The Effectiveness of State Legislation in Mitigating Moral Hazard: Evidence from Automobile Insurance

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ABSTRACT

Insurance fraud, which adds an estimated $85 billion per year to the total insurance bill in the U.S., is an extremely serious problem for consumers, regulators, and insurance companies. This paper analyzes the effects of state legislation and market conditions on automobile insurance fraud from 1988 to 1999, a period representing a substantial increase in the enactment of antifraud legislation. Our empirical results show that the laws have mixed effects; two laws have no statistically significant effect on fraud. The strongest evidence of fraud mitigation effects are associated with mandatory Special Investigation Units, classification of insurance fraud as a felony, and mandatory reporting of professionals to licensing authorities. However, laws requiring insurers to report potentially fraudulent claims to law enforcement authorities increase fraud, which may reflect some substitution from more efficacious private efforts to less productive state activity. Many underlying characteristics of the market also affect fraud.

1. INTRODUCTION

Insurance fraud is one of the most serious problems facing insurers, insurance consumers, and regulators. Fraud increases the cost of insurance, threatens the financial strength of insurers, and negatively affects the availability of insurance. The Coalition Against Insurance Fraud (1996) estimates that the cost of insurance fraud in the U.S. is as high as $85 billion per year. Carroll, Abrahamse, and Vaiana (1995) estimate that more than one third of people hurt in automobile accidents exaggerate their injuries, which have added $13 to $18 billion to America's annual insurance bill in 1993.

In the face of significant costs associated with insurance fraud, many states have enacted a wide variety of laws and regulations to reduce it. These statutes and antifraud activities include increasing penalties for insurance fraud, devoting more funds to detection and prosecution of insurance fraud, and implementing regulations requiring insurers and insurance regulators to devote more resources to reduce insurance fraud. Between 1988 and 1999, 43 states enacted 124

new antifraud statutes. Although antifraud and tort reforms have been promoted as important elements in the fight against insurance fraud, the actual impact of these laws on moral hazard is unclear. These laws may have no effect, could achieve the desired effect of reducing fraud, or could even have unintended consequences that increase insurance fraud.

Despite the significant change in the regulatory environment over these 12 years and the substantial variation in statutes and antifraud activities across the states, no academic study has assessed the effectiveness of these statutory efforts directed at reducing insurance fraud. This study measures the effect of these efforts on the level of automobile insurance fraud.

Our study utilizes regression analysis to evaluate the relationship between the level of insurance claim fraud and antifraud fraud statutes. Our measure of insurance fraud is the ratio of auto injury losses to auto property damage losses. Using state-level panel data between 1988 and 1999, we regress this fraud proxy variable on a set of insurance fraud and tort reform statutes, market structure characteristics, and other variables to assess their effects on fraudulent auto insurance claims. The results of our analysis should prove valuable to regulators, insurers, legislators, and consumers in focusing the continued efforts to mitigate insurance fraud through regulatory and statutory changes at the state level.

This analysis is presented as follows. First, Section 2 describes the variables used in the study and develops hypotheses about how the legislative and market structure variables may affect automobile insurance fraud. Sections 3 and 4 present the empirical model and the results of our empirical estimation, respectively. Finally, Section 5 concludes.

2. DATA AND HYPOTHESES

We use state-level data from 1988 to 1999 for two reasons. First, we start in 1988 because the Insurance Research Council (IRC), which provides the data for our dependent variable, did not provide the data before that year. Second and more important, this period is the most relevant for analyzing this issue because it covers a significant change in the legal environment as states aggressively implemented antifraud statutes. Figure 1 plots the number of states that adopted six antifraud laws during the sample period. In 1988, fewer than 10 states had enacted any of these laws. During the next decade the number of states adopting each of these laws increased quickly and substantially. Two laws that existed in no state in 1988 (laws that establish special investigation units and require states to revoke professional licenses in the event of insurance fraud) were used in 16 and 7 states, respectively, by 1999. In 1988, the three most frequently used laws—requiring insurance companies to report potential fraud, instituting a fraud bureau, and instituting a felony for insurance fraud—were each used in ten or fewer states. By the end of our sample each law was used in about 35 states.

[Insert Figure 1 Here]

A. Insurance Fraud

Moral hazard is present when claimants' behavior affects the amount of insured losses, and claimants have information about the value of losses that is not available to insurers. Insurance fraud occurs when moral hazard entices a claimant to inflate the value of a loss by deceiving an insurer.

Insurance fraud is often divided into two categories based on when the intent to defraud an insurer arose. The most egregious type of fraud is planned before the occurrence of a loss. For example, several instances of "fraud mills" have been exposed by law enforcement in recent

years. A “fraud mill” is a network of attorneys and physicians that stage low-speed automobile collisions to bill insurance companies for unnecessary and fictitious medical procedures. Many other elaborate schemes have been designed and implemented to defraud insurers.[1]

The more common form of insurance fraud occurs after a legitimate accident. This ex-post fraud involves unnecessary build-up or overstatement of claim costs (Dionne and St.-Michel, 1991; Dionne, St. Michel, and Vanasse, 1993). The Insurance Research Council surveys (1991, 1995) uncovered a surprising public tolerance for dishonesty in insurance claiming. According to the surveys, many consumers believe it is acceptable to exaggerate the cost of an accident to offset a deductible or make up for premiums paid in past periods when no claims were filed.

Insurance fraud is hard to measure because it is difficult to detect. Because no direct measure of insurance fraud is available, we use a proxy that we expect to be highly correlated with insurance fraud. The proxy is the ratio of average loss cost per insured car for all injury coverages combined to average loss cost per insured car for property damage coverage.

Moral hazard can only arise when the claimant has information about the distribution of damages that is not available to the insurer. If the insurer can objectively verify all damages, it will only pay the verified amount. When the insurer cannot observe the actual value of damages, the claimant can inflate damages by deceiving the insurer. Therefore, moral hazard in insurance claims is most likely to affect bodily injury losses because some portion of these losses is difficult to verify objectively. For example, whiplash and other soft tissue injuries cannot be detected by objective procedures like x-rays. The existence and severity of soft tissue injuries can only be evaluated based on statements made by the claimant. Therefore, once we control for

[1]Examples of insurance fraud schemes are described online by the *Coalition Against Insurance Fraud* at http://www.insurancefraud.org/stats_set.html.

other factors that could affect claiming behavior, differences across states and periods in injury losses should be highly correlated with insurance fraud. Property damage loss is the appropriate denominator because it approximates the universe of potential bodily injury losses (Cummins and Tennyson, 1996). It is very rare for bodily injury to occur in the absence of property damage.[2]

This fraud proxy is most similar to the dependent variable used by Cummins and Tennyson (1996), who find that the ratio of the frequency of bodily injury claims to the frequency of property damage claims is positively related to opinions regarding the morality of fraudulent insurance acts in a state.

Carroll and Abrahamse (2001) also employ a fraud proxy similar to our proxy. They use closed claims data to compare claiming patterns involving *hard injuries* to those involving *soft injuries*. Hard injuries are defined as those such as bone fractures and lost limbs that can be objectively verified. Soft injuries include soft tissue damage such as whiplash, sprains and strains. Soft injuries are harder to verify because the diagnosis is subjective and relies on information provided by the injured party. Carroll and Abrahamse (2001) compare the ratio of hard injury claims to soft injury claims across states with various regulatory regimes. They find evidence consistent with fewer soft injury claims relative to hard injury claims in states where regulation is less conducive to bringing a liability suit. Dionne and St-Michel (1991) find that injured workers miss more days of work due to injuries like lower back pain that are difficult to verify objectively than workers with verifiable injuries like bone fractures. They attribute this result to moral hazard.

[2] Automobile collisions with pedestrians are exceptions to this argument. However, pedestrian injuries constitute a small fraction of bodily injury losses.

Following the reasoning described above, we assume that the ratio of potentially fraudulent bodily injury losses to the universe of potential losses (estimated by property damage losses that are generally more conducive to objective verification) will be highly correlated with the level of insurance fraud in a state.

Other studies have used different measures of fraudulent insurance claims. Some have used conviction rates and other outcome-based measures to proxy for the fraud (Derrig and Zicko, 2002). While appropriate for evaluating prosecutorial efforts relative to allegations of fraud, this measure is less appropriate for this study, which also aims to measure fraud that goes unpunished. If all perpetrators of insurance fraud were subsequently convicted, moral hazard in insurance claiming would not be a problem worthy of great attention. Thus, such measures are likely biased downward from the actual fraud rate as defined in this study.

The Insurance Research Council provides the state-level claims information we use to calculate our fraud proxy. Figure 2 displays the trend of our fraud proxy during the sample period. It increases about 27% from 1988 until 1992, and decreases rapidly thereafter. The value in 1999 is over 36% less than it was in the peak year. This pattern is very similar to the overall trend in crime rates, which grew significantly in the late 1980s, peaked in 1991, and dropped precipitously since then.

[Insert Figure 2 Here]

B. Antifraud Legislation

We estimate the effect of six laws that are designed to mitigate moral hazard. Although the wording of each law differs slightly across states, the general form and meaning of each is consistent with the Model Insurance Fraud Act proposed by the *Coalition Against Insurance Fraud* (CAIF). For each law we record the year it was first enacted. Information about insurance

fraud statutes for each state is obtained from the CAIF and a search of *Lexis*. The first three statutes described below, *Warning*, *Mandatory Reporting*, and *Special Investigation Unit*, require private sector action by insurance companies. The last three, *Felony*, *Fraud Bureau*, and *License*, require action by public authorities including law enforcement and insurance regulators.[3]

The first antifraud variable, labeled *Warning*, requires insurers to print a warning on application and claim submission forms defining insurance fraud and stating that it is a crime. In 1999, 22 states had warning laws. The standard language of the warning is:

> *"It is a crime to knowingly provide false, incomplete or misleading information to an insurance company for the purpose of defrauding the company. Penalties include imprisonment, fines and denial of insurance benefits."*

If the claimants are not aware of the penalty for committing fraud, or that it is a crime to inflate insurance claims, this *Warning* legislation may mitigate moral hazard by increasing the social and psychic costs of fraud and the claimant's subjective estimate of the cost of committing fraud. However, if claimants are already aware that exaggerating claims is illegal; these statutes will not be effective.

The second law, *Mandatory Reporting*, was used in 35 states in 1999 and requires insurance companies to report any suspected fraudulent claims to the proper authority. In most states, fraudulent claims are reported to either the State's Insurance Fraud Bureau or the District Attorney. If insurers already report potentially fraudulent activities to the proper authorities, this law may merely ratify current behavior. In such a case, this statute would not affect moral hazard. If, however, prior to the enactment of this statute, insurers did not report suspected fraudulent behavior, and the public agencies have a comparative advantage in dealing with

[3] Some states have enacted antifraud laws that only apply to workers compensation insurance. These laws are not included in our sample. Otherwise, antifraud laws apply to all types of insurance.

insurance fraud, the law could mitigate moral hazard by increasing the probability that fraud is detected and punished. Alternatively, if insurers are better able to fight fraud privately, reporting suspected fraud to law enforcement officials may increase moral hazard by shifting the responsibility to the inferior party.

The third antifraud law, *Special Investigation Unit (SIU)*, grew from 0 to 16 states and requires insurers in the state to take specific actions in investigating and reducing insurance fraud. Many of these statutes require that insurers create a special investigation unit to discover and prosecute fraudulent claims. Others require insurers to perform similar antifraud activities using existing claims staff, or by subcontracting outside investigators. This law attempts to mitigate moral hazard by increasing the probability of detecting fraud. To the extent that insurers already have Special Investigation Units or perform similar fraud detection activities prior to enactment of this law, the effect on moral hazard will be small. However, if the law increases insurers' fraud detection efforts, it should mitigate moral hazard.

The fourth type of antifraud legislation, *Felony*, indicates that the state classifies insurance fraud as a felonious crime. By 1999, it was used in 35 states. The deterrent effect of prosecution is a function of the severity of penalties for committing insurance fraud. Although insurance fraud is a crime in all states, some states classify it as a misdemeanor that carries only a small fine for first time offenders while others classify it as a felony that carries greater fines and incarceration. Therefore, classifying insurance fraud as a felony should mitigate moral hazard by increasing the cost of committing fraud.

The fifth law, *Fraud Bureau*, requires the state to form an insurance fraud bureau to detect, investigate, and prosecute insurance fraud. Therefore, creating a bureau is intended to

affect the expected utility of committing fraud by increasing the probability of detection and prosecution for fraud. By the end of our sample period bureaus existed in 35 states.

Because insurers often fund fraud bureaus, the creation of a fraud bureau may redistribute antifraud resources from private to public entities. If bureaus have a comparative advantage in reducing fraud, the creation of a bureau should reduce moral hazard. Anecdotal evidence also suggests a complementary relationship between public and private antifraud efforts. Insurance company representatives complain that state prosecutors are often unwilling to devote resources to prosecuting insurance fraud if the fraudulent claim was denied (IRC-ISO, 2001). Further, the survey results in IRC-ISO (2001) suggest that prosecutors are often unwilling to prosecute individual instances of insurance fraud. Establishing a fraud bureau may increase antifraud efforts by prosecutors and law enforcement officials, especially when prosecutors and investigators are assigned to the bureau. This would increase an insurer's incentive to deny a fraudulent claim and to devote resources to the prosecution of fraud. If public and private antifraud efforts are complements, the creation of a bureau should reduce moral hazard.

Incomplete cross-sectional data suggest that fraud bureaus in some states may be less effective than others. If a fraud bureau does not have adequate resources it may be unable to affect moral hazard. The Coalition Against Insurance Fraud (2001) shows that fraud bureau resources and activity varied substantially across states in 2000. Fraud bureau budget per capita ranged from $3.07 in New Jersey to $0.06 in South Carolina. The number of claims referred to fraud bureaus ranged from 22,598 in California to 105 in Connecticut. Given this large variation in resources and activity, the ability of fraud bureaus to decrease fraud may vary significantly across states. Unfortunately, available data are inadequate to facilitate the inclusion of resources and activity of fraud bureaus in our empirical analysis.

The sixth law, *License*, requires prosecutors to report to the appropriate licensing authority any licensed professional who is convicted of or pleads no contest to insurance fraud. For example, attorneys are reported to the state's Bar Association, physicians are reported to the Board of Medical Examiners, and insurance agents are reported to the state's Department of Insurance. This law can mitigate moral hazard by increasing transaction costs of filing a fraudulent claim. The increased punishment for professionals involved in fraud should decrease the pool of physicians and attorneys willing to participate in such claims; increasing the claimant's search costs. It should also increase the compensation demanded by professionals for committing a crime. This is the least commonly used of our antifraud laws and was enacted in only 7 states in 1999.

Statutory immunity is frequently mentioned as important for fraud control. However, because many states had immunity statutes that existed well in advance of our sample period and few states change this law during this period, we do not test the efficacy of immunity statutes.

C. Tort Reform Legislation

In addition to antifraud laws, we investigate the effects of tort reforms on our dependent variable. We test four tort reforms, including limits on non-economic damages, limits on punitive damages, limits on joint and several liability, and modification of the collateral source rule because they can affect the frequency and severity of bodily injury liability losses.[4] They can affect severity directly by altering the outcome of bodily injury liability litigation, and can affect frequency indirectly by changing the expected value of filing a claim.[5] While most of these laws

[4] We test these four tort reform laws because they are most likely to affect our dependent variable. ATRA also tracks changes in prejudgment reform, product liability reform, class action reform, attorney retention sunshine, appeal bond reform, and jury service reform. The only one of these that could significantly affect automobile insurance claims is jury service. However, none of these reforms were passed before 2003.

[5] Born and Viscusi (1994) and Viscusi *et al.* (1993) examine the response of the insurance market to

were enacted in response to the liability insurance crisis of the 1980s, some reforms were enacted during our sample period when the number of states with such laws increased from 29 to 35 for joint and several liability, from 21 to 24 for collateral source rules, from 24 to 30 for punitive damage limits, and from 10 to 14 for limits on non-economic damages. The tort reform data are obtained from the *American Tort Reform Association.*

The first tort reform is legislation that limits damages awarded for non-economic losses including compensation for pain and suffering, emotional distress, loss of consortium or companionship, and other intangible injuries. These damages involve no direct economic loss and have no precise value. It is very difficult for juries to assign a dollar value to these losses, given the minimal guidance they customarily receive from the court. Several states have modified the rules for awarding non-economic damages by limiting the amount of damages or the circumstances under which they are available. Capping non-economic damages should decrease bodily injury liability losses in a state. Because caps are often set at $250,000 or higher, this law will not directly affect the severity of most automobile insurance losses. However, a cap on non-economic damages decreases a plaintiff's incentive to file a lawsuit, and increases an insurer's incentive to defend, rather than settle, a suit.

Punitive damages are awarded to punish the defendant, not to compensate the plaintiff. The possibility of collecting punitive damages increases the plaintiff's expected value of civil litigation. Many states have passed laws that limit the opportunities for awarding punitive damages and restrict the amount of punitive damage awards. Although one might anticipate that punitive damage caps would have a large effect, punitive damages are not legally insurable in

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various liability reforms. They find that tort reform laws generally decrease insured losses, decrease insurance premiums, and increase insurance market profitability.

many states.[6] In these states, a limitation on punitive damages would only deter filing a claim; it would not directly affect the amount of an insured loss. Further, in contrast to products or general liability litigation, in automobile liability litigation the defendant is more likely to be an individual rather than a corporation or business. As a result, the likelihood of punitive damages being awarded in automobile liability litigation would be lower and punitive damage caps would be expected to be less important.

Joint and several liability permits the plaintiff to recover damages from multiple defendants collectively, or from each defendant individually. In a state that follows the rule of joint and several liability, if a plaintiff sues three defendants, two of whom are 95 percent responsible for the defendant's injuries, the plaintiff may recover 100 percent of her damages from the solvent defendant that is 5 percent responsible for her injuries (American Tort Reform Association, 2002). Thus, all else equal, a plaintiff in a state that recognizes joint and several liability is likely to receive a larger damage award through civil litigation. Many states have enacted laws limiting the application of joint and several liability. Several studies find evidence that joint and several liability reforms reduce the frequency and severity of liability losses (Viscusi, *et al*. 1993, and Lee, Browne, and Schmit, 1994).

Finally, the collateral source rule of common law says that the defendant cannot present evidence at trial to show that the plaintiff's losses have been compensated from other sources such as health insurance or workers compensation insurance. Thus, a large percentage of economic damages awarded by juries may already have been paid to the plaintiff by another source. Many states have abolished or modified the collateral source rule. By allowing defendants to present evidence that plaintiffs have already received some compensation for

[6] Examples of such are California, Colorado, Florida, Illinois, Indiana, Kansas, Massachusetts, Minnesota, Missouri, New Jersey, New York, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Dakota, and Utah.

medical expenses, legislation that abolishes the collateral source rule of common law may reduce the damages awarded for bodily injury. All else equal, this would decrease our dependent variable. Unlike the two types of damage caps, this law can directly affect the outcome of large and small claims.

Tort reforms can affect our dependent variable by affecting both fraudulent and legitimate bodily injury claims. Our empirical analysis cannot distinguish between the effects of tort reforms on fraud and on other claims. However, these laws could mitigate moral hazard, and it is necessary to control for tort reforms when assessing the effects of antifraud laws.

D. Demographic and Market Structure Variables

The last set of explanatory variables measures the structure of the automobile insurance market and demographic characteristics in a state. The first market structure variable is a measure of Personal Injury Protection (PIP). Under a no-fault insurance system each party's insurer pays her own injuries, and bodily injury lawsuits are not allowed. The purpose of this system is to reduce the litigation costs inherent in a tort system. While pure no-fault systems do not exist in the United States, several states have enacted modified no-fault laws for automobile insurance. There are three observed variations of the modified no-fault system. The most restrictive form of modified no-fault insurance limits drivers' rights to sue for bodily injury liability damages unless the damages exceed some threshold, and requires the purchase of first-party coverage. This first-party coverage is known as Personal Injury Protection (PIP). Two types of thresholds are used to restrict an injured party's ability to sue. If a state uses a verbal threshold, injuries must exceed a definition of severity included in the law, for example loss of a limb, before an injured party can sue for bodily injury. If a state uses a dollar threshold, medical cost resulting from the accident must exceed a dollar limit before the injured party can sue for

bodily injury. In an "add-on" no-fault system, the state requires drivers to carry PIP coverage, but does not limit one's ability to sue for bodily injury. Finally, in an elective PIP system, motorists can purchase PIP coverage, but it is not mandated by statute.[7]

A recurring theme in the insurance fraud literature is that PIP may affect the level of fraud (Cummins and Tennyson, 1996; Carroll and Abrahamse, 2001; Tennyson and Salsas-Forn, 2002). Cummins and Tennyson (1996) expect modified no-fault laws with verbal or dollar thresholds to reduce the ratio of bodily injury claims to property damage claims, but make no firm prediction regarding the effect of add-on and elective PIP laws. In states where one's ability to sue for bodily injury is limited by no-fault laws, the frequency of bodily injury claims should decrease because PIP claims and bodily injury claims are mutually exclusive. However, because our dependent variable measures the amount paid for bodily injury and PIP claims in the numerator, the PIP variable in our model compares the relative expected net benefit[8] of submitting a fraudulent PIP claim to that of submitting a fraudulent third party claim for bodily injury bodily injury claim.

A decrease in the insurers' ability to detect and deny fraud in PIP claims may increase the expected utility from submitting a fraudulent PIP claim. Insurance regulators in New York and other states have expressed concern that PIP coverage presents additional opportunities to submit fraudulent insurance claims (Hillman, 2002). In many states, insurers must pay or deny a first-party insurance claim within thirty days of the claim's submission to avoid a penalty under Unfair Claims Practices statutes. Moreover, to deny a claim on the basis of fraud, the insurer must be able to prove the fraud at the time it denies the claim. This effect is exacerbated by the

[7] See Harrington (1994) for a detailed description of no-fault automobile insurance laws.

[8] The expected net benefit of submitting a fraudulent claim equals the expected value of the claim in excess of the fair value of damages multiplied by the probability that the fraudulent act will go unpunished, minus any fine

insured's option to wait up to six months before submitting a PIP claim in some states. After six months, evidence of common injuries such as soft tissue damage may have disappeared. In this situation, evidence of injury may be limited to the physician's statement. For these reasons, we expect modified no-fault coverage to increase moral hazard by decreasing the probability that fraud will be detected and punished. This is consistent with a positive relationship between the percentage of PIP losses and our fraud proxy. To our knowledge, extant literature does not empirically test this hypothesis.

We measure the impact of modified no-fault coverage with the ratio of PIP losses to total bodily injury losses rather than with a dummy variable that captures the existence of the law for two reasons. First, there is very little change in the existence of no-fault laws during our sample period, but PIP losses vary considerable across states and years. Second, the ratio of PIP losses to total bodily injury losses reveals changes in the use of PIP coverage over time. This information is important because insurance regulators have expressed concern about a rising trend of fraud in PIP claims starting near the middle of our sample period.

The next market structure variable is the market concentration by state. The concentration of a state's automobile insurance market should reduce fraud. It is common for insurers to allocate significant resources to detecting and denying fraudulent claims, but antifraud efforts across insurers are not uniform. Evidence suggests that large insurers are more likely than small insurers to participate in aggressive antifraud measures (IRC-ISO, 2001). Cummins and Tennyson (1996) contend that externalities of claims resistance by insurers in a given state, such as reductions in consumers' expectations regarding the probability that a fraudulent claim will be paid, may be more beneficial to insurers with a larger market share in that state. Thus, there is

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or other decrease in utility from prosecution times the probability that the claimant will be found guilty of fraud.

potential for a free-rider problem, where primarily the largest insurers expend resources to fight fraud. It is also possible that large insurers can achieve economies of scale in fraud detection and develop a reputation for fighting fraud. In a concentrated market, claimants are more likely to encounter a large insurer than they would in a less concentrated market. Following Cummins and Tennyson (1996) we do not expect market concentration to affect legitimate claims because denying legitimate claims exposes insurers to bad faith penalties and other punitive damages. To estimate these effects our model includes a measure of concentration, *Market Concentration*, in each state's market for automobile insurance. This variable is a Herfindahl index of direct automobile insurance premiums written by insurers in each state calculated using data provided by the NAIC. Larger observations of this measure indicate a greater degree of market concentration in the state. Therefore, if moral hazard is less problematic in states with more concentrated markets, the market concentration will reduce the fraud proxy.

The last three variables in our model control for demographic factors that could affect a claimant's expected utility from submitting a bodily injury claim. We include the natural logarithm of real per capita income as a control variable, but its theoretical relationship with fraud is ambiguous. Competing hypotheses suggest that per capita income could increase or decrease expected utility from submitting a claim. First, transaction costs of submitting a claim may be greater for higher income people because the opportunity cost of time is increasing in income. Furthermore, prior research suggests that higher income people face larger opportunity costs of time in committing crimes and higher penalties in the form of lost future wages if convicted (Lott 1992). Similarly, wealthier individuals should be less likely to engage in fraudulent insurance claiming behavior because marginal utility is decreasing in wealth (Cummins and Tennyson, 1996, p. 37). However, Danzon (1984) suggests that transaction costs

of filing a claim could be decreasing in wealth if high income people are more familiar with the legal system than are low income people. Also, because one component of compensable damages is the lost wages of an injured claimant, individuals with greater income should be awarded greater damages. Because these effects work in different directions, the effect of per capita income is unclear.

Finally, we control for the unemployment rate and the percentage of a state's population residing in metropolitan areas. In addition to possible wealth effects, we expect the transaction costs of filing a claim to be smaller for unemployed people and those living in metropolitan areas (Danzon, 1984, 1985). First, the opportunity costs of engaging in illegal activity are lower for unemployed people (Gould, Weinberg, and Mustard, 2002). Second, Cummins and Tennyson (1992, 1996) assert that observed automobile insurance claiming behavior in large metropolitan areas is different than that in other areas of a state. For example, the ratio of bodily injury claim frequency to property damage claim frequency in Philadelphia is more than three times higher than the rest of Pennsylvania. Similarly, this ratio is more than twice as high in New York City and Los Angeles than the respective state averages. This may be due in part to reduced search costs for the claimant in locating an attorney or physician. Furthermore, large-scale insurance fraud is often perpetrated by organized crime rings that are more likely to be found in large metropolitan areas (CAIF, 2004).

The U.S. Census Bureau is the source of data for unemployment, real per capita income, and the percentage of state population residing in metropolitan areas. Table 1 contains the summary statistics for the primary variables used in this study.

[Insert Table 1 Here]

3. EMPIRICAL MODEL

We use two empirical strategies to determine the impact of laws on our fraud proxy—a base specification and a more sophisticated specification that includes time trends before and after the various laws are implemented.

A. Base Specification

Model 1 uses dummy variables to indicate whether each law existed in a given state (i) and year (t).

$$FRAUD_{it} = \alpha + \sum_{j=1}^{10} \beta_j LAWS_{ijt} + \gamma' F_{it} + \sum_{t=1988}^{1999} \tau_t T_t + \sum_{i=1}^{50} \delta_i S_i + \varepsilon_{it} \quad (1)$$

The variable $FRAUD_{it}$ proxies for insurance fraud in state i at time t. $LAWS_{ijt}$ contains the set of six antifraud laws and four tort reform measures discussed in Section 2. Coefficients are estimated for each of these ten laws ($j = 1-10$). F_{it} is a vector of market structure variables in state i at time t, including logged income, unemployment, and urbanization. Time and state fixed effects, T_t and S_i, control for unobserved time trends that affect all states in common and unobserved characteristics within states that are constant over time, respectively.

The coefficient estimates on the law variables are interpreted as the average effects of the law after it is in existence. It tests whether the fraud proxy is lower on average after the law is implemented than before the law. However, this simple test may be biased if the laws were adopted in response to changes in fraud. If states adopted these laws because fraud was increasing and the laws lowered fraud, the estimates underestimate the reduction in insurance fraud—the before and after averages would show little difference. For example, in Connecticut the fraud proxy increased by 48% between 1988 and 1991. Connecticut created a fraud bureau in 1992 and the fraud proxy steadily decreased by 45% from 1992 until the end of our sample

period. In the year before North Dakota passed antifraud legislation, the fraud proxy increased by 28%. The following year it decreased by 24%. Likewise, if the laws were adopted when insurance fraud was declining, the bias would be in the opposite direction.

B. Before and After Trends

A common approach to control for this type of endogeneity is to use instrumental variables. Valid instruments must be correlated with the decision to enact a change in the law but uncorrelated with the fraud proxy. Unfortunately, it is not technically feasible to use this approach because we would need at least six valid instruments to estimate the antifraud laws and four more to properly identify effects of the changes in the tort laws. Therefore, we use an alternative method that controls for before and after time trends for each law, as shown in Equation 2.

$$FRAUD_{it} = \alpha + \sum_{j=1}^{10} \beta_j LAWSBEFORE_{ijt} + \sum_{j=1}^{10} \gamma_j LAWSAFTER_{ijt} + \eta' F_{it} + \sum_{t=1988}^{1999} \tau_t T_t + \sum_{i=1}^{50} \delta_i S_i + \varepsilon_{it} \quad (2)$$

By using this estimation technique we follow a growing literature that uses before and after time trends for each of the state laws.[9] Once we estimate these trends we can test whether the differences in the before and after trends are statistically significant. In addition to being technically feasible, this strategy has two other advantages. First, the coefficient estimates are easy to interpret—positive coefficient estimates on the before and after trends indicate that our fraud proxy was increasing before and after the laws were enacted. Second, it does not shorten the sample, as would the use of a series of leads and lags. Table 2 depicts the differences in the two estimation strategies.

[9] Figure 4 allows comparison of the *LAWS* variables in Model 1 to the *LAWSBEFORE* and *LAWSAFTER* variables in Model 2. Others who have used this empirical technique to evaluate the impact of laws are Lott (1998), Mustard (2001), Plassman and Whitely (2003), and Grinols and Mustard (2004).

[Insert Table 2 Here]

4. RESULTS

The results of the by-state regressions of Model 1 and Model 2 are presented in Tables 3 and 4, respectively. The results associated with the wealth proxies are consistent with the previously stated hypotheses. The coefficient estimates of the urbanization variable in Model 1 and the unemployment variable in Models 1 and 2 are significant and are positively related to our insurance fraud proxy, consistent with theory and prior empirical research. We argue that the significance of these variables provides indirect evidence of the appropriateness of our fraud proxy.

Table 3 presents the results of the basic regression (Model 1) described above. Two of the six antifraud laws are negative and statistically significant. The coefficient estimates for classification of insurance fraud as a felony and for revocation of licenses of professionals are negative and statistically significant, and indicate that these two laws reduce the insurance fraud proxy by 11.3 and 33.4 percentage points, respectively. The coefficient estimates for the other four laws—*Mandatory Reporting*, *Warning*, *Special Investigation Unit*, and *Fraud Bureau*—are not statistically different from zero.

[Insert Table 3 Here]

Three of the tort laws—modification of joint and several liability, caps on non-economic damages and caps on punitive damages—have statistically significant effects on the fraud proxy. States that cap non-economic damages and those that cap punitive damages display a higher value of the fraud proxy after the law, and those that eliminate the collateral source rule have less

fraud after the law. All of these results are statistically significant; however, the results change in the specification that controls for changes in fraud before and after the laws are implemented.

The coefficient estimates for each of the market structure variables have the anticipated signs. However, there is no evidence supporting the hypothesis that firms with a greater share of the market have a greater benefit of expending resources to fight fraud.

The positive and highly statistically significant coefficient estimates on the PIP ratio suggests that there is an inflationary effect of no-fault coverage on claim costs. This is the opposite of Cummins and Tennyson's (1996) result regarding the effect of no-fault laws on insurance claiming behavior, but it does not contradict their hypothesis. Cummins and Tennyson (1996) expect no-fault coverage to reduce the frequency of bodily injury claims because bodily injury claims and PIP claims are mutually exclusive. However, because our dependent variable measures the amount paid for bodily injury and PIP claims in the numerator, the PIP variable in our model compares the relative expected net benefit of submitting a fraudulent PIP claim to that of a bodily injury claim. Thus, our finding that the ratio of claims paid under PIP coverage increases the fraud proxy is consistent with suggestions in the trade press (Hillman, 2002) that regulation restricting the insurers' ability to deny fraudulent PIP claims makes it easier for insureds to inflate PIP claims compared to other bodily injury claims.

The positive and statistically significant coefficient estimates on both the unemployment rate and the fraction of the population in metropolitan areas are consistent with the predictions that these groups may have lower transactions and opportunity costs of engaging in fraudulent activity. Because there are multiple and opposite effects of income on fraud, the sign of its coefficient estimate is uncertain. The empirical results show a slightly negative coefficient with a very high standard error, indicating that these opposing effects approximately offset each other.

Table 4 presents the results for the before and after trends (Model 2) and reports the results of whether the before and after trends differ. When we utilize the before and after time trend variables the results for the antifraud and tort reform laws are very different. We now find the strongest evidence that three of the antifraud laws reduce the fraud proxy. For the establishment of special investigation units, classification of insurance fraud as a felony and revocation of licenses of professionals who engage in fraud, we find a statistically significant decrease in our fraud proxy when considering the difference in the before and after time trends for each of these laws. However, laws requiring insurers to report suspected fraudulent claims show decreases before the law and slight decreases (not statistically significant) after the law is implemented. Although the lower after effect is not statistically significant on its own, the difference between the before and after trends is statistically significant and positive.

[Insert Table 4 Here]

To better understand the motivation for and interpretation of the Before and After Trends model (Model 2), it is useful to consider the differences in results produced by the two models. Model 1 compares the average fraud proxy before a law is enacted to the average after a law is enacted. Model 2 compares the rate of change in the fraud proxy before a law is enacted to the rate of change after a law is enacted. For example, the coefficient estimate for Special Investigation Unit in the Before and After Averages model (Model 1) is not statistically different from zero. Therefore, the average of the fraud proxy before the law is enacted is not significantly different from the average after the law is enacted. This test is biased if the fraud proxy was increasing before enactment and decreasing after enactment.

The same law produces different results in the Before and After Trends model (Model 2). The before trend coefficient indicates that, all else equal, the fraud proxy was increasing by an

average of 0.048 per year before the law was enacted in states that enacted the law during our sample period. The after trend coefficient estimate indicates that the fraud proxy decreased by an average of 0.074 per year after the law was enacted. The F-value (17.91) tells us that the difference between the before and after coefficient estimates is statistically significant, and the magnitude of the difference suggests that this law reduced the insurance fraud proxy by .122 annually. Thus, the Model 2 results are consistent with the notion that laws requiring Special Investigation Units mitigate moral hazard in automobile bodily injury claims by increasing the probability that insurance fraud will be detected.

Interpretations of the coefficient estimates for the other three laws displaying significant effects on fraud, License, Felony, and Mandatory Reporting, are slightly different from that of the Special Investigation Unit. Laws revoking the licenses of professionals involved in insurance fraud reduce the rate of change in the fraud proxy, which decreased by an average of 0.043 annually before the law was enacted. After the law passed the average rate of change drops even lower to -0.132. The difference between the before and after coefficient estimates is significantly different from zero at the ten-percent confidence level (F-value=3.25), and the magnitude of the effect is equivalent to a .089 annual reduction in the fraud proxy. This evidence is consistent with the law decreasing moral hazard in automobile insurance by increasing the cost to the claimant of finding and hiring a physician or attorney who will participate in insurance fraud.

The classification of insurance fraud as a felony also decreases the rate of change in the fraud proxy. Although neither the before trend or after trend coefficient estimates are statistically different from zero, the difference between them is statistically different from zero at the ten-percent confidence level (F-value=3.33). The magnitude of the effect is equivalent to a .03 reduction in the fraud proxy per year. This evidence is consistent with the law decreasing moral

hazard by increasing the cost of committing fraud.

Requiring insurers to report suspected insurance fraud to the proper authorities increases the rate of change in our fraud proxy. The before trend coefficient estimate indicates the fraud proxy was decreasing by an average of 0.071 per year before such laws were enacted. The after trend coefficient estimate is not significantly different from zero and the difference between the before and after estimates is significant at the five-percent level (F-value=4.05). The magnitude of the effect equates to a .049 annual increase in the fraud proxy. This evidence suggests that when states enact the mandatory reporting law, previously declining fraud rates stop declining. The result is consistent with our hypothesis that requiring insurers to report suspected fraud to the proper authorities may increase moral hazard by decreasing the probability of detecting and prosecuting fraud. One explanation for this result is that private antifraud efforts are more effective than are public efforts.

The difference between the before and after trend variables is not statistically significant for fraud warnings or the creation of a fraud bureau. As noted in Section 2, this result for fraud bureaus may indicate that public and private antifraud efforts offset each other. Alternatively, given the differences across bureaus in available resources and activity, some bureaus may decrease fraud, while others increase fraud, effectively canceling each other out in the empirical analysis. Available data do not facilitate an empirical test of this hypothesis.

We also find interesting results in the before and after trend analysis of the tort reform variables. Limiting non-economic damages has a statistically significant and negative effect on the fraud proxy. For limiting non-economic damages the difference between the before and after trend variables is significant at less than the one-percent level. There is some evidence that altering the collateral source rule and modifying joint and several liability increases the fraud

proxy. Tort reforms involving punitive damages have no statistically significant before or after effects, consistent with Eaton, Mustard, and Talarico (2005) who find that the decision to seek punitive damages has not statistically significant effect on the majority of phases of the tort litigation process.

The results for our market structure variables are similar to those in Table 3. The positive and statistically significant coefficient estimate on the PIP ratio reinforces the belief that no-fault laws may inflate claim costs. The qualitative results for the other market variables are similar in the two specifications. While the metropolitan variable is not significant in this specification, states with high unemployment rates display a higher value of our fraud proxy. Per capita income has no effect in either specification.

5. CONCLUSION

In the face of growing concern over the economic and societal implications of insurance fraud, many have proposed a variety of steps to reduce insurance fraud. A popular approach to reduce insurance fraud has been the enactment of antifraud legislation in many states. The number of states with at least one antifraud statute has increased by more than three-fold since 1988. In spite of the substantial increase in these laws, there are no thorough empirical analyses of their efficacy.

Not surprisingly, the evidence suggests that while some antifraud laws appear to have reduced insurance fraud, the effects of all laws are not equal. An important feature of our study is the unique methodology to control for trends in the fraud proxy before the laws were implemented. These estimates are consistent with laws being enacted while fraud was changing, thus biasing the results of the basic OLS specifications. Finally, the strongest evidence of fraud

mitigation effects is associated with the mandatory Special Investigation Units, classification of insurance fraud as a felony, and mandatory reporting of professionals to licensing authorities. However, laws requiring insurers to report potentially fraudulent claims to law enforcement authorities increase fraud, which may reflect a tendency for this type of law to substitute less productive state activity for more efficacious private efforts that would have been undertaken in the absence of this mandate.

The tort reform laws also have mixed effects. Modification of joint and several liability and elimination of the collateral source rule are associated with an increase in our fraud proxy. Reforms on punitive damages have little effect on fraud. The most promising tort reform limits non-economic damages, which reduces the fraud proxy.

The market structure variables have very strong effects. States with a higher ratio of PIP claims have substantially higher values of the fraud proxy. This is consistent with our hypothesis that the expected net benefit from submitting a fraudulent PIP claim is greater than that from a bodily injury claim. The difference is likely due to statutory regulations that limit an insurer's ability to deny PIP claims without facing significant bad faith penalties. Also, as expected, states with higher unemployment display substantially higher values of our fraud proxy.

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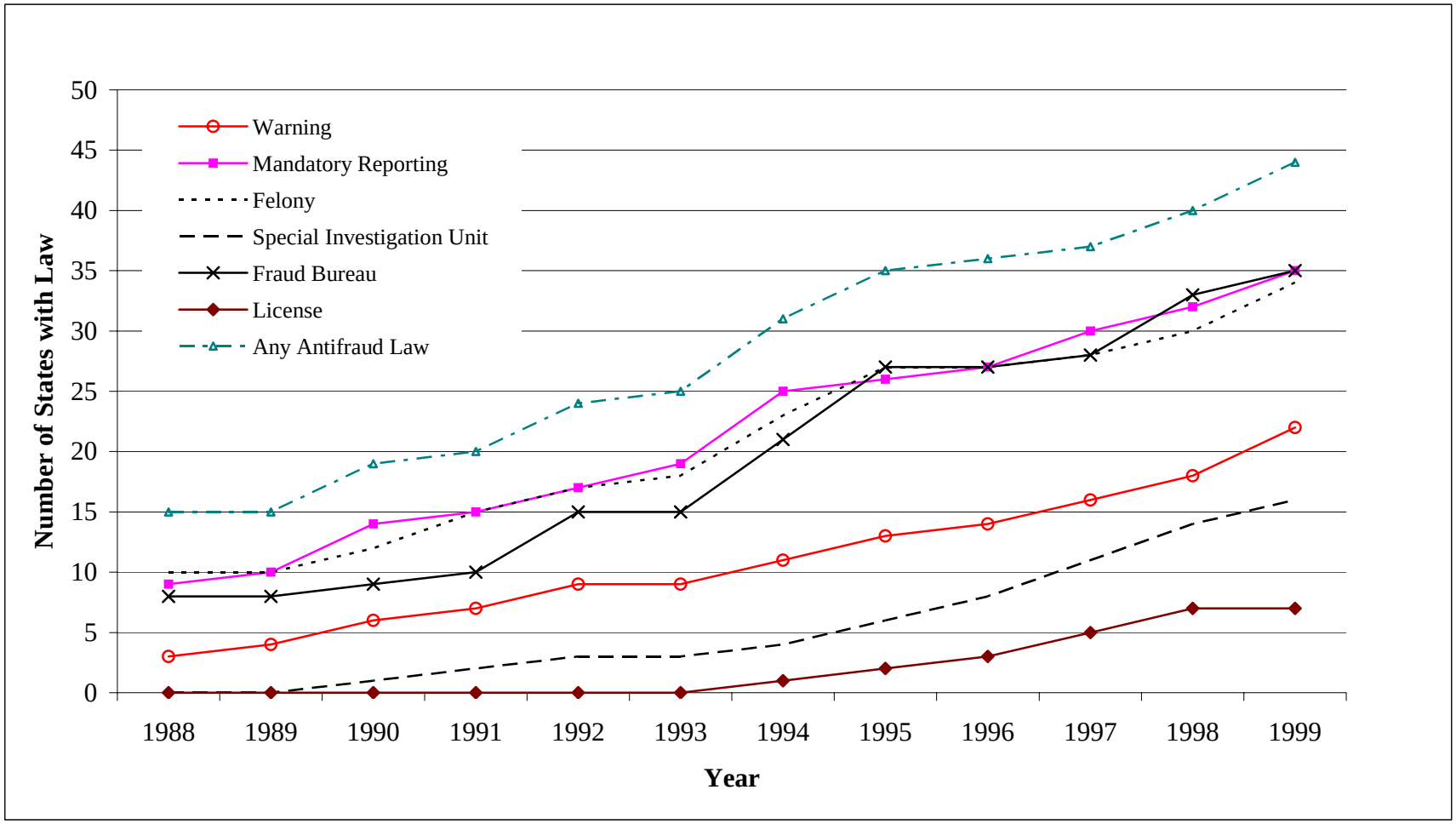
Figure 1

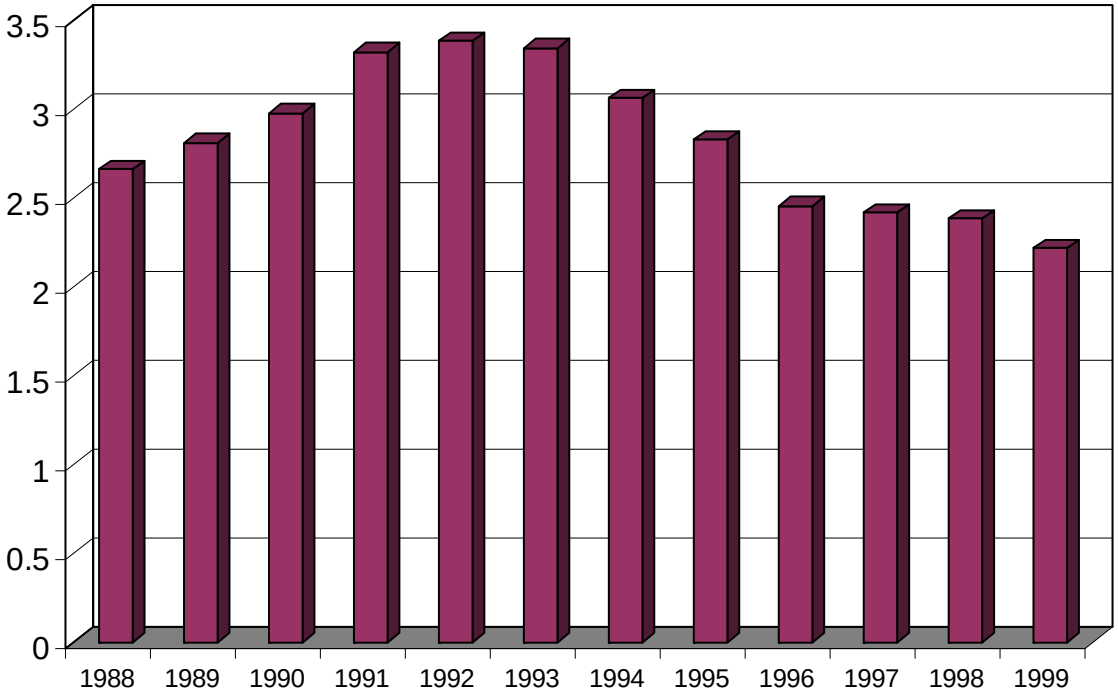
Antifraud Law Enactment



Sources: Lexis, Coalition Against Insurance Fraud

Figure 2

Insurance Fraud Proxy 1988-1999



Definition: Ratio of ratio of average loss cost per insured car for all injury coverages combined to average loss cost per insured car for property damage coverage.

Source: Insurance Research Council (2002) *Trends in Auto Injury Claims*.

Table 1

Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable				
Fraud	2.8219	0.9825	1.18	7.44
Antifraud Laws				
Warning	0.2200	0.4146	0	1
Mandatory Reporting	0.4300	0.4955	0	1
Special Investigation Unit	0.1117	0.3152	0	1
Felony	0.4183	0.4937	0	1
Fraud Bureau	0.3950	0.4893	0	1
License	0.0433	0.2038	0	1
Tort Reform Laws				
Cap on Non-economic Damages	0.2333	0.4233	0	1
Cap on Punitive Damages	0.5583	0.4970	0	1
Modification of Joint and Several Liability	0.6667	0.4718	0	1
Elimination of Collateral Source Rule	0.4650	0.4992	0	1
Market Structure Variables				
PIP Ratio	0.0935	0.1400	0.0000	0.7417
Market Concentration	0.0844	0.0239	0.0417	0.1914
Per Capita Income	21331	4371	11695	38560
Unemployment	5.4031	1.5554	2.2300	11.3900
Metropolitan	0.6744	0.2079	0.2664	1.0000

TABLE 2
Comparison of Law Enactment Variables

Year	*LAWS* (Model 1)	*LAWSBEFORE* (Model 2)	*LAWSAFTER* (Model 2)
1988	0	-6	0
1989	0	-5	0
1990	0	-4	0
1991	0	-3	0
1992	0	-2	0
1993	0	-1	0
1994	1	0	0
1995	1	0	1
1996	1	0	2
1997	1	0	3
1998	1	0	4
1999	1	0	5

Represents the three variables for a law enacted in 1994

Table 3

Results from Model 1
Before and After Averages

Variables	Coefficient Estimate	Standard Error
Changes in Laws—Antifraud Legislation		
Warning	0.032	0.0566
Mandatory Reporting	-0.055	0.0525
Special Investigation Unit	-0.0743	0.0556
Felony	-0.1134*	0.0462
Fraud Bureau	0.0642	0.0467
License	-0.3341***	0.0687
Changes in Laws—Tort Reform		
Cap on Non-economic Damages	0.4005***	0.0865
Cap on Punitive Damages	0.2665**	0.0781
Modification of Joint and Several Liability	-0.1997	0.0892
Elimination of Collateral Source Rule	-0.4071***	0.1078
Market Structure		
PIP Ratio	2.525***	0.4705
Market Concentration	-3.7495	2.0176
Per Capita Income	-0.3753	0.5782
Unemployment	0.0816***	0.0156
Metropolitan	7.4615**	2.5496
Intercept	3.735	5.4569
State Fixed Effects	Yes	
Year Fixed Effects	Yes	
R^2	.890	
Adjusted R^2	.874	

* indicates statistical significance at the 10% level
** indicates statistical significance at the 5% level
*** indicates statistical significance at the 1% level
Results for the state and time fixed effects variables are available from the authors.
The dependent variable is the ratio of bodily injury liability losses incurred to property damage liability losses incurred and proxies fraud.

Table 4

Results from Model 2
Before and After Trends

Variables	Before Trend Coefficient Estimate	Before Trend Standard Error	After Trend Coefficient Estimate	After Trend Standard Error	Difference F-Value
Changes in Laws-Antifraud Legislation					
Warning	-0.0072	0.0165	-0.0362*	0.0194	1.36
Mandatory Reporting	-0.0705***	0.0175	-0.0219	0.0183	4.05**
Special Investigation Unit	0.0483***	0.0167	-0.074***	0.0235	17.91***
Felony	0.0117	0.0131	-0.0181	0.0144	3.33*
Fraud Bureau	-0.0078	0.0147	0.0218	0.0187	1.89
License	-0.043***	0.0145	-0.1318***	0.0437	3.25*
Changes in Laws-Tort Reform					
Cap on Non-economic Damages	0.0321	0.0255	-0.0475***	0.0118	8.67***
Cap on Punitive Damages	0.0214	0.0275	-0.0123	0.011	1.34
Modification of Joint and Several Liability	-0.093***	0.0293	-0.028**	0.0112	4.54**
Elimination of Collateral Source Rule	-0.1128**	0.0567	0.03***	0.0109	6.09**
Market Structure					
PIP Ratio	2.9403***	0.612			
Market Concentration	-2.8608	2.7979			
Per Capita Income	-0.5533	0.8226			
Unemployment	0.0933***	0.0203			
Metropolitan	4.4717	3.874			
Intercept	5.8103	7.7934			
State Fixed Effects	Yes		Yes		
Year Fixed Effects	Yes		Yes		
R^2	0.907				
Adjusted R^2	0.892				

* indicates statistical significance at the 10% level
** indicates statistical significance at the 5% level
*** indicates statistical significance at the 1% level
Results for the state and time fixed effects variables are available from the authors.
The dependent variable is the ratio of bodily injury liability losses incurred to property damage liability losses incurred and proxies fraud.