 percent of cases dropped, compared with 45 percent in other states) in 1974. The estimates imply that fee ceilings increased the percentage dropped by 5 percentage points, decreased settlement size by 9 percent, and reduced the proportion of cases litigating to verdict by 1.5 percentage points. These estimates tend to refute the common argument that contingent fees yield above-competitive, windfall returns, that is, earnings that exceed potential earnings on the most valuable alternative use of the attorney's time. If so, fees could be reduced with no reduction in attorney effort, hence no reduction in the plaintiff's probability of winning and gross recovery and an increase in recovery net of fee. On the contrary, the evidence is more consistent with contingent fees yielding only competitive returns at the margin.[36]

Other variables. Filing and dropping a case represents error by the plaintiff. We hypothesized that errors should occur less frequently (higher A) in states where the frequency of claims is high, implying a large stock

[34] Landes, *supra* note 1.

[35] The elasticity of A with respect to court delay is $-.15$. Of cases closed presuit, attorneys represented 50 percent of those dropped without payment, 63 percent of those settled with payment. Virtually all cases proceeding to suit had representation.

[36] A theoretical analysis of contingent fees and the effects of fee constraints is given in Patricia Munch Danzon, Contingent Fees for Personal Injury Litigation, Bell J. Econ., in press.

of information and possibly more specialized litigants. The weak negative effect of claim frequency is inconsistent with this prediction. The indicator that a claim closed prior to suit (*PRESUIT*) is included to control for unmeasured case characteristics. The significant negative coefficient does not imply that filing suit per se increases the probability of receiving payment.

4. *The Defendant's Maximum Offer (Table 1, Col. 4).*

Potential verdict (V). The elasticity of the offer with respect to V (.71) is considerably less than the ask elasticity (1.12). This suggests that the defense spends less on litigation, relative to the plaintiff, the higher the potential award, which is plausible if plaintiffs invest more in presenting evidence on the extent of damages on cases with larger stakes.[37]

Defense litigation costs. We hypothesize that defense costs are higher in cases with multiple defendants, because of incentives to shift blame, and in cases involving physician defendants, because physicians incur higher time and embarrassment costs of going to court than do institutional defendants. The significant elasticity of the offer with respect to number of defendants (.44) is consistent with multiple defendants tending to raise costs for the defense.[38] The offer is 42 percent higher if there is at least one physician defendant.

Court delay and closure prior to suit reduce the offer; claim frequency in the state has a weak negative effect.[39]

5. *Size of Settlement (Table 1, Col. 5).* By assumption, settlement is a weighted average of the ask and the offer. The estimates imply that the offer dominates, with a weight (g) of .87 compared to .13 for the ask.[40] In other words, the setttlement is closer to the maximum the defense would be willing to offer than to the minimum the plaintiff would accept. The

[37] From eqq. (4) and (5), $dA/dV = \gamma_1 dW/dV + \gamma_2 - d\alpha/dV + du_1/dV$, and $dM/dV = \gamma_3 dW/dV + \gamma_4 + d\beta/dV + du_2/dV$. Thus if expectations are unbiased ($du_1/dV = du_2/dV = 0$), W is independent of V ($dW/dV = 0$), and plaintiffs are typically more risk averse than defendants ($\gamma_2 \leqslant \gamma_4$), then the higher elasticity of A may arise because defense costs fall by more than plantiff costs ($d\beta/dV < d\alpha/dV < 0$) as V increases.

[38] This may be an upward-biased measure of the cost effect, to the extent that the omitted probability of winning is positively correlated with numbers of defendants for reasons other than cost.

[39] In order to identify the structural equations, court delay, closure presuit, and claim frequency are constrained to have equal effects on the ask and offer. This is plausible for any variable which affects the stakes equally for both parties (closure presuit) or shifts costs from one to the other (court delay). Also, for reasons of identification, the proxies for plaintiff and defense litigation costs (court delay, lag in reporting, physician defendant, limits on contingent fees) are omitted from the V and W equations. This is plausible if these factors affect the cost of going to verdict but not the input of effort to influence outcome, conditional on going to verdict.

[40] The estimate of g may be sensitive to behavioral and distributional assumptions which constrain the estimates.

estimated parameters of the equation (S) are simply these weights applied to the estimated parameters of the A and M equations.

The estimated elasticity of S with respect to V of .77 implies that the proportional discrepancy between settlement and potential verdict increases with the stakes. On average, cases settle for 74 percent of their potential verdict. Settlement size is higher in cases with multiple defendants or a physician defendant (defense litigation costs); lower (elasticity $= -.15$) in states with court congestion (plaintiff litigation costs); and 9 percent lower subsequent to limiting contingent fees. Our estimates of the marginal product of attorney representation (28 percent) are probably a lower bound because of measurement error in this variable due to nonreporting in 1974.[41]

6. *Propensity to Go to Verdict.* In our sample, 50 percent of cases are settled before a legal suit is filed and 40 percent after suit is filed but before verdict (including during trial); less than 10 percent are tried to verdict. Although cases tried to verdict represent a small fraction of the total, they are important because they determine the precedents that guide future settlements and because expenditure on litigation is substantially higher.[42]

Recall that, by assumption, necessary and sufficient conditions for litigation to verdict are that the ask is positive and exceeds the offer. Under certain conditions, this implies that the plaintiff's expectation of the payout in court exceeds the defendant's expectation by more than the sum of their litigation costs. The propensity to litigate is expected to be higher the greater the variance of prediction errors relative to the costs of going to court. Since the propensity to go to verdict depends on the difference between the ask and the offer, the coefficients are simply the difference between the A and M coefficients.

Potential verdict (V). The propensity to litigate increases with V (elasticity $= .4$). Since it seems unlikely that prediction errors increase more than in proportion to V, this evidence suggests that costs increase less than in proportion to V. Thus the stage of disposition appears to be significantly influenced by substantial fixed costs of going to court.[43]

[41] Using single year estimates for cases closed presuit, the effect of attorney representation is 150 percent, Danzon, *supra* note 6.

[42] The plaintiff attorney's contingent fee percentage is typically 40 percent if the case goes to trial compared with 33 percent if it is settled pretrial. Stephen Dietz, Bruce C. Baird, & Lawrence Berul, The Medical Malpractice Legal System, in Appendix to the Report of the Secretary's Commission on Medical Malpractice (DHEW No. [OS]73-89 1973). For the defense, NAIC 1980 reports that expenditure on cases tried to verdict averages twice that on cases settled. National Association of Insurance Commissioners, 2 Malpractice Claims, no. 2 (1980).

[43] Since plaintiff's costs are subtracted in A and defense costs are added in M, a less than

TABLE 4
PREDICTED MEAN VALUES BASED ON OBSERVED CHARACTERISTICS (X), BY STAGE OF DISPOSITION

	Dropped	Settled	To Verdict	
			Won	Lost
Probability of dropping, $A \leq 0$	.491	.377	.285	.326
Probability of settling, $0 < A < M$	.460	.563	.650	.613
Settlement:				
$S(\mathbf{X})$, log $*	7.23	8.23	9.22	8.80
exp $[S(\mathbf{X})]$†	3.437.	9,473.	18,945.	11,701.
exp $[S(\mathbf{X}) + \hat{\sigma}_s^2/2]$‡	8,678.	23,920.	47,833.	29,545.
Probability of going to verdict, $A > M$	.050	.060	.065	.061
Probability of verdict and win, $A > M$ and $W > 0$	.010	.014	.021	.014
Award				
$V(\mathbf{X})$, log $*	7.86	8.49	9.20	8.73
exp $[V(\mathbf{X})]$†	5,821.	12,052.	23,046.	14,176.
exp $[V(\mathbf{X}) + \hat{\sigma}_v^2/2]$‡	16,460.	34,077.	65,163.	40,820.
Probability of win, $W > 0$	.184	.224	.317	.230

* Mean of log dollar values.
† Mean of exponentiated log dollar values = approximate median.
‡ Mean of exponentiated log dollar values = approximate mean conditional on **X**. See note 31.

Table 4 reports predicted mean values of *V*, *S*, etc., by stage of disposition.[44] The mean *V* for cases actually litigated to verdict and won is roughly twice as large as the mean *V* for cases settled out of court, which in turn is roughly twice that for cases dropped. We return to this below.

Other variables. Evidence of other factors contributing to the propensity to litigate is sparse.[45] Attorney representation is virtually essential to filing suit and, a fortiori, to going to verdict. We estimate that limits on contingent fees reduce the probability of going to verdict from .061 to .046—a trivial absolute change but a substantial percentage change. Al-

proportional increase in costs with V implies an elasticity of the difference $(A - M)$ with respect to V greater than zero, as observed.

[44] In Table 4, predicted means $S(\mathbf{X})$ and $V(\mathbf{X})$ are means of the log values. To provide some measure of central tendency in dollar values, estimates of the median and the mean are reported, but both are approximations because of selectivity. For the full sample, dollar values are log normally distributed. Then exp $[V(\mathbf{X})]$ estimates the median and exp $[V(\mathbf{X}) + \hat{\sigma}_v^2/2]$ estimates the mean conditional on **X**. For specific dispositions, systematic selection on the basis of $V(\mathbf{X})$ implies that for the subsample observed at each disposition, $V(\mathbf{X})$ is not normally distributed. Then exp $[V(\mathbf{X})]$ and exp $[V(\mathbf{X}) + \hat{\sigma}_v^2/2]$ are not precise measures of median and mean for claims closing at that stage of disposition.

[45] Measured characteristics have little explanatory power in the $M - A$ equation (R = .03).

TABLE 5
EFFECT OF NUMBER OF DEFENDANTS

	Single Defendant	Net Change	Multiple Defendants
Probability of dropping	.455	−.103	.352
Probability of settling	.488	.105	.593
Settlement (log $)	7.41	1.33	8.74
Probability of going to verdict	.056	−.001	.55
Award (log $)	8.03	.65	8.68
Probability win	.164	.134	.298

though multiple defendant cases have 90 percent larger V than single defendant cases, a higher probability of winning at verdict (.30 vs. .16), and a lower probability of being dropped (.35 vs. .46), they are marginally less likely to go to verdict (.055 vs. .056). (See Table 5.) Thus, although multiple defendants tend to be associated with large V and, presumably, with uncertainty as to the liability of individual defendants (both of which tend to increase the probability of going to verdict), this is apparently offset by higher defense litigation costs and higher P.

Evidence reported elsewhere suggests that the probability of going to verdict is inversely related to P.[46] Cases alleging res ipsa rarely go to verdict. Cases alleging misdiagnosis or lack of informed consent have a relatively higher probability of going to verdict but a low probability of winning.[47] Where the insurer's evaluation of the merit of the case is known, the insurer's evaluation that there was negligence greatly reduces the probability of going to verdict.

V. THE PROBABILITY OF WINNING IN COURT FOR CASES SETTLED OR DROPPED

In theory, the ask, offer, and size of settlement discount the expected verdict by the expectation of the plaintiff's probability of winning in court, $P = \phi(W)$. Empirically, we were unable to incorporate W directly into the estimates of A, M, and S to obtain unbiased estimates of P for cases settled or dropped. However, P can be estimated indirectly from

[46] Danzon, *supra* note 6.

[47] This might be construed as investment in establishing more efficient legal rules, assuming that the existing system provides insufficient deterrence to errors of diagnosis or advice. However, the necessary condition for the efficient evolution of common law, that individual litigants internalize all social costs and benefits, is surely not realized in medical malpractice. See Paul H. Rubin, Why Is the Common Law Efficient? 6 J. Legal Stud. 51 (1977); George L. Priest, The Common Law Process and the Selection of Efficient Rules, 6 J. Legal Stud. 65 (1977); William M. Landes & Richard A. Posner, Adjudication as a Private Good, 8 J. Legal Stud. 235 (1979).

TABLE 6
PLAINTIFF'S PROBABILITY OF WINNING (P) FOR CASES DROPPED AND SETTLED

Indirect Estimates $[P = S - V - \alpha(2g - 1)]$	Disposition	
	Dropped	Settled
$g = .87$		
$\alpha = .1$	.49	.72
$\alpha = .3$	.43	.62
$g = .5$		
$\alpha = .1$	.53	.77
$\alpha = .3$	.53	.77
$g = 1.0$		
$\alpha = .1$	.48	.70
$\alpha = .3$	.39	.57
Direct estimate $[P = \phi(W)]$*	.18	.22

* Derived from the estimated W equation. Probably downward biased because of estimation of W from cases going to verdict only.

the settlement equation, given estimates of S, V, the bargaining parameter (g), and litigation costs as a percentage of potential award (α and β), and assuming unbiased expectations and risk neutrality. By equation (14) in dollars:

$$S = PVe^{g\beta'(\mathbf{X}) - (1-g)\alpha'(\mathbf{X})}, \tag{14}$$

or in logs:

$$S = P + V + g\beta(\mathbf{X}) - (1 - g)\alpha'(\mathbf{X}). \tag{14'}$$

We have estimates of S, V, and g from the data, but α and β are unknown. If we further assume that costs are a uniform percentage of potential award, the same for plaintiff and defense (that is, $\bar{\alpha} = \bar{\beta}$), then we have:

$$P = S - V - \alpha(2g - 1). \tag{15}$$

Equation (15) is used to estimate P under two assumptions about costs: (1) costs are 10 percent of V ($\alpha = \beta = .1$), and (2) costs are 30 percent of V ($\alpha = \beta = .3$); and three assumptions about g: (1) the plaintiff dominates, as estimated ($g = .87$), (2) bargaining strength is equal ($g = .5$), and (3) settlement is at the offer ($g = 1$).[48]

Table 6 reports estimates of P under these alternative assumptions. The bounds on P for cases settled with payment range from .57 (if $g = 1$, $\alpha = .3$) to .77 (if $g = .5$, $\alpha = .1$ or .3), whereas for cases dropped without

[48] We report the estimates based on measured characteristics only, since the results including information implied by the stage of disposition are essentially identical.

payment estimates range from .39 to .53. Regardless of the assumed parameter values, the estimates of P are higher for cases paid than for cases dropped. This suggests that the settlement process is not random with respect to which cases are paid: cases more likely to win in court are more likely to win out of court. Note that these estimates of P are downward biased if plaintiff's litigation costs exceed defense litigation costs and if plaintiffs are typically more risk averse than defendants.

Table 6 also gives value of P computed using the estimated coefficients of the W equation. These direct estimates are implausibly low (.18 and .22). For the wealth-maximizing defendant, it is rational to settle if $S \leq M = PVe^{\beta}$ (in dollars). Thus, if P is only .22, it does not pay the defense to settle for more than one-third of the potential verdict, even if costs of going to verdict are as much as one-third of the potential verdict ($\beta = .3$).[49] In fact, cases that actually settle receive 77 percent of their potential verdict. If $\beta = .3$, this is rational settlement behavior for the defense only if $P \geq .57$. If litigation costs are lower ($\beta = .1$), the observed settlement behavior is rational only if $P \geq .7$.

Thus the discrepancy between plaintiff win rates at verdict (28 percent) and settlement (51 percent), often cited as evidence that the settlement process is capricious, in fact partly reflects selection bias: cases litigated to verdict are disproportionately those where the plaintiff's probability of winning is low.

VI. Accounting for the Distribution of Dollars

The Difference between Mean Verdict and Mean Settlement

Recall that in our sample the actual mean verdict is \$102,000 compared with a mean settlement of \$26,000. Table 7 presents a rough accounting for the discrepancy between mean potential verdict and mean potential settlement in terms of two factors: (1) the propensity of claims involving large compensable damages to go to verdict, and (2) the fact that out-of-court settlements discount potential verdicts for the probability of winning, litigation costs, etc. As a measure of compensable damages we use the mean predicted V for claims closed at each stage of disposition, since the main predictors in the V equation are the observed measures of compensable damages—severity, loss, life expectancy. Subscripts v and s denote cases closed (with payment) at verdict and settlement, respectively.

The estimates imply that V_v exceeds V_s by 103 percent. By contrast, for cases settled out of court, the difference between their potential verdict

[49] From: $S/V = Pe^{\beta} = (.22)\,(1.35) = .30$.

TABLE 7
ACCOUNTING FOR DIFFERENCE BETWEEN MEAN VERDICT AND MEAN SETTLEMENT

	Log $	Percentage Difference
V_v: mean potential verdict (cases won at verdict)	9.20	. . .
V_s: mean potential verdict (cases paid at settlement)	8.49	. . .
$V_v - V_s$: difference due to observed measures of compensable damages	.71	103
S_s: mean potential settlement	8.23	. . .
$V_s - S_s$: difference due to settlement process	.26	30

NOTE.—Reported estimates are based on measured characteristics only. Estimates based on measured and unmeasured characteristics are very similar. Precise means in dollars are not reported for reasons given in note 31 *supra*.

and their potential settlement, $V_s - S_s$, which reflects discounting for P, $\beta - \alpha$, and g, is only 30 percent. Thus the fact that cases going to verdict typically involve much larger stakes accounts for over three times as much of the explained discrepancy between mean verdict and mean settlement as the tendency of cases to settle for less than their potential verdict.

Distribution of Total Payment

A frequent criticism of the tort system in general and medical malpractice in particular is that the distribution of the total dollar payout is highly skewed. The lower 50 percent of cases account for 4 percent of the total dollars paid. The upper 5 percent of paid claims (3 percent of all claims) account for 49 percent of total dollars paid.

This uneven distribution may be decomposed into three factors: (1) the skewed distribution of compensable damages (59 percent of cases involve minor injury, 23 percent involve permanent partial disability, 4 percent involve permanent total disability, and 14 percent involve death); (2) the fact that cases that settle tend to receive less than their potential verdict; and (3) the interaction of V and stage of disposition, that is, cases with small V are more likely to be dropped without payment or to settle for less than their potential verdict, while cases with large V are likely to go to verdict.

Table 8 shows the contribution of these factors to the skewness of dollar payout. Panel A includes all claims closed with and without payment. Twenty-six percent actually receive over $6,500, while 2.6 percent receive over $140,000. To indicate the contribution of compensable dam-

TABLE 8
ACCOUNTING FOR THE DISPERSION OF DOLLAR PAYOUT

	PERCENTAGE OF CASES		
	≥$6,500	≥$30,000	≥$140,000
A All cases (5,832)			
1. Actual	26.2	9.8	2.6
2. *V*	37.9	14.2	3.5
3. *S*	32.0	11.0	2.2
B Paid cases (3,058)			
1. Actual	50	20	5
2. *V*	43.5	17.6	4.5
3. Random *V* or *S*	32.1	11.1	2.3
4. *V* or *S*	39.8	14.8	3.3
C Cases won at verdict (108)			
1. Actual	82.4	55.6	21.3
2. *V*	57.8	28.7	9.2
D Cases paid in settlement (2,950)			
1. Actual	48.8	17.3	4.3
2. *S*	39.1	14.3	3.1

ages, line 2 shows the hypothetical distribution if all cases received their potential verdict. The percentage receiving more than $6,500 rises (from 26 percent to 38 percent), but there is little increase in the over-$140,000 class (2.6 percent to 3.5 percent). Line 3, which assigns all cases their potential settlement, shifts the distribution to the right only marginally and still underpredicts in the under-$6,500 size class, because of the large percentage closing with zero payment although their potential verdicts and settlements are positive.

Panel B, using paid cases only, tells a similar story. Fifty percent of actual payments, compared with 56 percent of potential verdicts, are under $6,500. At the other extreme, 5 percent of actual payments, compared with 4.6 percent of potential verdicts, exceed $140,000. Thus the skewed distribution of dollar payout is largely accounted for by the skewed distribution of compensable damages.

The interaction of severity and stage of disposition can be shown in several ways. A comparison of potential verdicts (line 2) for all claims (panel A) and paid claims (panel B) shows that cases with low *V* are more likely to be dropped: if the propensity to drop were random, the distribution of paid claims would mirror the distribution of all claims. Alternatively, line 3 in Panel B shows the effect of randomly selecting from the full sample a subsample equal in size to the paid sample and assigning them randomly *V* or *S* in the proportions of actual verdicts and settlements. Line 4 assigns *V* or *S* correctly, that is, as a case either went to verdict or settled. In all size classes except the lowest, the proportion of

TABLE 9
EFFECTS OF STATE LAWS LIMITING AWARDS:
DOLLAR CAPS, PERIODIC PAYMENTS, AND ELIMINATING AD DAMNUM

A. STATES PASSING AT LEAST ONE LAW				
	1974 (Before)	1976 (After)	1976 ("If")	Effect of Law (2−3)
Probability of dropping	.371	.484	.435	.049
Probability of settling	.561	.470	.514	−.044
Settlement, $S(\mathbf{X})$, log dollars	8.03	7.48	7.90	−.42
Probability of going to verdict	.062	.046	.051	−.005
Award, $V(\mathbf{X})$, log dollars	8.41	7.88	8.42	−.54
B. STATES NOT PASSING ANY LAWS				
	1974 (Before)	1976 (After)	1976 ("If")	Effect of Law (3−2)
Probability of dropping	.436	.397	.444	.049
Probability of settling	.509	.550	.506	−.044
Settlement, $S(\mathbf{X})$, log dollars	7.66	8.21	7.79	−.42
Probability of going to verdict	.054	.055	.050	−.005
Award, $V(\mathbf{X})$, log dollars	8.20	8.53	7.99	−.54

claims in line 4, using correctly assigned V or S, exceeds what would be expected if stage of disposition were random (line 3).

Panels C (cases won at verdict) and D (cases paid in settlement) compare the actual and predicted distributions of verdicts and settlements. They show that while our predictions of settlements are quite accurate, we rather severely underpredict verdicts for the sample of cases actually litigated to verdict and won (21.3 percent of actual verdicts exceed $140,000, compared to 9.2 percent predicted). This suggests that the distribution of verdicts is even more skewed than the lognormal distribution we have assumed.

VII. SIMULATED EFFECTS OF TORT REFORMS

Limits on Awards

To illustrate how tort reforms may have indirect and perhaps unforeseen consequences, Table 9 simulates the ramifications of laws designed to limit awards (dollars caps, periodic payments and elimination of ad damnum). The table distinguishes states that enacted at least one of the three laws from states that enacted none. The first two columns show mean predicted values in 1974 and 1976, respectively, based on the law actually in effect. The third column shows counterfactual calculations, that is, predicted values had the law not changed, for states that in fact made a change, and predicted values had the law been changed, for states that in fact made no change.

The counterfactual calculations imply that laws limiting awards reduced potential verdicts by 42 percent.[50] This feeds into a 34 percent reduction in settlement size, and a 0.5 percentage point decrease in the percentage of cases going to verdict. States which passed laws limiting awards had higher awards in 1974 than states which passed no such laws. This ranking was reversed by 1976, apparently largely due to the change in law. As noted above, these are rough estimates of short-run effects. They may be downward biased by the exemption of claims filed prior to the change, upward biased by other unmeasured legal or attitudinal changes coinciding with the tort reforms whose effect we are attempting to measure.

The model can also be used to simulate partial effects of changes in the cost of litigating, such as the proplaintiff trends in rules of procedure and evidence in the sixties or the introduction of arbitration and pretrial screening panels by many states since 1975.[51] Predicting precise effects of specific measures is beyond the scope of this study.[52] Instead we simulate the effects of hypothetical cost-reducing measures that result in (1) a 30 percent reduction in plaintiff costs (increase in A); (2) a 30 percent reduction in defense costs (decrease in M); and (3) a simultaneous 30 percent reduction in A and M.[53] This latter might approximate a uniform switch to arbitration. The results are shown in Table 10.

The 30 percent reduction in plaintiff costs has a minimal effect: 2 percentage point reduction in percentage of cases dropped, 0.6 percentage point increase in percentage of cases going to verdict, and a 4 percentage point increase in settlement size. The comparable reduction in defense costs has the same effect on percentage of cases going to verdict, but induces a 26 percent reduction in S because of the dominant weight of the offer ($g = .87$). The simultaneous reduction in plaintiff and defense costs increases the percentage going to verdict from 5.6 to 6.9. This small absolute increase represents a 23 percent increase. Fewer cases are

[50] From: $e^{-.54} - 1 = -.42$. Table 9 shows the effect of passing the average number of laws (1.5), whereas Table 1 shows the average effect of each law: $(1.5)(-.36) = -.54$.

[51] Since the 1960s, common law changes, such as admitting textbooks as evidence of the standard of care, expanding the locality rule, and interpreting res ipsa more liberally, have effectively reduced the plaintiff's cost of proving liability.

[52] Arbitration and panels may affect the payoff as well as the cost of litigation inputs. Alternative forums were not sufficiently widespread by 1976 for us to estimate their effect directly from the data.

[53] For (1), we add ln 1.3 to the constant in the ask equation. For (2) we subtract ln 1.3 from the constant in the offer. For (3) we combine (1) and (2). This method of simulating changes in costs is obviously only approximate.

TABLE 10
EFFECTS OF HYPOTHETICAL 30 PERCENT REDUCTION IN LITIGATION COSTS

	Actual	Plaintiff Costs Down*	Defense Costs Down†	Both Costs Down‡
Probability of dropping	.421	.401	.421	.401
Probability of settling	.523	.537	.517	.530
Settlement, $S(\mathbf{X})$, log dollars	7.85	7.89	7.62	7.66
Probability of going to verdict	.056	.062	.062	.069
Probability of going to verdict and winning	.013	.014	.014	.015
Mean verdict, $V(\mathbf{X})$, log dollars	8.25	8.25	8.25	8.25

* Plaintiff costs reduced by 30 percent implies ask increases by 30 percent.
† Defense costs reduced by 30 percent implies offer falls by 30 percent.
‡ $c = a + b$.

dropped, but settlement size for those paid is reduced 22 percent because the decrease in the offer more than offsets the increase in the ask.

These simulations show that measures that reduce costs per case may not reduce total expenditure on litigation. To illustrate, assume first that the litigation costs of settlement are zero and that the costs of going to verdict are 30 percent of the verdict, initially, and 20 percent after the change. With these assumptions, total expenditure on litigation falls by 18 percent, since the increase in percentage of cases going to verdict only partially offsets the reduction in cost per case. If costs of settling are 10 percent of the potential verdict, before and after the change, then total litigation costs fall by only 3 percent despite the 30 percent reductions in *per case* costs of going to trial, because fewer cases are dropped and more incur settlement and trial costs.

Obviously, this analysis is insufficient to evaluate the efficiency of procedural reform because it ignores the influence of litigation expenditure on the outcome at verdict, on incentives to file claims, and ultimately on the frequency of injury through deterrence of negligence. It simply illustrates that procedural reform intended to reduce total expenditure on litigation may be counterproductive because of the "freeway principle" at work: adding more lanes does not simply move the current flow of traffic faster, because when the cost per trip falls more traffic enters the system.

VIII. CONCLUSIONS

Although with the data available one cannot directly test the economic model of claim disposition, the plausibility of our estimates, which are constrained by the assumptions of the model, lends credibility to the model.

Taken at face value, the estimates imply that the outcome of the malpractice system is far from random. Court awards are strongly related to economic loss. Because of error in reported economic loss, we cannot measure the markup for pain and suffering, but the conclusion reached by others of systematic overcompensation of small cases and undercompensation of large cases (relative to economic loss) is not sustainable with these data. Data deficiencies also limit tests of the extent to which courts adhere to the standard of liability in cases of negligence only. We find a plaintiff verdict is more likely in the case of death or severe injury, but this does not necessarily imply relaxation of the negligence standard.

Out-of-court settlements are strongly influenced by the potential verdict should the case go to court. On average, cases settle for 74 percent of their potential verdict. This discrepancy is larger or smaller the greater the litigation costs of the plaintiff or defense, respectively. For technical reasons, we were unable to estimate directly the probability of winning in court for cases actually closed out of court. However, indirect estimates suggest that for cases paid, this probability is in the range of .6–.8, whereas for cases dropped, it is .4–.5. Thus, whatever standard is applied by the courts does feed back to the outcome at settlement.

Costs appear to influence disposition in the predicted manner. The evidence overwhelmingly refutes the allegation that insurance companies can be forced to pay out on any case, no matter how trivial, in order to avoid litigation costs. Claims with small potential verdict are less likely to receive payment, presumably because of relatively high litigation costs.

Although these data cannot reveal the full long-run impact of the 1975–76 tort reforms, they suggest that ceilings on awards, periodic payments, and elimination of the plaintiff's ad damnum significantly reduce awards and reduce the probability and size of payment in settlement out of court. Limits on contingent fees decrease settlement size, increase the likelihood that a case is dropped, and decrease the likelihood of litigation to verdict. This is interpreted as evidence that unconstrained contingent fees do not convey rents at the margin. If so, fee constraints will limit expenditure on litigation at the cost of reduced compensation to plaintiffs.

The limited evidence on the determinants of the decision to go to verdict shows that the probability is higher if (1) the stakes are large (which suggests that fixed costs of going to court are large or that uncertainty increases with the severity of the injury) and (2) the plaintiff's probability of winning is low. The interaction between severity and stage of disposition contributes to the observed skewness of the distribution of payout and to the wide gap between the mean verdict and mean settlement. However, the skewed distribution of dollars among claimants, although widely criticized, appears to be attributable primarily to the extremely skewed distribution of compensable damages.

APPENDIX

VARIABLE DESCRIPTION AND MEANS

Variable and Description	Full Sample (N = 5832)	Pre-Verdict Drop (N = 2492)	Pre-Verdict Settle (N = 2950)	Verdict Lose (N = 282)	Verdict Win (N = 103)
CALIFORNIA (= 1 if claim from California, 0 otherwise)	.2227	.1794	.2678	.1454	.1994
PERMANENT PARTIAL DISABILITY (= 1 if injury was permanent partial disability, 0 otherwise)	.2270	.1766	.2580	.3121	.3241
PERMANENT TOTAL DISABILITY (= 1 if injury was permanent total disability, 0 otherwise)	.0432	.0321	.0488	.0638	.0926
DEATH (= 1 if injury resulted in death, 0 otherwise)	.1445	.1364	.1437	.1631	.3056
DEFENDANTS $\log_e$ (ln number of defendants)	.3226	.2439	.3745	.3690	.5997
*INDUCED BY TREATMENT** (= 1 if injury was induced by treatment, 0 otherwise)	.2848	.2725	.2973	.2695	.2685
*LACK PREVENTION** (= 1 if injury due to lack of preventive measures, 0 otherwise)	.0830	.0807	.0905	.0496	.0185
RESIPSA (= 1 if res ipsa loquitur was alleged [1974] or obvious treatment error [1976], 0 otherwise)	.0660	.0241	.0953	.1099	.1204
LOSS $\log_e$ (ln economic loss: medical, wage, and other)	5.7303	4.5780	6.4858	7.2801	7.6339
DLOSS (<\$100) (= 1 if loss <\$100, 0 otherwise)	.2852	.3953	.2098	.1489	.1574
LIFE (70 − age at time of injury)	29.5711	29.2632	29.9692	28.0145	29.8634
PPD × *LIFE* (*PERMANENT PARTIAL DISABILITY* × *LIFE*)	6.3950	4.5744	7.6281	8.0674	10.3542
PTD × *LIFE* (*PERMANENT TOTAL DISABILITY* × *LIFE*)	1.2734	.9927	1.3930	1.6150	3.5934
DEATH × *LIFE*	4.1354	3.6999	4.2758	4.6971	8.8843
1976 (= 1 if claim closed in 1976 [January–July], 0 if claim closed in 1974)	.5568	.5787	.5515	.4787	.3981

LID† (*AD*† + *RECLIM*† + *PERPD*†; *AD* = 1 if law eliminates ad damnum, 0 otherwise; *RECLIM* = 1 if law limits recovery, 0 otherwise; *PERPD* = 1 if law permits periodic payments and injury is permanent, 0 otherwise)	.9515	.8824	1.0268	.8227	.8241
LID × *76 (LID* × *1976)*	.4657	.5257	.4336	.3547	.2500
COLLATERAL SOURCE† (= 1 if collateral source rule modified, 0 otherwise)	.4246	.3700	.4858	.2695	.4167
COLR × *76 (COLLATERAL SOURCE* × *1976)*	.2462	.2548	.2502	.1418	.2130
*ATTORNEY** (= 1 if attorney represented plaintiff, 0 otherwise)	.4539	.4137	.4898	.4539	.3981
FEE LIMIT† (= 1 if law limiting contingent fee, 0 otherwise)	.4078	.3680	.4610	.2270	.3426
FEELIM × *76* (*FEELIM* × *1976*)	.2123	.2303	.2108	.0957	.1389
LAG IN REPORTING (ln months between injury and filing claim)	1.9658	1.8296	2.0340	2.3862	2.1478
COURT DELAY (ln average number months of court delay in state‡)	2.7902	2.8040	2.7727	2.8062	2.9103
CLAIM FREQUENCY (ln number claims closed in state in 1976)	6.6811	6.5074	6.8574	6.3598	6.7130
PRESUIT (= 1 if claim closed prior to filing legal suit, 0 otherwise)	.4208	.6505	.2824	0	0
PHYSICIAN (= 1 if at least 1 physician defendant, 0 otherwise)	.6835	.6681	.6837	.7695	.8056

* Known only for 1976 claims.
† Law passed between January 1975 and July 1976. Source: Survey of state statutes.
‡ Source: Institute for Judicial Administration, Calendar Status Study (1970, 1972, 1974).