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# The Influence of Tort Reform on Auto Liability Losses and Premiums

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**Abstract:** In response to the growing frequency and severity of court awards, and increasing legal expenses, most states in the U.S. have enacted some set of tort reforms—including limits on attorney contingency fees, modifications of joint and several liability rules, modifications of collateral source rules, limits on liability, and limits on noneconomic and/or punitive damages. While the main target of states' tort reform activities was medical malpractice insurance, the measures have important implications for the resolution of automobile liability claims as well. If the main objective of enacting these reforms is/was to stabilize the medical malpractice industry, as is often suggested, one would expect auto insurers to experience the same beneficial effects, although perhaps on a smaller scale. The results here suggest that caps on punitive damages may have lowered insurer losses, but most reform measures have had little, if any, discernible beneficial influence on insurers writing auto liability insurance. [Key words: Auto liability, tort reform.]

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## INTRODUCTION

In response to the growing frequency and severity of court awards, and increasing legal expenses, most states in the U.S. have enacted some set of tort reforms in their legal regimes in the past few decades.<sup>2</sup> These reforms include limits on attorney contingency fees, modifications of joint and several liability rules, modifications of collateral source rules, limits on liability, and limits on noneconomic and/or punitive damages. Many of these reforms were directed toward medical malpractice cases, but other areas involving liability claims, including automobile bodily injury, were also targeted.

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<sup>2</sup>California led the charge in 1975 with tort reforms addressing the medical malpractice environment. For a history of California's Medical Injury Compensation Reform Act (MICRA) see Jenkins and Schweinfurth (1979).

Concurrent with the first medical malpractice “crisis” of the mid-1980s, auto insurance prices were rising dramatically, even as auto accident rates declined. Cummins and Tennyson (1992: 114) provide an overview of the auto liability market and assess various factors driving this increase. They conclude that “reducing excessive claims costs and ensuring competition in the marketplace offer the best hope for controlling automobile insurance prices.” Their findings concur with other research that emphasizes the importance of the legal environment in driving up auto insurance costs. In the 1970s, twenty states enacted no-fault laws to address expensive litigation. The intent of these laws was to allow individuals to recover medical expenses caused by an auto accident from their own insurer, regardless of fault, thus reducing delays in payment and further promoting compensation of victims when at-fault drivers are uninsured or underinsured. Over time, these states have modified their no-fault laws—e.g., adjusted the quantitative thresholds on the dollar amount that must be spent before a tort is allowed.

States without no-fault laws focused on modifications to the tort law environment to address rising auto insurance costs. In these states, plaintiffs are not generally restricted from bringing any third party auto liability claim to the court. Thus, tort reform measures designed to reduce the number of cases or the size of awards could have significant effects on the cost of auto insurance. While access to the tort system by auto injury plaintiffs is limited by both qualitative and quantitative thresholds in no-fault states, the effects on auto insurance costs of modifications to the tort environment may still be relevant in these states, but to a lesser degree than in states without a no-fault regime.

Across states, tort reform activity has taken a variety of forms, beginning in the mid-1970s. California’s Medical Injury Compensation Reform Act (MICRA), enacted in 1975, was the first comprehensive effort to reform the legal environment for torts. Since then, many states have addressed their own unique problems through various packages of reform measures. As noted, most reforms were aimed at medical malpractice tort cases, and enactment dates closely follow periods in which premiums in medical malpractice insurance were on the rise.<sup>3</sup> The reforms are manifest in legislative enactments to state statutes, and are generally found in sections of the state code pertaining to civil proceedings. Each state may have had different motivations for enacting any specific reform, and the reform language varies to some degree across states.<sup>4</sup> However, the basic purpose behind each of the common reform measures is fairly clear. The potential

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<sup>3</sup>See Harrington et al. (2008) for a discussion of the periodic “hard” and “soft” markets for medical malpractice insurance.

effects of the specific reforms on court outcomes, and their subsequent effects on insurance markets, are discussed further below.

To the extent that tort reforms affect outcomes in the legal environment, they can potentially influence insurance company operations. Specifically, those reforms that result in a reduced likelihood of filing a lawsuit, a reduction in the probability of an award, a reduction in the size of awards, or a reduction in defense costs, can all have a direct effect on third-party liability claims. Insurers may, subsequently, adjust premiums to reflect the change in expected liability losses. Insurers are largely in favor of tort reform, presumably because the expected effect of reform measures is to reduce liability losses for a given exposure (i.e., volume of premiums). Over time, the effect of reforms may diminish as insurers are able to reduce premiums commensurately. Existing literature supports these assumptions, and is discussed further below.

The primary goal of this study is to provide evidence of the effects of a set of tort reform measures in the U.S., with an emphasis on reform measures that would theoretically affect the frequency and severity of bodily injury claims, or the legal expenses incurred, in automobile insurance. Based on statistical analysis of the historical performance of a set of reforms in the U.S., the study will shed light on the types of reforms that provide a benefit to automobile insurers, in terms of lowering losses incurred.

The paper proceeds as follows: Section 2 provides background and discusses the relevant literature. Section 3 presents the data and methodology, while Section 4 provides a discussion of the empirical approach and the results of the analysis. A final section concludes.

## BACKGROUND

### Tort Reform Measures

Efforts to reform the tort environment are founded on a variety of claims. The direct evidence cited for justifying reform includes increasing caseloads, increasing award amounts, and delays in obtaining judgments. To a greater extent, the indirect effects of these changes in the legal environment have been noted as well. Growing uncertainty surrounding the determination and consequences of liability prompted insurers to increase

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<sup>4</sup>Some reform measures explicitly target claims in medical malpractice, while the others are more general. The ensuing analysis includes only those reforms that would be applicable to automobile liability claims.

rates or cancel coverage for high-risk insureds. In the 1980s and 1990s, manufacturers discontinued production of some products, hotels removed diving boards from their swimming pools, and medical providers changed the way they practiced, e.g., by ordering additional diagnostic tests to avoid claims of malpractice or avoiding high-risk procedures. The consequences for the medical community feature prominently in states' consideration of the need for reform, but they extend beyond medical malpractice insurance to all areas of insurance with a bodily injury component, e.g., workers compensation and automobile liability.

These problems were not of equal concern in every state, and thus the method and timing for reform of the state legal environment differs. The specific measures enacted in a state can be found in legislative enactments to state statutes, in sections of the state code pertaining to civil proceedings. The basic purpose behind the most common reform measures, the potential effects of the specific reforms on court outcomes, and their subsequent effects on insurers—specifically those insurers that would be responsible for paying claims—are summarized below. The ensuing discussion and analysis focuses on the measures most likely to influence the automobile liability insurance market.

*Limitations on noneconomic damages awards.* Awards for noneconomic damages are especially difficult to address objectively and little guidance is provided to juries. For these reasons, states enacted varying levels of limitations on the amount that a plaintiff may recover for pain and suffering, emotional distress, loss of consortium or companionship, and other intangible injuries. The intent is to reduce court award amounts. Insurers may benefit from the reduction in claim payment amounts.<sup>5</sup>

*Limitations on punitive damages awards.* Awards for punitive damages are intended to further punish a liable defendant for intentional or willful misconduct. These awards are rare and, when assessed, they vary significantly. For these reasons, states enacted varying levels of limitations on the amount of punitive damages to be assessed. The intent is to reduce court award amounts. Insurers may benefit from the reduction in claim payment amounts.

*Joint and several liability reform.* Under a joint and several liability rule, when there are multiple defendants to a lawsuit, one party may be held liable for the whole award amount if another party is unable to pay their share. The intent of reform is to allow defendants to pay only their share

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<sup>5</sup>The cap may have a deterrent effect, as well, in that claimants seeking large noneconomic damage awards may be discouraged from filing a suit. Further, insurers may benefit from a reduction in the uncertainty surrounding claims, which could result in more adequate pricing of the risk.

of the award. Insurers may benefit from the reduction in claim payment amounts.

*Collateral source rule reform.* The collateral source rule bars the admissibility of evidence at trial to show that a plaintiff has been compensated from other sources, such as the plaintiff's insurance or workers compensation. The intent of reform is to allow information about relevant compensation to be considered by juries in the determination of damages, and thereby lower award amounts (often by a mandated offset). Insurers may benefit from the reduction in claim payment amounts.

*Contingent fee reform.* Contingent fees may encourage lawyers to bring meritless cases to the court, and can benefit lawyers at the expense of their clients. Reforms place a limit on the proportion of the plaintiff's award for which the plaintiff's attorney may be entitled. The intent is to reduce the filing of meritless claims. Insurers may benefit from a reduction in claims.

*Frivolous lawsuit sanctions.* Courts and defendants may face significant costs associated with meritless claims. The intent of reform is to clearly define a frivolous lawsuit, and establish penalties when such cases are filed. Insurers may benefit from reduced defense costs.

*Prejudgment interest reform.* Prejudgment interest rules require that interest be added to the award to reflect the time between the event and the judgment. They are designed to encourage early settlement of cases, but can also lead to over-indemnification. Reforms either place a limit on the interest rate, specify how the interest rate should be calculated, limit the total amount, or prohibit prejudgment interest on future damages. The intent is to reduce award amounts. Insurers may benefit from a reduction in claim amounts.

*Other reforms.* Five other tort reform measures were more particular in nature—e.g., they addressed specific types of claims or court procedure—and are not likely to have an impact on automobile liability torts. These include attorney retention limits, class action reform, appeal bond reform, jury service reform, periodic payments and product liability reform. Descriptions of these reforms are available at the American Tort Reform Association (ATRA) website ([www.atra.org](http://www.atra.org)).

With the exception of the "other" reforms noted above, all of the reforms to the tort environment have the potential to influence auto liability costs by reducing the number of cases brought to court, reducing the size of the award, or reducing insurer defense expenditures. The ensuing analysis of whether, and how, the reforms affected auto liability insurers is guided by existing research on the effects of the reforms in other areas.

## Relevant Literature

The analysis here is concerned with three primary areas of academic literature. The first relevant area of research addresses the influence of tort reform on its primary target: the legal environment. This body of research evaluates the influence of reforms on the number of claims filed, length of time to resolution, and award amounts, among other things. The second area of research concerns the influence of tort reforms on the liability insurance environment, which includes studies that have attempted to single out the effects of individual measures (e.g., noneconomic damages, periodic payments). Results in this area are limited due to the complexity of singling out any specific reform so that it may be analyzed in isolation from other reforms enacted around the same time period. Further, most of this literature addresses torts in medical malpractice or general liability; these results may not be generalizable to auto liability torts. The last area of research addresses the influence of tort reforms in the auto insurance market.

### *Tort Reform and the Legal Environment*

The direct influence of tort reforms is assessed by evaluating the characteristics of cases brought to court before and after the reform. Some reforms will influence the likelihood of filing a case (e.g., limits on liability), some will influence the size of the award (e.g., noneconomic damages cap), and many can influence both the frequency and size of awards. A noneconomic damages cap, for example, not only lowers the expected award amount, but may reduce the frequency of cases since a cap lowers the expected benefit of filing a claim. There is a wide range of research addressing the effects of tort reforms in the legal environment. For example, Danzon (1984) shows that caps on the amount of damages that may be awarded and modifications to rules regarding the disclosure of collateral sources significantly reduced the severity of claims filed.

Sloan, Mergenhagen, and Bovbjerg (1989) present three subsets of tort reform—those increasing the difficulty for claimants to file a lawsuit, those increasing litigation costs for plaintiffs, and those that limit payments. The authors combine two data sets on closed medical malpractice claims, one from the National Association of Insurance Commissioners (NAIC) containing closed cases from 1975 to 1978, and the other from a study by the U.S. General Accounting Office (GAO) that contained closed cases from 1984. Not surprisingly, caps on award amounts are the strongest reforms in regard to the impact they have on the size of the paid claim. The authors find that most caps limit the recovery for noneconomic losses, but some limit dollar awards. Additionally, provisions that limit the types of costs

that were eligible for award and mandatory collateral source offsets were associated with reduced payments per claim.

Schmit et al. (1997) evaluate the effects of five tort reform measures on the frequency with which patients bring malpractice suits, with emphasis on the frequency of frivolous complaints. They find that caps on noneconomic damages and penalties for frivolous lawsuits reduce the rate of tort filings. Other reforms were found to either increase the rate of filings (modification of joint and several liability) or have no effect (reforms of collateral source rules and punitive damages). Similarly, Browne and Puelz (1999) employ a sample of 18,000 closed automobile liability claims to evaluate the effects of tort reforms on total awards as well as the separate components of economic and noneconomic damages awards. They find that joint and several reform is positively related to the value of noneconomic claims, while collateral source rule reforms, penalties for frivolous suits, prejudgment interest, and periodic payments are negatively related to claims for noneconomic damages.

Two other studies focused specifically on how tort reforms affected automobile liability tort outcomes. Weisberg and Derrig (1992) evaluate the 1988 Massachusetts Automobile Bodily Injury Tort Reform Law, whereby medical charges were increased from \$500 to \$2,000. Their findings indicate that this law failed to succeed in limiting tort claims and reducing fraudulent or inflated claims. Browne and Schmit (2008) analyze third-party automobile bodily injury data from the Insurance Research Council (IRC) from the sample years 1977, 1987, and 1997 in an effort to study the changes in the use of attorneys and in the filing of legal claims to resolve these automobile third-party bodily injury claims. While the authors did find evidence of both the use of attorneys and the filing of legal claims to increase over the sample period, their results also find that tort reforms slowed the rates of increase in the use of attorneys and in the filing of legal claims to resolve disputes.

Empirical research generally concludes that tort reforms have real effects in the legal environment, despite the complexity in identifying the effect of any one tort reform measure in isolation. One approach to overcome this problem is to conduct an experiment. For example, in an empirical study using mock juries, Maroney et al. (1990) find that informing the jury of the plaintiff's collateral sources of recovery was not generally associated with lower awards. Another approach is to isolate a reform within one state or a set of treatment states and conduct a natural experiment or difference-in-differences approach (DID). These approaches compare the effects in the treatment state(s) with those in a control state or group of control states. Donohue and Ho (2007) use a DID approach to

evaluate the impact of damage caps and find that they have no influence on the number of claims against physicians.

For this analysis, tort reform measures presumably have real effects in the legal environment if the insurance industry is affected. The evidence suggests this is a reasonable assumption. However, the extent to which insurers respond to any specific changes in the legal environment is not clear. A cap on damages has an immediate effect of reducing loss amounts and a more long-term effect of reducing uncertainty as to the size of awards, which may prompt insurers to reduce premiums. Similarly, modifications to the collateral sources rule that allow consideration of alternative sources of reimbursement also have an immediate effect of reducing potential payouts.<sup>6</sup> On the other hand, evidence suggests that modifications to joint and several liability lead juries to boost noneconomic awards (Browne and Puelz, 1999). Generally, reforms that work to reduce either the frequency or severity of cases should have a favorable effect on insurer underwriting performance. However, existing research suggests that the effects on losses are more immediate while the effects on the price of insurance coverage follow after some time.

### *Tort Reform Influence on Insurance Markets*

Some of the earliest research to evaluate the effects of tort reforms on insurers was a study by Viscusi, Zeckhauser, Born, and Blackmon (1993). The authors study the medical malpractice and general liability markets, analyzing whether the tort reforms during the mid-1980s had an effect either on claims paid by insurers or on premiums paid by consumers. The authors specifically address differences in the market performance of 1988, when compared to the benchmark year of 1985. Several reforms are considered throughout their study, including modified joint and several liability, limits on liability, limits on noneconomic damages, and limits on punitive damages. The authors find a significant negative effect on loss levels for states that enacted tort reforms during the sample period. Additionally, they find that liability reform measures lowered premiums paid by consumers.

Several studies followed, in which the main focus of analysis was the influence of tort reforms on the medical malpractice area. For example, Viscusi and Born (1995) analyze the effect of liability tort reforms using a sample of medical malpractice insurer performance from 1984 to 1991.

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<sup>6</sup>Interestingly, Rubin and Shepherd (2007) provide evidence that suggests modifications to collateral source rules result in an increase in accidental deaths. They propose that the award-reducing effect of the reform is outweighed by the reduction in a deterrence effect since the reform reduces the likelihood that an injurer will be required to pay.

Their results indicate that the reforms enacted decreased insurer loss ratios, thereby increasing insurer profitability via the reduction in insurer losses. Several reforms are analyzed, such as the monetary caps on punitive or noneconomic damages, the limitations on the circumstances whereby damages may be awarded, the punitive damages barred in medical malpractice actions, and the monetary caps on all of medical malpractice damages. Damage caps are found to be the most influential of the reforms, and the authors' findings suggest that the most unprofitable firms are affected the most by liability tort reform.

When considering the effect of reforms on the distribution of insurers, Born and Viscusi (1998) show that insurer performance is significantly improved by tort reform, and the least profitable insurers (e.g., those with the least effective underwriting policies) receive the most benefit from the reforms. More recently, Born, Viscusi, and Baker (2009) evaluate the long-run benefits of tort reform, as measured by developed losses. They find that the effects of tort reform are even greater than insurers expected. With respect to specific reforms, they note that noneconomic damages and punitive damages reforms have a negative effect on losses. However, their results suggest that joint and several liability reforms have a positive effect on losses.

Several studies have found that tort reform can affect the growth of premiums (Kane and Emmons, 2005; Thorpe, 2004). Grace and Leverty (2012) examine data from 1985 to 2005 and find that insurers do account for states' legal environments when setting premiums; insurers who expect reforms to stay in place over time charge lower premiums than insurers who expect the reforms to be repealed.

Existing research has also considered other indirect or secondary effects of tort reform. Specifically, researchers have looked at how tort reform affects malpractice risk, which has implications for medical provider behavior. For example, Kessler and McClellan (1996) evaluate the relationship between tort reform and defensive medicine practices. Using a sample of Medicare beneficiaries treated for serious heart disease, they find that liability reforms directly limiting awards (i.e., caps on damages) reduce the growth in medical expenditure corresponding to the treatment of elderly patients with cardiac diseases. Additionally, the authors conclude that this reduction in medical expenditure growth is accompanied by no consequences for health outcomes. They conclude that defensive medical practices can be limited by a reduction in liability. In another study, Kessler and McClellan (2002), the authors find that direct reforms—defined as reforms intended to reduce the compensation to claimants—reduce the claim rates and compensation from a claim in the medical malpractice market. The authors also propose that a reduction in time or a reduction

in the amount of conflict involved in defending a claim could also reduce defensive practices.

### *Tort Reform and Automobile Bodily Injury Insurance*

The primary target of most state tort reform efforts was the medical malpractice area, in response to periodic crises in the availability and affordability of medical malpractice insurance.<sup>7</sup> Thus, it is not surprising that most of the analysis of the influence of tort reform on the insurance market has focused on the medical malpractice line. However, some states enacted reforms that were more broadly applicable to other areas of liability, and hence would presumably influence insurer operations in other lines of business. Nevertheless, while studies mentioned above suggest that tort reforms have affected auto liability claim frequency and/or severity, this research has not been extended to consider the subsequent effects of tort reform on the automobile insurance market.

One exception is a recent paper by Heaton (2015), who provides an analysis of the relationship between tort reform measures and the cost of auto insurance. Using *Consumer Expenditure Survey* microdata files for the period 1990 to 2011, the author evaluates how five reform measures (non-economic damages cap, joint and several liability limit, collateral source reform, repeal of no-fault, and introduction of a tort for insurer bad faith) affect consumer expenditures on auto insurance. The results indicate that collateral source reforms and the repeal of no-fault liability rules reduced the cost of automobile insurance by a range of 5–15 percent from the perspective of consumers. Reforms showing no influence over automobile premiums, on the other hand, are bad faith reform, joint and several liability reform, and noneconomic damage caps. The results suggest that tort reform may have real, beneficial effects on auto liability insurers, to the extent that at least some reforms are associated with reduced premiums. It is still an open question as to whether the remaining reforms may have helped to lower insurer costs, but these savings were not passed through to consumers.

To date there has been no comprehensive analysis of the influence of tort reforms on auto liability insurer performance. Because the auto liability market was not a primary target of reforms, tort reform measures could have a relatively smaller effect on auto insurer performance than the evidence among medical malpractice insurers indicates. For one, auto insurance tort claims may not be as severe in the first place, such that reforms are not actually binding in the legal environment. The median

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<sup>7</sup>See Harrington et al. (2008) for a discussion of medical malpractice crises as they relate to hard and soft markets for underwriting.

compensatory and punitive award amounts are roughly 300 percent higher in medical malpractice cases than in auto liability<sup>8</sup>; caps on damages amounts are not likely to be relevant for a majority of claims. Further, as noted above, indirect responses to medical malpractice tort reform—i.e., changes in provider behavior—have further consequences for the performance of malpractice insurers, which may explain why these reforms are found to have sizable effects on medical malpractice insurers. An analogous indirect response is not likely in the automobile liability area. For one, medical providers are more aware of the malpractice risk as it is related to their livelihood, and they have obvious ways to reduce exposure to this risk, e.g., by limiting the types of procedures they perform. Vehicle owners, on the other hand, have been found to react only minimally to changes in tort liability. In a comparison across several areas of liability, Baker and Swedloff (2013) discuss ways in which the deterrent effect of liability is not as strong in auto liability as in medical liability. This result is corroborated in other more narrowly-focused studies.<sup>9</sup>

## HYPOTHESES

In the existing literature, the estimated effects of tort reform measures on medical malpractice insurers indicate that these measures result in lower losses, all else equal. The literature suggests that this arises because the reform measures have real consequences in the courtroom, i.e., following reform, the likelihood of a lawsuit, the size of the damage award, or both are reduced. If there is a comparable result among automobile liability cases, then a similar finding should emerge for the underwriting performance in auto insurance lines. That is, automobile liability losses will be lower for insurers operating in states with reform measures relative to those without reform.

Much of the literature fails to find an effect of tort reforms on premiums, which should, at least theoretically, be reduced if losses are reduced and the exposures stay the same. However, since the measure of premiums captures prices and quantities, prices may fall but the quantity of coverage

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<sup>8</sup>U.S. Department of Justice, Bureau of Justice Statistics (2005).

<sup>9</sup>For example, Sloan et al. (1995) survey individuals about their drinking and driving behavior and find that tort deterrents do not have a strong effect on the fraction of bingeing episodes after which the individual drove. Cardi et al. (2012) conduct a behavioral experiment to test empirically whether tort law works to deter certain behaviors. They find that subjects' willingness to engage in risky behavior, such as using a cell phone while driving, was significantly affected by the threat of potential criminal sanctions, but the threat of potential tort liability did not have a significant effect.

could increase. Thus, the effects of various reforms on insurer premiums and, consequently, their effects on loss ratios are unclear.

These hypotheses are tested using two different approaches, described below.

## DATA

The following empirical analysis uses data on insurer performance and tort reform measures covering the period 1984–2007. The long time span is necessary in order to capture the volume and variety of reform activity across states. The specific data and the sample construction are described below.

### *Data on Insurer Underwriting Performance*

Insurer underwriting data were collected from the National Association of Insurance Commissioners (NAIC) Property and Casualty Database for the period 1984 through 2007. These data include premiums earned, premiums written, and losses incurred by line and by state for all U.S. insurers. Two samples are used for the analysis. Inclusion in the first sample required that an insurer reported \$1 million or more of premiums earned in private passenger auto liability. The second sample contains insurers that wrote \$1 million or more of premiums earned in commercial auto liability. The number of unique firms in any one year ranges from 710 to 976, but each observation in the samples contains information on the operations of one insurer in one state. In addition to the basic underwriting information, the data also include other financial information (e.g., total assets and surplus). The insurer's business across all states is used to calculate the number of states in which the insurer writes any automobile insurance. The data are further filtered by eliminating insurers that had negative or zero assets, and removing insurers with loss ratios outside of the 1 percentile to 99 percentile range of the loss ratio distribution.

### *Data on Tort Reform Enactments*

The main source for the tort reform measures was the American Tort Reform Association (ATRA), which produces annual compilations of state tort reform enactments. These publications provide detailed descriptions of the enactments, thus allowing verification that reforms included in the analysis are pertinent to automobile insurance. Many reforms during my sample period pertained only to medical malpractice cases, and were thus not included in my analysis. Other reforms mentioned on the ATRA website are not included because they were too recent or because auto

**Table 1.** Tort Reform Variables

Reform measure	Proportion of states with reform, 1984–2013	Number of states with reform in 1990	Number of states with reform in 2000	Number of states with reform in 2013
Punitive damages reform	55.72%	26	30	31
Joint and several liability reform	56.07%	28	31	35
Collateral source reform	43.32%	23	23	24
Frivolous suit reform	36.62%	19	20	23
Product liability reform	23.12%	6	15	16
Prejudgment interest reform	21.40%	10	11	15
Contingent fee reform	15.68%	9	10	10
Noneconomic damages reform	13.32%	8	6	9
Appeal bond reform	23.66%	0	5	37
Class action reform	7.39%	0	3	9
Attorney retention reform	5.40%	0	3	8
Jury service reform	7.66%	0	0	13

insurers are not likely to be affected by the measure. These include appeal bond reform, attorney retention limit, class action reform, jury service reform, and product liability reform, and several more recent measures including forum and venue reform, legal consumers' bill of rights, teacher liability protection, and medical liability reform, which are generally caps on noneconomic damages specifically applied to medical malpractice cases. The reforms were further checked against the compilation of reforms provided by Avraham's (2015) Database of State Tort Law Reforms. Individual state statutes were also consulted to confirm or clarify the content and scope of the reforms as well as the year enacted, as needed. Table 1 presents the proportion of states that enacted reforms through the sample period and the number of states in which each reform measure was in effect for three specific years to illustrate the variation over time.

The most common tort reform measures are caps on punitive damages, modifications to joint and several liability, modifications of collateral source rules, and sanctions for frivolous suits. Further, these reforms represent the earliest attempts at reforming the legal environment as it pertains to torts. The popularity of specific reforms across time can be seen

in the last three columns of Table 1. These periods roughly follow three main waves of reform activity across the country.

### *Other Data Sources*

The insurer data are supplemented by other measures to control for differences across states in demographic characteristics and economic conditions. State population and per capita income data were collected from the U.S. Bureau of Labor Statistics and the U.S. Bureau of Economic Analysis, respectively.<sup>10</sup> Data on total vehicle miles driven, by state, were collected from the U.S. Department of Transportation and used to create miles driven per capita (total vehicle miles driven/state population). In the following analysis, these variables are used to control for differences across states in the potential frequency and severity of automobile liability claims. All monetary amounts are indexed for inflation (2007\$) using the Consumer Price Index (CPI) obtained from the U.S. Bureau of Labor Statistics.<sup>11</sup>

Table 2 presents the full sample statistics for all U.S. insurers reporting business in either private passenger automobile liability or commercial auto liability insurance.<sup>12</sup> The figures suggest that the average commercial automobile liability insurer is almost twice as large as the average private passenger auto liability insurer when measured by total assets, but the latter collects substantially more in premiums. Underwriting performance is similar; the loss ratio for private passenger auto insurers and commercial automobile liability insurers averages 75.2 and 79.5, respectively, over the entire sample period.<sup>13</sup> A larger proportion of the commercial insurers write private coverage (68 percent) than vice versa (45 percent).

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<sup>10</sup>The state unemployment rate was also collected but was removed from the analysis due to multicollinearity.

<sup>11</sup>Rate regulation—specifically prior approval regulation of rates—is also commonly associated with underwriting performance volatility (Harrington, 2002). A measure of state rate regulation could not be included because the model is estimated with firm-state fixed effects.

<sup>12</sup>Insurers report their underwriting performance separately for personal vs. commercial automobile liability and, for each of these, the business is divided between business written under the traditional recovery regime (denoted on insurers' regulatory filings as "Auto Liability, Other") and business written under a no-fault regime. In the U.S., personal auto insurance written under the traditional recovery regime amounted to over \$83.2 billion in premiums earned, while personal auto insurance written under a no-fault regime totaled about \$10.6 billion (both in 2007 dollars). The no-fault automobile insurance business is not analyzed in this paper; tort reform measures should have little or no effect on the no-fault business due to limitations for filing torts under this regime.

<sup>13</sup>Loss ratios were multiplied by 100 for ease in discussing the empirical results.

Table 2. Sample Statistics, 1984–2007<sup>1</sup>

Variable	Private passenger auto liability N = 70,152		Commercial auto liability N = 25,863	
	Mean	Std. dev.	Mean	Std. dev.
Premiums Earned (in \$millions)	22.709	76.794	7.651	10.691
Losses Incurred (in \$millions)	15.651	52.401	5.370	7.712
Loss Ratio	0.752	0.227	79.531	39.799
Total Assets (in \$billions)	4.065	11.515	7.046	15.086
Premiums to Surplus Ratio	1.619	30.326	2.311	39.128
Number of States in which Insurer Writes Auto Insurance	27.470	18.209	30.619	17.857
Insurer Writes Both Private and Commercial Auto Insurance	0.310	0.462	0.685	0.465
Miles Driven Per Capita (in thousands)	9.895	6.451	9.116	4.640
State Per Capita Income (in \$millions)	32.773	5.842	32.753	5.730
<i>Tort Reform Measures (dummy variables)</i>				
Noneconomic Damages Reform	0.212	0.409	0.189	0.391
Punitive Damages Reform	0.572	0.495	0.571	0.495
Joint and Several Liability Reform	0.545	0.498	0.501	0.500
Collateral Source Reform	0.455	0.498	0.450	0.497
Contingent Fee Reform	0.160	0.366	0.169	0.375
Frivolous Suit Reform	0.374	0.484	0.403	0.490
Prejudgment Interest Reform	0.199	0.400	0.188	0.390

<sup>1</sup> All dollar amounts adjusted for inflation (2007 \$).

## METHODOLOGY AND RESULTS

To test my hypotheses, I use a panel regression approach and estimate twelve equations to evaluate whether and how tort reform measures are related to losses incurred, premiums earned, and loss ratios for personal and commercial auto liability insurance business written in a traditional tort regime. The first six equations include, as explanatory variables, all seven relevant tort reform measures enacted during the entire sample period. Each reform measure is coded as 0-1 dummy variables, where a "1" indicates that the reform is applicable in that particular year. As long as the reform measure remains pertinent, the variable remains a "1." This approach captures the cross-sectional differences in performance of insurers in states with and without the reform measures. Then, I re-estimate the same equations replacing each of the dummy variables with the number of years since the reform was enacted.

Following Viscusi and Born (2005), I develop an empirical model for estimating the reform effects on insurer performance, namely, losses incurred, premiums earned, and loss ratios.<sup>14</sup> Specifically, I estimate the following equations:

$$Losses\ Inc_{ist} = \alpha + \beta Prens\ Earn_{ist} + \gamma' Reform_{st-1} + \delta' Insurer_{ist} + \mu' State_{st} + \epsilon_{ist} \quad (1)$$

$$Prens\ Earn_{ist} = \alpha + \beta Prens\ Earn_{ist-1} + \gamma' Reform_{st-1} + \delta' Insurer_{ist} + \mu' State_{st} + \epsilon_{ist} \quad (2a)$$

$$Prens\ Earn_{ist} = \alpha + \gamma' Reform_{st-1} + \delta' Insurer_{ist} + \mu' State_{st} + \epsilon_{ist} \quad (2b)$$

$$Loss\ Ratio_{ist} = \alpha + \gamma' Reform_{st-1} + \delta' Insurer_{ist} + \mu' State_{st} + \epsilon_{ist} \quad (3)$$

where:

$Losses\ Inc_{ist}$  = auto liability losses incurred (in \$millions) for insurer  $i$  in state  $s$  at time  $t$ .

$Prens\ Earn_{ist}$  = auto liability premiums earned (in \$millions) for insurer  $i$  in state  $s$  at time  $t$ .

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<sup>14</sup>Viscusi and Born (2005: 35) also estimated equation (1) with lagged losses incurred included as a control, and note that the results are similar.

$Premis Earn_{ist-1}$  = auto liability premiums earned (in \$millions) for insurer  $i$  in state  $s$  at time  $t - 1$ .

$Loss Ratio_{ist}$  = auto liability loss ratio for insurer  $i$  in state  $s$  at time  $t$ .

$Reform_{st-1}$  = a vector of dummy variables for each reform measure where 1 indicates the reform is applicable (e.g., cap on noneconomic damages), 0 otherwise; for state  $s$  at time  $t$ .

$Insurer_{it}$  = a vector of insurer characteristics that do not vary across states, but may vary over time. This vector includes the number of states in which the insurer writes automobile insurance, the insurer's total assets, and the insurer's premiums to surplus ratio.

$State_{st}$  = a vector of state characteristics for state  $s$  at time  $t$ . This vector includes miles driven per capita and per capita income.

The first equation includes the contemporaneous value of premiums earned to control for the insurer's exposure to losses. In the loss equation, the estimated coefficient on premiums earned should be highly significant and should be a reasonable approximation to the average insurer's loss ratio. The second equation includes a lag of premiums earned to control for the insurer's "usual" volume of business and captures average growth over the time period. Because the lagged value of premiums embodies prior years' responses to the reform measures, the premium equation is also estimated without the lagged dependent variable (equation 2b). The dummy variables for the reform measures are equal to one in the first year following the year in which the reform becomes applicable, and then remain equal to one for the rest of the sample period.<sup>15</sup>

Three insurer characteristics and two state-level variables are included in the model. Total assets (in \$billions) is used to capture differences in performance across insurers of different sizes, to capture various economies of scale in operations. Larger insurers may be more efficient than smaller insurers, and able to achieve lower losses and, consequently, lower loss ratios, for a given volume of premiums. The premiums-to-surplus ratio is a measure of insurer underwriting capacity. A higher ratio indicates greater risk and may capture differences in insurers' underwriting outcomes due to this variation in risk bearing. Finally, the number of states in which the insurer operates captures differences across insurers in the geographic scope of operations. Insurers with greater scope may also

<sup>15</sup>The one-period lag is used because I cannot account for the specific time of the year of enactment in which the reform was effective.

achieve greater operating efficiencies than insurers who are more focused. As noted above, the state variables are included to capture potential differences in litigiousness and claim costs (i.e., claimants in states with higher income seek higher awards).

Each equation is estimated using a panel regression model with insurer-state fixed effects.<sup>16</sup> In addition, dummy variables are included for each year to capture time trends. All results below are presented with robust standard errors.

For a robustness check, I apply the approach of Hoyt et al. (2006) and Mustard (2001) and re-estimate equations 1, 2a, and 3, replacing the simple dummy variable for each reform with a series of “before-reform” measures that capture the number of years before the reform (i.e., “1” in the year before the reform, “2” in the year previous, etc.) and a series of “after-reform” measures that capture the number of years following the reform (i.e., “1” for the year after the reform, “2” for the next year, etc.). In this specification, the estimated coefficients on the reform variables capture an average rate of change in the dependent variable before and after the reform.<sup>17</sup>

## *Results*

Tables 3 and 4 show the results of estimating equations 1, 2a, 2b, and 3 for the two samples of insurers, i.e., eight separate models. In the two losses-incurred equations, the contemporaneous value for premiums earned is positive and significant, as expected. The estimated coefficients are also within range of the average loss ratios for the insurers in each sample. The lagged value of premiums earned is also a significant determinant of current premiums earned.

The main interest, of course, is the effects of the reforms. Interestingly, each of the seven reforms is found to have some significant relationships with our three dependent variables, but significant coefficients are not

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<sup>16</sup>Hausman tests on each equation support the use of fixed effects over random effects. Insurer fixed effects preclude the use of a variable representing insurer organization form because too few insurers change ownership form over time to capture meaningful results. The models would not run with state fixed effects. I obtained similar results—i.e., the same measures are significant—for all models when run with errors clustered by state, rather than with robust standard errors.

<sup>17</sup>This approach also controls for a potential endogeneity problem. That is, the reforms may have been enacted in environments in which automobile liability losses (premiums, loss ratios) were already declining (rising). Since the reforms mainly addressed problems in medical malpractice, this endogeneity is not likely. Several other specifications, including a log-log transformation, and a model with explicit lags of the reform measures were also estimated. These models yielded similar results.

**Table 3.** Estimated Coefficients from Panel Regression—Private Passenger Auto Liability (standard errors in brackets)

Variable	(1) Losses incurred	(2a) Premiums earned	(2b) Premiums earned	(3) Loss ratio
Premiums Earned <sub>t</sub>	0.634*** [0.037]			
Premiums Earned <sub>t-1</sub>		0.896*** [0.016]		
Noneconomic Damages	-0.478 [0.534]	-0.056 [0.268]	-0.169 [1.116]	-1.192** [0.580]
Punitive Damages	-0.980* [0.545]	-0.283 [0.272]	2.512*** [0.876]	0.379 [0.529]
Joint and Several Liability	0.315 [0.290]	-0.008 [0.207]	-0.319 [0.792]	0.036 [0.481]
Collateral Source Rule	1.876*** [0.537]	0.837** [0.334]	-3.276*** [1.263]	1.647*** [0.585]
Contingency Fee	0.282 [0.426]	-0.278 [0.280]	-1.235 [1.573]	-0.274 [1.017]
Frivolous Lawsuit	0.123 [0.292]	0.823*** [0.250]	0.839 [1.244]	1.721*** [0.633]
Prejudgment Interest	1.198*** [0.382]	0.629** [0.254]	0.483 [1.228]	1.779*** [0.605]
No. of States—Auto	-0.011 [0.018]	0.000 [0.019]	0.284*** [0.050]	-0.081** [0.033]
Premiums-to-Surplus	-0.010 [0.009]	0.056*** [0.012]	0.214*** [0.012]	0.006*** [0.002]
Total Assets (\$B)	-0.715*** [0.210]	-0.339*** [0.100]	1.158*** [0.300]	-0.063*** [0.023]
Writes Both <sup>†</sup>	0.504* [0.294]	0.608** [0.297]	2.112** [0.896]	-2.461*** [0.431]
State Per Cap Income (\$M)	0.316** [0.127]	0.036 [0.080]	0.415 [0.323]	0.555*** [0.125]
Miles Driven Per Cap	0.071*** [0.023]	0.053*** [0.013]	-0.083* [0.045]	-0.102*** [0.028]
Constant	-4.115 [3.236]	2.909 [2.227]	-6.828 [9.101]	73.437*** [3.608]
N	57975	57890 <sup>‡</sup>	57975	57975
R-squared	0.638	0.857	0.081	0.106

All equations include year effects, not shown.

<sup>†</sup>Insurer writes both private passenger auto liability and commercial auto liability.

<sup>‡</sup> Sample is slightly reduced due to missing values for lagged premiums earned.

\*, \*\*, and \*\*\* denote significance at the 90%, 95%, and 99% levels based on 2-tailed tests.

**Table 4.** Estimated Coefficients from Panel Regression—Commercial Auto Liability (standard errors in brackets)

Variable	(4) Losses incurred	(5a) Premiums earned	(5b) Premiums earned	(6) Loss ratio
Premiums Earned <sub>t</sub>	0.659*** [0.028]			
Premiums Earned <sub>t-1</sub>		0.812*** [0.017]		
Noneconomic Damages	0.078 [0.162]	0.482** [0.191]	1.133** [0.463]	1.632 [1.829]
Punitive Damages	-0.242 [0.202]	-0.043 [0.195]	-0.606 [0.478]	-0.917 [1.449]
Joint and Several Liability	0.335** [0.147]	-0.045 [0.187]	0.200 [0.413]	0.001 [1.470]
Collateral Source Rule	0.007 [0.185]	0.123 [0.258]	0.201 [0.386]	1.011 [1.834]
Contingency Fee	-0.196 [0.272]	-0.336 [0.401]	-0.437 [0.688]	-6.879** [2.979]
Frivolous Lawsuit	0.270 [0.210]	-0.337 [0.239]	-0.690* [0.400]	3.442* [1.771]
Prejudgment Interest	-0.534* [0.316]	0.732*** [0.239]	0.552 [0.460]	-4.275** [1.940]
No. of States—Auto	0.025*** [0.009]	0.038*** [0.009]	0.172*** [0.029]	-0.022 [0.078]
Premiums-to-Surplus	-0.009*** [0.001]	0.009*** [0.001]	0.021*** [0.003]	-0.028*** [0.004]
Total Assets (\$B)	-0.007 [0.007]	0.003 [0.007]	0.011 [0.017]	-0.081 [0.055]
Writes Both <sup>†</sup>	-0.150 [0.116]	0.036 [0.144]	0.765** [0.331]	-3.951*** [1.347]
State Per Cap Income (\$M)	0.025 [0.041]	0.058 [0.041]	0.117 [0.116]	-0.453 [0.393]
Miles Driven Per Cap	0.008 [0.007]	0.020** [0.008]	0.057** [0.028]	0.085 [0.094]
Constant	-2.232 [1.705]	-3.366** [1.650]	-0.568 [4.613]	90.175*** [16.347]
N	21442	21442	21442	21442
R-squared	0.613	0.691	0.075	0.040

All equations include year effects, not shown.

<sup>†</sup>Insurer writes both private passenger auto liability and commercial auto liability.

\*, \*\*, and \*\*\* denote significance at the 90%, 95%, and 99% levels based on 2-tailed tests.

consistent across the two samples. In the first equation, in Table 3, two reforms are significant and positively related to losses while one has a negative coefficient. These results can be interpreted as follows: insurers operating in states with modified collateral source rules experience losses that are \$1.8 million greater than insurers operating in states without this reform, holding premiums and all other measures constant. Since the mean losses for this group are about \$16 million, the reform is associated with about a 17 percent increase in losses. Similarly, for insurers operating in states with prejudgment interest reforms, losses are about 8 percent higher, on average, than in states without these reforms. On the other hand, the cap on punitive damages is associated with a small reduction in losses, consistent with the hypothesis that these caps would lower both the frequency and severity of claims and therefore lower insurer losses.

In the first premiums equation, three reforms are significantly associated with private passenger auto liability premiums. The effects are all positive, indicating that premiums post-reform are generally increasing in states with modified collateral source rules, limitations on frivolous lawsuits, or limitations on prejudgment interest. This may be due to an increase in the volume of coverage and not necessarily prices. However, in two cases, the reforms lead to higher losses and high premiums, which might imply that insurers in states with these reforms increased the price of coverage. The results from estimating the second premiums equation tell a different story. Only two reforms appear to be significantly related to premiums earned when the lagged dependent variable is omitted: insurers in states with a punitive damages cap have higher premiums and insurers in states with modified collateral source rules report lower premiums than insurers in states without these respective measures. The finding for the collateral source rules measure suggests that insurers in states with this reform measure are generally increasing premiums (over time) more than insurers in states without this reform measure, but the overall level of premiums is significantly lower in the states with this reform measure when compared to the states without this reform measure. The cap on punitive damages is not significantly related to changes in premiums but insurers in states with caps report higher premiums than insurers in states without caps. Finally, while the limitations on frivolous lawsuits and limitations on prejudgment interest are positively related to insurer premium changes, they do not explain the variation in premium levels across insurers.

Four reforms are found to be significantly related to loss ratios in the third model. The noneconomic damages cap is associated with a small (1.2 percentage point) reduction in insurer loss ratios despite no significant relationship with losses or premiums. Similarly, insurers in states with

modified collateral source rules or limitations on prejudgment interest experience 1.6 and 1.8 percentage point increases in loss ratios, respectively, consistent with the estimated respective increases in losses. Finally, while insurers in states with limitations on frivolous lawsuits report significantly higher premium growth, their reported loss ratios are 1.7 percentage points higher.

Turning now to the results for the second sample of insurers in Table 4, it appears that the tort reform measures have less influence, overall, on the commercial auto insurers. Interestingly, commercial insurers operating in states with noneconomic damages caps report higher premium growth and overall premiums, but the loss ratios are not significantly different from insurers operating in states without a cap. Insurers in states that have modified their joint and several liability rules report higher losses than insurers in states with no such reform. The estimated coefficient indicates an increase of about 7 percent when evaluated at the mean of losses incurred (\$5.4 million). Finally, two reform measures are associated with improved underwriting profitability. The cap on contingency fees is not significantly related to losses or premiums, but is associated with loss ratios that are nearly 7 percentage points lower for the sample of commercial insurers. The limitations on prejudgment interest has the most striking effects, indicating that insurers in states with this reform measure report losses that are 10 percent lower, premiums that are 13 percent higher, and loss ratios that are over 4 percentage points lower, on average, when compared to insurers in states without this reform.

Several of the insurer and state control variables are significant in one or more of the eight equations presented in Tables 3 and 4. Among private insurers, premiums are higher as the number of states in which the insurer operates increases, and this is associated with higher underwriting performance (lower loss ratios). Commercial insurers report losses and premiums that increase with the number of states, with no significant effect on loss ratios. For both samples of firms, premium growth and overall premiums are higher as the premiums-to-surplus ratio increases, but the estimated relationship with loss ratios is positive for private insurers and negative for the commercial insurers, which also report significantly lower losses as the ratio increases. This result may reflect varying ability to capitalize on risky opportunities: commercial insurers are less regulated and may have better opportunities for using underwriting leverage. Insurers that write both types of coverage report slightly better underwriting performance. Losses incurred for private auto insurers is positively related to state income per capita, as expected, but this relationship does not hold for commercial insurers. Miles driven per capita is associated with increased losses, as expected, but the corresponding estimated

relationships with premiums are mixed across the two samples of insurers and may be picking up other omitted state characteristics (e.g., urbanization).

The results overall are encouraging as to capturing effects of tort reform activity in the automobile insurance market, but the relationships estimated do not provide confirmation of the hypotheses that suggested these reforms would have a favorable effect on insurers. As noted previously, disentangling the effects is complicated, since states often enacted these reforms in packages, and the details of the reform can vary. Nonetheless, some of the estimated effects are sizable in an economic sense, and further exploration is warranted.

Table 5 presents the results of my alternative approach to estimating the relationships between the reforms and insurer performance. In this table, the relationships between reforms and the measures of performance can be evaluated by comparing the estimated coefficients on the "Before Reform" variables with the estimated coefficients on the "After Reform" variables. The coefficients are interpreted as rates of change in the two periods. For example, the results suggest that private insurers in states with noneconomic damages caps were experiencing a significant increase in losses before the reform and a significant, slightly higher, increase in losses after the reform. The F-value (5.83) indicates that the coefficients on the before and after trends are significantly different, and thus indicates an overall positive effect of the cap on insurer losses. This result is similar for the commercial insurers, where the growth in losses post-reform appear to have increased.

Insurers in states that enacted caps on punitive damages experienced a positive trend in losses before the reform and a subsequent negative trend after the reform. The F-value (10.99) confirms this estimated beneficial effect of punitive damages caps on losses and is also consistent with the result from Table 3. Although the post-reform coefficient is not significant for the commercial insurers (column 4), the F-value (3.77) confirms a similar beneficial effect among commercial insurers who were experiencing a positive rate of change in premiums before the punitive damages cap.

The results pertaining to the caps punitive damages may have benefited private auto insurers, at least when evaluating losses incurred and holding premiums constant. The findings for premiums and loss ratios confirm this beneficial effect among the private insurers: the trends in premiums and loss ratios are significantly higher before caps on punitive damages are implemented than after the caps are implemented.

Two reform measures have a striking positive relationship with the growth of private auto insurer losses: modifications to collateral source rules and limitations on prejudgment interest. Insurers in states that modified collateral source rules report significantly higher growth in losses

Table 5. Estimated Coefficients from Panel Regression — Model 2 (standard errors in brackets)

Variable	Private passenger auto liability			Commercial auto liability		
	(1) Losses incurred	(2) Premiums earned	(3) Loss ratio	(4) Losses incurred	(5) Premiums earned	(6) Loss ratio
Premiums Earned <sub>t</sub>	0.637*** [0.030]			0.656*** [0.026]		
Premiums Earned <sub>t-1</sub>		0.896*** [0.016]			0.812*** [0.017]	
Before-reform variables						
Noneconomic Damages	0.164*** [0.059]	0.071 [0.056]	0.088 [0.098]	0.026 [0.021]	0.068* [0.036]	-0.117 [0.302]
Punitive Damages	0.250*** [0.058]	0.139** [0.057]	0.257** [0.105]	0.077*** [0.028]	-0.013 [0.051]	0.523 [0.331]
Joint and Several Liability	0.084 [0.080]	-0.027 [0.063]	0.119 [0.079]	0.055*** [0.020]	0.022 [0.031]	0.318 [0.218]
Collateral Source Rule	0.022 [0.066]	0.201*** [0.064]	-0.568*** [0.142]	-0.015 [0.029]	0.097** [0.047]	0.544 [0.488]
Contingency Fee	-0.008 [0.095]	-0.004 [0.105]	-0.479** [0.240]	-0.028 [0.038]	0.022 [0.066]	0.252 [0.545]
Frivolous Lawsuit	0.040 [0.060]	0.035 [0.046]	0.093 [0.075]	0.012 [0.019]	0.024 [0.026]	-0.292 [0.216]
Prejudgment Interest	0.023 [0.051]	0.003 [0.047]	0.022 [0.091]	0.021 [0.022]	-0.029 [0.033]	1.049*** [0.307]
After-reform variables						
Nonecon Damages	0.183*** [0.056]	0.115*** [0.043]	0.096* [0.050]	0.038** [0.017]	0.051** [0.022]	0.104 [0.161]
Punitive Damages	-0.179** [0.072]	-0.087* [0.048]	0.104** [0.047]	0.001 [0.013]	-0.004 [0.019]	0.137 [0.150]

Joint and Several Liability	-0.055 [0.055]	-0.016 [0.038]	0.014 [0.046]	0.008 [0.013]	0.013 [0.017]	-0.273* [0.148]
Collateral Source Rule	0.226*** [0.085]	0.091 [0.058]	0.208*** [0.052]	0.020 [0.014]	0.030 [0.023]	0.065 [0.169]
Contingency Fee	0.019 [0.039]	-0.076* [0.041]	0.101 [0.064]	-0.006 [0.018]	-0.055** [0.023]	-0.066 [0.198]
Frivolous Lawsuit	-0.082** [0.034]	-0.030 [0.031]	-0.089** [0.043]	-0.017 [0.013]	-0.012 [0.017]	-0.092 [0.140]
Prejudgment Interest	0.212*** [0.060]	0.114** [0.048]	0.069 [0.056]	0.050*** [0.017]	0.034 [0.023]	0.062 [0.181]
Other						
No. of States — Auto	0.000 [0.012]	0.001 [0.019]	-0.120*** [0.029]	0.022*** [0.007]	0.037*** [0.009]	-0.011 [0.069]
Premiums-to-Surplus	-0.006 [0.007]	0.056*** [0.012]	0.010*** [0.002]	-0.009*** [0.001]	0.009*** [0.001]	-0.027*** [0.005]
Total Assets (\$B)	-0.601*** [0.180]	-0.340*** [0.099]	-0.035* [0.020]	-0.006 [0.006]	0.002 [0.007]	-0.068 [0.050]
Writes Both <sup>†</sup>	0.477** [0.243]	0.603** [0.296]	-2.429*** [0.394]	-0.075 [0.089]	0.039 [0.145]	-3.452*** [1.191]
State Per Cap Income (\$M)	0.370*** [0.118]	0.098 [0.090]	0.610*** [0.117]	0.090** [0.038]	0.048 [0.048]	0.417 [0.366]
Miles Driven Per Cap	0.082*** [0.025]	0.057*** [0.017]	-0.071*** [0.026]	0.007 [0.006]	0.018** [0.007]	0.041 [0.115]
Constant	-5.812** [2.751]	1.968 [2.383]	69.432*** [3.303]	-5.202*** [1.602]	-3.198* [1.897]	57.141*** [15.783]
N <sup>‡</sup>	70152	57890	70152	25863	21442	25863
R-squared	0.672	0.858	0.100	0.626	0.691	0.039

All equations include year effects, not shown.

<sup>†</sup>Insurer writes both private passenger auto liability and commercial auto liability.

<sup>‡</sup>Sample size for Premiums Earned equations are smaller due to inclusion of lagged term.

\*, \*\*, and \*\*\* denote significance at the 90%, 95%, and 99% levels based on 2-tailed tests.

post-reform when compared to the pre-reform period ( $F = 3.53$ ) compared to insurers in states without this reform. The results for the premium equation suggest that premiums declined for insurers in states with modified collateral source rules, although the post-reform measure is not statistically significant. Similarly, insurers in states that limited prejudgment interest also experienced higher growth in losses across the pre- and post-reform periods ( $F = 6.19$ ), compared to insurers in states without these limits. Here, the results for the premium equation indicate a significant post-reform increase in premiums related to this reform, which is consistent with the results in Table 3.

As seen in Table 4, insurers in states that modified joint and several liability report higher losses. However, the results in Table 5 contradict a positive effect, suggesting instead that the trend in losses pre-reform was positive, and that there is not significant trend post-reform.

The significant results in Table 5 are generally consistent with the main findings of Table 3 and Table 4. Four of the included reform measures explain variations in insurer performance, but the estimated relationships are stronger or more consistent among private insurers than among the commercial insurance sample. Namely, insurers operating in states with caps on punitive damages have lower losses or lower growth in losses, all else equal, than insurers in states without such caps. This is consistent with the first hypothesis and with existing research that evaluates these reforms in the medical malpractice insurance industry. On the other hand, the stronger and more surprising results here suggest that noneconomic damages caps, modifications to collateral source rules and limits on prejudgment interest represent a cost to the insurers operating in states with these reform measures, as losses are higher, all else equal, than for insurers in states without these reform measures.

## CONCLUSION

The growing frequency of tort claims and increasing severity of awards remain ongoing concerns in the U.S., especially as they relate to consumers' accessibility to legal services, efficiency of the legal process, and the fairness of judgments. A variety of reform measures—including caps on noneconomic and/or punitive damages, limits on attorney contingency fees, modifications of joint and several liability rules, modifications of collateral source rules, and limitations on prejudgment interest—have addressed this concern over time, and existing research suggests these reforms have met with varying degrees of success. Many of these reforms

were directed toward medical malpractice cases, but other areas involving liability claims, including automobile bodily injury, were also targeted.

In this paper, I conduct an analysis of the effects of state tort reform activity on automobile liability insurer performance. While the main target of states' tort reform activities was medical malpractice insurance, the measures have important implications for the resolution of automobile liability claims as well. If the main objective of reform is to stabilize the legal environment, as often suggested, auto insurers should experience the same beneficial effects experienced by medical malpractice insurers, although perhaps on a smaller scale. My results indicate that several reform measures are significantly related to insurer losses incurred, premiums earned, and loss ratios, but the direction and significance of their influence is not consistent, and thus the results here should be interpreted with caution. The complexity of these enactments—especially the fact that most reforms were enacted in packages—complicates the ability to assess the direct influence of any one reform measure. Nonetheless, these results provide evidence that caps on punitive damages may have had some beneficial effects while caps on noneconomic damages, modifications of collateral source rules, and limitations on prejudgment interest may represent a new cost to insurers that needs further evaluation. Future research should explore how these reforms play out in the legal environment more directly—e.g., as they relate to tort award amounts over time—to shed more light on why insurers do not benefit from these measures.

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