Does Sorry Work?

The Impact of Apology Laws on Medical Malpractice

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ABSTRACT

Apologies made by physicians for adverse medical events have been identified as a mitigating factor in whether patients decide to litigate. However, doctors are socialized to avoid apologies because apologies admit guilt and invite lawsuits. An "Apology Law," which specifies that a physician's apology is inadmissible in court, is written to encourage patient-physician communication. Building on a simple model, we examine whether apology laws at the State-level have an impact on malpractice lawsuits and settlements. Using a difference-in-differences estimation, we find that State-level apology laws could expedite the settlement process and increase the number of settlements by 15% within 3 to 5 years of adopting the laws. Using individual level data, we also find that apology laws have the greatest reduction in average payment size and the settlement time on cases with more severe patient outcomes.

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[1] Please do not cite without authors' consent.

"It's sad, so sad
Why can't we talk it over?
Oh, it seems to me
That sorry seems to be the hardest word"

~ "Sorry Seems to Be the Hardest Word": *Elton John*

1. Introduction

Healthcare costs are a growing popular concern in the United States. Many reports identify the rising number of medical malpractice lawsuits, the corresponding increase in medical malpractice insurance premiums, and the widespread practice of defensive medicine as the main factors that contribute to the rising cost of health care.[2] In response, national and State legislatures have proposed and enacted legislation to put in place a number of reforms, including jury award caps, insurance premium price caps, State medical malpractice funds, greater information disclosure, and of particular relevance here, apology exemptions. In 1986, Massachusetts became the first State that adopted some form of "Apology Law," which designed to protect statements made to victims of accidents. More recently, these "Apology Laws" specifically declare that a statement of apology made by a medical practitioner to a patient is inadmissible as evidence of liability in court. In September 2005, then Senators Clinton and Obama co-sponsored the National MEDiC Act, which would have implemented such exemptions at a national level. As of January 2009, 36 States have implemented various forms of "Apology Laws."

All of these apology laws are premised on two stylized facts. The first fact is that doctors would like to apologize to their patients for medical mistakes, but are stymied by their fear of inviting a lawsuit. Research shows that doctors are typically told to avoid admissions of fault and apologies because of the risk of lawsuits (Lamb et al., 2003; Novack et al., 1989; Pinkus, 2000). The second fact is that a main motivation patients give when asked why they chose to sue their doctors is anger, and that anger would have been assuaged by an apology (Hickson et al., 1992; May and Stengal, 1990; Vincent et al. 1994). These two facts lead to a vicious cycle, breaking down patient-doctor communication which increases

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[2] For more discussion and overview on medical malpractice see Sloan and Chepke's book "Medical Malpractice" (2008).

litigation costs. By making apologies inadmissible as evidence, it is hoped that doctors would communicate with patients more, thus reducing confusion and patient's anger in case of adverse events and therefore reduce the cost of medical malpractice (Cohen, 2003).

To date, this paper is the first economic study that investigates the impact of the State-level apology legislation on settlements and malpractice payments.[3] In legal studies, apologies have been found to have an important impact on the outcome of many legal cases. Unsolicited apologies can have an impact on conviction rates as well as sentence and judgment sizes (Rehm and Beatty, 1996). Some studies give subjects hypothetical situations and report that apologies may reduce their likelihood to litigate (Mazor et al. 2004; Robbenholt, 2003; Wu, 1999; Wu et al. 2009). The studies that are closest to our current research are a few studies in the medical/legal literature. These studies examined the apology programs in individual hospitals in Pennsylvania (Liebman and Hyman, 2004, 2005) or in Tennessee (Kraman and Hamm, 1999) and find that programs that encourage effective apologies and disclosure of mistakes can dramatically reduce malpractice payments. Most notably, the study done at the University of Michigan Health Service reports that their per-case payments decreased by 47% and the settlement time also dropped from 20 months to 6 months since the introduction of their 2001 apology and disclosure program (Boothman, 2006). While the findings associated with hospital-level apology programs are promising, one is uncertain of the generalizability of these results. The decision as to why these hospitals became pioneers in implementing such programs could be endogenous. Or, there could be other concurrent reforms at the hospital level, as such programs are often implemented by a charismatic and reforming administrator. Therefore, the true effect of apologies on medical malpractice litigation could be overestimated and the external validity of these studies is in question.

In our study, we examine the impact of State-level apology legislation. We use data from the National Practitioner's Databank Public Access File (2009), which includes the universe of medical malpractice payment made by or on behalf of a healthcare provider since 1991. Our analysis is conducted

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[3] There is an extensive literature investigating the impact of tort reform on settlement and payment (Danzon 1984, 1986; Durrance, 2009; Browne and Puelz 1999; Yoon 2001), but to our knowledge, apology laws have always been ignored in past studies.

at two levels. The first is a difference-in-differences analysis using the time variation from the staggered implementation of State-level apology laws to investigate the impact on total number of settlements and payments within a State-year. We further explore the change of case composition by the severity of injury. The other is at the individual level, where we conduct a duration analysis on the impact of apology laws on time to resolution. We further investigate the impact of apology laws on payments and how the size of the impact depends on the medical outcome of a case. Similar to the concern raised earlier about the hospital level apology policy, one may be concerned that the passing of apology laws at the State level could also be endogenous, which would result in a biased estimate. To address these concerns we perform various robustness checks and the results remain consistent.

The analysis suggests that the apology laws could increase the number of closed settlements by about 10-15% in the short run (3-5 years). One can attribute the increase to several reasons. Most notably, the increase can be due to an overall increase in the number of claims or it could be due to faster settlement time. Consistent with theory, we find evidence that suggests that the overall increase in closed cases is due to faster settlement time while the total number of cases is declining. For example, on the subset of cases involving insignificant injuries—the cases which are most likely to resolve in the 3 to 5 years of available data—we see a 16 to 18% reduction in total cases. When we investigate the impact by the severity of medical outcomes, the duration analysis results suggest that conditional on the cases resolving before 2009, the cases with most severe outcomes are 25% more likely to settle at any time in States that have the apology laws relative to States that do not. As for the dollar amount of settlement, again conditional on the cases resolving before 2009, apology laws reduce the settlement of the most severe cases by $58,000 ~ $73,000 per case and "somewhat" severe cases by $7,000~$14,000 per case. In sum, we find that apology laws, at least in the short run, induce faster settlements and lower payments for the malpractice cases with the most severe outcomes. Also, while we do not observe the composition of cases that have yet to settle, the evidence suggests that these effects should persist.

The remainder of the paper proceeds as follows: in Section 2, we provide background on apology laws. In Section 3 we provide a model. Section 4 describes out dataset. Is Section 5, we discuss our empirical specification and present our findings. Section 6 concludes.

2. Background of Apology Law

As of January 2009, apology laws have been enacted in 36 States, and all were enacted between 1999 and 2008 except for Massachusetts, whose law dates to 1986. Table 1 lists all State legal codes pertaining to medical apologies.[4] A crucial identifying assumption in our analysis is that the passage of the laws are not correlated with any other event that affects medical litigation. An obvious possibility is the passage of other tort reform laws. Table 2 shows that the timing of other medical malpractice tort reform is generally not correlated with passage of apology legislation, though as a precaution we include the timing of the other tort reforms studied by Currie and McLeod (2008) as controls.[5] Unlike other tort reforms which have predominantly been a Republican issue (Durrance, 2009), apology laws are not disproportionately supported by any particular political party.[6] Also, apology laws have anecdotally been passed due to the effort of individual activist pressure rather than systemic changes in the litigation environment which means the laws are unlikely to be correlated with other changes that affect litigation.

The laws are mostly copied from similar templates. The apology law from Connecticut serves as an example. The Connecticut law states that

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[4] California, Massachusetts, Florida, Tennessee, Texas and Washington have general apology statutes that apply across all industries while the other 30 States have specific laws that only protect the statements of apology made by health care providers. The States can be first divided into two types depending on the applicability of these laws: general versus health practitioners' only. We perform an F-test checking whether we can group the general versus health-care only laws together, the F-test fails to reject the null hypotheses that these two types of apology laws have the same impact. Therefore in our analysis, we are not going to differentiate between general and health care only laws.

[5] The other tort reform measures that we have controlled the timing for in our study include the existence of noneconomic cap, punitive cap, law on full information disclosure, joint and several liabilities and collateral source rule. The information on the existence of the laws (excluding information disclosure laws) is from the annual produced by American Tort Reform Association. The information on the disclosure laws is from Gibson and Del Vacchio (2006).

[6] In regressions not reported here, we find that State political composition in the State Senate and the State House, has no significant explanatory power on the passage of apology laws.

"In any civil action brought by an alleged victim of an unanticipated outcome of medical care, or in any arbitration proceeding related to such civil action, any and all statements, affirmations, gestures or conduct expressing **apology, fault, sympathy, commiseration, condolence, compassion or a general sense of benevolence** that are made by a health care provider or an employee of a health care provider to the alleged victim, a relative of the alleged victim or a representative of the alleged victim and that relate to the discomfort, pain, suffering, injury or death of the alleged victim as a result of the unanticipated outcome of medical care shall be inadmissible as evidence of an admission of liability or as evidence of an admission against interest."
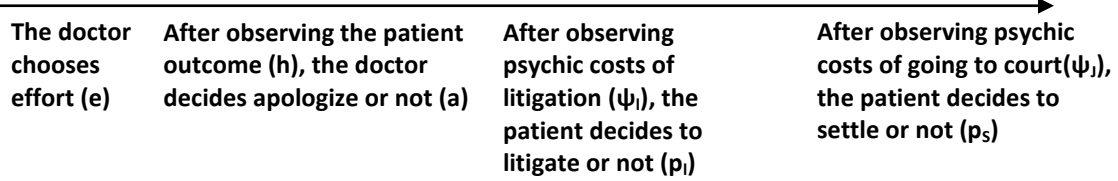
Depending on the State, there is a slight variation in the types of statements that are protected by these statutes. Protected statements typically include a combination of apology, fault, sympathy, commiseration, condolence, compassion, fault, mistakes, errors and liability. In the legal literature, some studies divide apology laws into one of two categories: 1) full apology laws that protect against all types of apologies including those that contain statements of fault, mistakes, errors, and liability versus 2) partial apology laws that only protect against statements of sympathy, commiseration, condolence, compassion.[7] An F-test fails to reject the null hypotheses that full and partial apology laws have the same impact. Therefore in our analysis, we will not differentiate the two.

3. Theory

To illustrate the mechanisms that we are analyzing, consider first the simplest possible model of how doctors decide to apologize and how patients decide to litigate and to settle. Previous models of apologies (Ho, 2009) and litigation (Farber and White, 1994; Spier 2005; Daughety and Reinganum, 1993, 2000) have focused on asymmetric private information, but these assumptions introduce considerable complications to the analysis that we will return to at the end of this section.

Consider a situation where there are two players: a patient/plaintiff (P) and a doctor/defendant (D) who play a game of healthcare provision, apology, and litigation with the following timeline:

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[7] The divisions between full and partial apology are arguably ill-defined. A paper by McDonnell and Guenther (2008) reports 8 States as having full apology laws; whereas an article by Morse (2009) reports only 5 States as having full apology laws.

The doctor chooses effort (e)	After observing the patient outcome (h), the doctor decides apologize or not (a)	After observing psychic costs of litigation (ψ_l), the patient decides to litigate or not (p_l)	After observing psychic costs of going to court(ψ_J), the patient decides to settle or not (p_S)

The patient's health outcome $h(e, \varepsilon)$[8] depends on the doctor's effort, e, which can be thought of as whether the doctor adhered to the standard of care ($e = \bar{e}$), but it also depends on the patient's circumstances, represented by a noise term, $\varepsilon \sim F(\varepsilon)$, which is unobserved by the doctor when deciding effort. We will assume for now that the doctor always adheres to the standard of care ($e = \bar{e}$), but later we will consider the possibility that the doctor's efforts may depend on the incentives created by the threat of malpractice payments. The doctor then decides whether to apologize ($a = 1$) or not ($a = 0$).[9]

The cost of an apology for the doctor is that an apology can be used as evidence against them in court. If litigation occurs, since the court cannot observe the doctor's effort, we assume that the expected judgment, $J(h, a)$[10], is exogenously decreasing with better health outcomes and exogenously increasing with the doctor's apology (Sloan and Hsieh, 1990) since the apology can be used as evidence (Rehm and Beatty, 1996). We consider the implications of endogenizing the judgment size in the next section.

The benefit of an apology to the doctor is that it increases the psychic cost of litigation. Numerous case studies suggest that anger is a main motivator for litigation that can overcome the patient's aversion to litigate (Hickson et al., 1992; May and Stengal, 1990; Vincent et al. 1994). Studies also find apologies reduce anger, increase communication and reduce the motivation to sue (Ohbuchi et al., 1989; Liebman and Hyman, 2004, 2005; Sloan and Hsieh, 1995). We capture these psychological factors by saying there is a psychic disutility of initiating litigation, $\psi_l(a)$, and a psychic disutility for going to court, $\psi_J(a)$. Both disutility would increase if the doctor apologizes. These psychic costs are modeled as random

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[8] Higher h indicates better health. It is increasing with e, the doctor's effort.
[9] In this model, even though doctors adhere to the standard care procedure, since the court cannot observe the level of care, they might still want to apologize if apology helps reduce the probability of litigation. Patients could still sue the doctors as long as the utility from litigation is higher than the disutility from litigation.
[10] This is the amount that the patient receives and the doctor required to pay after accounting for the probability that the patient wins.

valued functions of whether a doctor apologizes where $\psi_i\,(1)$ first order stochastically dominates $\psi_i\,(0)$ for $i \in \{l, j\}$. For now we assume that apologies exogenously increase the patient's psychic disutility to litigate, but discuss alternatives where apologies serve as signals in the next section.

After the doctor apologizes (or not), the patient observes the realization of his psychic disutility of litigating. It is now the patient's turn to decide whether to litigate and to settle. We define p_s as the probability the patient decides to settle, p_l as the probability the patient decided to litigate and c_p as the economic cost of going to court.

Solving then by backward induction, the patient decides to settle if the benefit of settling, $S(h, a)$, is greater than the benefit of going to trial $J(h, a) - c_P - \psi_J(a)$. How the settlement is determined relative to the judgment size typically depends on a bargaining game that we will abstract away from here. Here we just say that that settlement, $S(h, a)$, is some fraction of the judgment size, $S(h, a) = \lambda J(h, a)$ where $\lambda \in [0,1]$.

If the patient decided to litigate, then the probability of settling is

$$p_s = \Pr\Big[S(h, a) > \big[J(h, a) - c_P - \psi_J(a)\big]\Big] \qquad (1)$$

From here, we can take a step back and compute the expected malpractice payment to be equal to the expected value from settling plus the expected value from a judgment minus the costs (both psychic and economic) of going to court:

$$E\Big[p_s S(h, a) + (1 - p_s)\big(J(h, a) - c_P - \psi_J(a)\big)\Big] \qquad (2)$$

The patient's probability of litigating, p_l, then is given by the probability the expected malpractice payment is greater than the psychic disutility of litigating:

$$p_l = \Pr\Big[E\Big[p_s S(h, a) + (1 - p_s)\big(J(h, a) - c_p - \psi_J(a)\big)\Big] > \psi_l(a)\Big] \qquad (3)$$

Consistent with the empirical evidence found by Sloan and Hsieh (1995), equation (3) predicts that patients are more likely to litigate given more serious health outcomes.

To summarize, patient utility depends on his health plus expected malpractice payments net of litigation and psychic costs, while doctor utility depends on her cost of effort minus expected malpractice payments and the doctor's economic costs of litigation (c_D):

$$U_P(l,s) = h(e,\varepsilon) + p_l \left[p_s S(h,a) + (1-p_s)\left(J(h,a) - c_P - \psi_J(a)\right) - \psi_l(a) \right] \quad (4)$$

$$U_D(e,a) = -e - p_l[\, p_s S(h,a) + (1-p_s)(J(h,a) + c_D)]$$

Doctors will apologize if and only if $U_D(\bar{e}, 1) \geq U_D(\bar{e}, 0)$. Note that a rational doctor will only apologize if the apology reduces his expected costs from litigation. Therefore, it follows that the probability the patient litigates, p_l, must go down in the event of an apology.[11] The impact of an apology on the probability of settlement is ambiguous since apologies increase the psychic cost of going to trial but by providing the patient with more evidence to use against the doctor, apologies also increase the potential judgment that would be awarded.

Introducing Apology Laws

Now suppose the legislature passes a law that excludes apologies as evidence in court. Assume that the law has no effect on how apologies affect psychic costs and that the only effect of an apology is to reduce judgments such that the new expected judgment function, $\hat{J}$, treats all cases as if no apology was ever tendered: $\hat{J}(h,1) = \hat{J}(h,0) = J(h,0)$. We will examine how introducing asymmetric information changes both of these assumptions later in this section.

Staying with the symmetric information case, the law has no effect on the doctor's payoff when he does not apologize, but when he does apologize, the patient is unambiguously more likely to settle and less likely to litigate, reducing the size of the expected medical malpractice payment. Consider the

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[11] A doctor only apologizes if the size of his expected malpractice costs $p_l[\, p_s[S(h,a)] + (1-p_s)(J(h,a) + c_D)\,]$ is decreasing in apologies. Assume for the sake of contradiction that p_l increased with a, then that would imply expected payments also increased, because the apology made the psychic cost of litigation go up, so the patient would only litigate if expected payments went up. But if that were the case, then the doctor would never apologize. Therefore, p_l must be decreasing in apologies.

expression for p_s. Rearranging terms, a patient chooses to settle if the cost of seeking a court judgment outweighs the benefit of seeking a court judgment:

$$p_s = \Pr[c_p + \psi_J(a) > J(h,a) - S(h,a)] \quad (5)$$

After substituting $S(h,a)$ with $\lambda J(h,a)$, we can rewrite Equation (5) as

$$p_s = \Pr[c_p + \psi_J(a) > (1-\lambda)J(h,a)] \quad (6)$$

Equation (6) shows that a patient settles if the cost of going to court is greater than the incremental benefit of seeking a judgment. Apology laws reduce the benefit of seeking a judgment, without affecting the costs, thus patients settle more often. Furthermore, going back to Equation (3), a patient decides to initiate litigation if the expected benefit from litigation outweighs the costs of litigation. Apology laws reduce judgment sizes and increase settlements, both of which decrease the benefits from litigation, thus the probability the patient litigates decreases as well.

Also given symmetric information and risk neutral parties, the welfare implication of the law is unambiguous: since for now we assume that doctor effort is unaffected, litigation results only in transfers from the defendant to the plaintiff and the deadweight loss of the cost of litigation ($c_P + c_D$). Thus the reduced likelihood of litigation means the law must increase welfare.

If we make additional assumptions about the distribution of psychic costs, then we can say more. Assuming the psychic costs are uniformly distributed, the model predicts that the apology law would increase the probability of settlements relative to going to trial more for the cases with higher expected malpractice payments, and for the cases where patients have relatively less pre-trial bargaining power,[12] which might occur when the patient has less evidence of wrong-doing and needs a trial to obtain it. Similarly, these same conditions that lead to a larger increase in the probability of settlements also lead to a corresponding decrease in the probability of litigation.

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[12] If we assume that ψ takes on the uniform distribution that is shifted by α in the case of an apology such that $\psi \sim [\underline{\psi}, \bar{\psi}]$ if there was no apology and such that $\psi \sim [\underline{\psi} + \alpha, \bar{\psi} + \alpha]$ if there was an apology. Since we know from the patient's utility function that he will settle if $p_s = \Pr[c_p + \psi_J > (1-\lambda)J(h,a)]$, then we can say that $p_S(a=1) - p_S(a=0) = -[(1-\lambda)[J(h,1) - J(h,0)] - \alpha]$. Introducing the law means that apologies no longer affect judgment sizes $\hat{J}(h,1) = \hat{J}(h,0)$, so the first term goes away and we are left with $p_S(a=1) - p_S(a=0) = \alpha$. Thus the change in the probability of settlements is given by : $(1-\lambda)[J(h,1) - J(h,0)]$

With an overall decrease in the number of lawsuits, and an increase in the number of settlements (relative to going to court), the cases that make it to a court judgment should on average be more severe. However, examining two cases with the same characteristics before and after the law, the law reduces the amount of evidence available to the plaintiff and thus should reduce the size of the expected judgment payment.

Introducing private information

The preceding analysis presumes there is no private information between players. Much of the past theoretical literature on malpractice litigation has focused on asymmetric information, and thus introducing private information is important for increasing the validity of the model. Unfortunately, private information also makes most of the model's predictions indeterminate.

The obvious place to introduce private information is to introduce moral hazard into the doctor's effort. The doctor knows whether she adhered to the standard of care, i.e. her effort, but the patient and the courts cannot directly observe it. To ensure a range of efforts are provided, the model needs heterogeneous doctor types, where different doctor types have different marginal costs of effort. The consequences of such moral hazard on the effects of the apology law are numerous.

One consequence is that the welfare effects become ambiguous, because as noted by Polinsky and Rubinfeld (1988), malpractice litigation is an important deterrent to moral hazard. By reducing the expected malpractice payments a doctor faces, apology laws could reduce doctor effort. This increase in moral hazard is echoed by Cohen (2002) who worries that the predicted decrease in lawsuits filed will have a detrimental impact on the natural process of remediation. Already, very few cases of medical malpractice come to trial (Huycke and Huycke, 1994). One could argue that since these lawsuits are essential for restorative justice and efficient monitoring, welfare would be enhanced if there were more lawsuits, not fewer.

A second possible consequence, in a world where patients are imperfectly informed about their own health and doctors have private information about the health outcome, is that an apology could lead

to the disclosure of health information that informs the patient about his chance of winning a lawsuit. However, a rational doctor would only apologize if the apology reduced his expected medical malpractice payment, and thus the law should still reduce malpractice payments.

However, if the law leads to a potential devaluation of the apology, then it could have ambiguous effects on malpractice payments. Ho (2009) analyzes a more general model of apologies and shows that the impact of an apology is increasing in the cost of tendering it.[13] By reducing the potential consequences of an apology, the laws make apologies less effective, potentially increasing lawsuits and decreasing welfare. Such concerns are echoed on legal and ethical grounds by Taft (2002) who argues that apology laws reduce the moral weight of apologies. Consider the following scenario that illustrates this counter-intuitive result. In the event of a medical error where there is no law, an apology would have satisfied the patient and removed his desire to litigate. But if an apology law were in effect, a lawyer might tell the patient that the doctor only apologized because she had been protected, prompting the patient to litigate anyway. Furthermore, in States where the law has made apologies easier to tender, the lack of an apology could become more offensive to the patient, since the doctor no longer has the lawsuit as an excuse for not apologizing.

The impact on settlement is also affected by private information. The impact depends crucially on the assumptions about the negotiation and settlement process (Spier 1992; Bebchuk, 1984). Settlement offers could both serve to screen or to signal. (Spier, 1994; Daughety and Reinganum, 1994). Though if

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[13] Ho (2009) also predicts where apologies would be most prevalent and therefore one might expect the apology laws to have greatest impact. For example, theory predicts that apologies are more prevalent when the patient has greater uncertainty about the doctor's abilities. Thus one might look at specialties where the doctor's effect on the outcome is more difficult to observe. The theory also suggests that apologies are more important when reputations are less well established, and thus one would expect younger doctors to apologize more. Also, the differential importance of reputation means that apologies potentially play a bigger role in specialties such as Obstetrics/Gynecology (OB/Gyn) where patients shop more for their doctors, as opposed to specialties such as Emergency Medicine where typically circumstance dictates which doctor the patient sees. Apologies are more important in long relationships and repeated doctor patient interaction, thus one would expect larger effects in oncology which has a long course of treatment rather than in anesthesiology or medical equipment. The theory predicts that conditional on there being a mistake; competent doctors apologize more than incompetent doctors. One would expect that doctors with fewer prior offenses or State licensing actions are more likely to apologize than doctors with more prior offenses. Finally, the theory predicts that apologies are more effective when outcomes are less severe, thus apologies are more effective for emotional injuries or minor temporary injuries rather than cases of major permanent injury of death.

the law does increase information disclosure to the patient models tend to predict that asymmetric information discourages settlement, and the law could be expected to increase settlement (Spier 2004).

Thus, while the theory offers some guidance on the effects to expect, the net effect of apology laws on whether they increase or decrease medical malpractice litigation and whether the laws increase or decreases malpractice settlements becomes an empirical question that this paper intends to resolve.

4. Data

To assess the impact of these various types of apology laws, we use data drawn from the National Practitioner Databank (NPDB) Public Use Database (2009). Due to the *Federal Health Care Quality Improvement Act*, all payments—either as part of a settlement or as part of a court judgment—made by or on behalf of a licensed health care provider must be reported within 30 days. The NPDB contains the universe of all settlements with non-zero payment and it provides additional information about each claim beyond payment size. For each claim, there is information about the year of incident, the nature of the allegation (e.g. diagnosis related, anesthesia related, surgery related, etc.), the outcome of the incident (e.g. emotional injury, minor temporary injury, major permanent injury, death, etc.) [14], the graduation year and age group of the practitioner, work state and license state of practitioner, and whether the payment was for a judgment or a settlement. This dataset has been widely used in many studies related to medical practice (see Baicker and Chandra, 2005; Matsa, 2007; Durrance, 2009).

We restrict our analysis to the reports in which adverse events occurred after 1991 due to the incomplete reporting in the earlier years. Table 3 provides summary statistics at the individual level. There are a total of 225,319 payment reports in our sample.[15]

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[14] The outcome variable had only become mandatory for recording since 2004. These categories of injuries are reported by the entities that make payments to patients.
[15] The NPDB data is not free from problem. It has been criticized because of a "corporate shield" loophole, where settlement payments made on behalf of a practitioner where the practitioner's name has been excised from the settlement is not included. Chandra et al. (2005) compare data from the NPDB with other sources of malpractice information and while they find approximately 20% underreporting, they find that underreporting is not systematically different across States. Therefore, for our analysis, which is extracting information at the State level, there is also no obvious reason why corporate shield loophole would bias the effects of the apology legislation. Also,

In Figure 1, we present the number of settled cases by the year the event occurred and the average number of years it take to settle. Since the NPDB only has information about an offense/omission when the payment was made, the dataset is truncated for offenses/omissions that occurred late in the dataset but have yet to be resolved. For example, as evident in Figure 1, fewer than 1,000 offenses that occurred in 2007 are included in our data since the rest have yet to be settled. Therefore, the interpretation of regression results requires extra caution, which will be addressed in the analysis section.

Besides the individual level data, the NPDB was used to generate an aggregate dataset where an observation is at the State-year level. We establish two measures at the State level. One is the total number of settlements made by practitioners working in a given State for an offense committed in a given a year.[16] Another is value of malpractice payments made by medical practitioners in a given State for an offense committed in a given year.[17] Table 4 presents summary statistics for the dataset. With 51 States (including the District of Columbia) and 17 years (1991-2007), there are 867 observations in the State-level dataset.[18] In 2000, the median number of incidents per State-year is 184, the median total value of payments in a given State-year is $35.7 million. Note that the average time to settlement is 3.86 years with a standard deviation of 2.15. Longer settlement times are associated with cases that involve more severe injuries. This variability in settlement time will be crucial for understanding our results. In Figure 2, we present a histogram of settlement times for cases that occurred in 1992 so that we can be reasonably certain that this represents a fairly complete distribution of cases.

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the NPDB dataset has been used for most recent influential studies of medical malpractice reform (Currie and McLeod, 2008)

[16] Another way to construct the State-level dataset is by the total number of settlements made in a given year. Our goal is to analyze the impact of apology law, which intends to encourage the apology made by practitioners and communication. The impact on the settlement is hinged upon the apology. While the model in Section 2 cannot distinguish the timing of apology, the apology is likely to be most effective soon after the incident occurs, not a few years later. Therefore, we aggregate it by the year of incidents instead of the year of settlement.

[17] We adjust the settlement by CPI, so all payments are in Y2000 dollar.

[18] We have excluded all cases occurred in 2008 since only less than 100 cases occurred in 2008 have settled by 2009.

5. Empirical Specification and Results

The effect of apology laws on medical malpractice outcomes is estimated using a difference-in-difference method. The validity of this specification rests on the assumption that these States that have passed the law would have otherwise followed the same trend as the States that have not passed the law. Therefore, we perform various checks to examine the validity of the assumption. To ensure that it is not a correlation with other malpractice laws that drives our results, we will include controls for other tort reforms as studied by Currie and MacCleod (2009) in each of our specifications . Also, in each specification, we cluster standard errors by State to avoid the problem of serial correlation (Bertrand, Duflo, Mullainathan, 2004).

State Level Analysis

We employ OLS to estimate the following

$$\log Y_{st} = controls_{st} + \beta \; apology_{st} + \sum_t \delta_t Year_t + \sum_s \delta_s State_s + \varepsilon_{st}$$

There are two main outcome variables. One is the natural log of the number of already-settled malpractice cases for State s for incidents that occurred in year t, the other one is the natural log of the value of payments for State s for incidents that occurred in year t. *apology* is a dummy variable which is one if an apology law was in effect in State s during that year t and zero otherwise. Our main coefficient of interest is β which represents the percentage change in the number of closed cases due to the adoption of the law.

The results are presented in Table 5. Columns 1 and 4 are presented without controls, Columns 2 and 5 add a full set of social policy changes (the existence of noneconomic cap, punitive cap, joint and several liabilities and collateral source rule, and law on full information disclosure) while Columns 3 and 6 include a set of time-varying State demographics, including numbers of physicians in the State, racial compositions, population, and percentage of population that are 65 or above. The results show a consistent 14~15% increase in the number of payments related to malpractice settlements. While the

model and reformers expected the law to decrease the amount of medical malpractice litigation, the model also predicts an increase in the probability that a case leads to a settlement. Assuming that a settlement leads to a faster resolution of cases, that should increase the total number of settlements in the first few years after a law has been passed (see Figure 3). The results for total payments also show an increase of 20-27%. The fact that the percent increase shown in Columns 4-6 is larger than those in Columns 1-3, suggests that the payment per case has increased after the law is enacted. While this may seem to be a surprising result, it is consistent with the later finding that the apology law has caused a change in the composition of cases which settle within the first few years after an adverse medical event occurs.

To further investigate the full dynamic response of the medical malpractice cases settlement to the law change, the following OLS regression is estimated where we introduce additional indicator variables $apology_{st}^{j}$ which signifies whether a law has existed in State s, for j years at time t:

$$\log Y_{st} = controls_{st} + \sum_{j} \beta_j \, apology_{st}^{j} + \sum_{t} \delta_t \, year_t + \sum_{s} \gamma_s \, state_s + \varepsilon_{st}$$

Table 6 presents the results where the outcome variables is the natural log of number of cases per State in Columns 1, 2 and 3 while the outcome variable is the natural log of the total malpractice payments made in each State in Columns 4-6. The coefficients demonstrates that the law's effect is minimal in the first year after enactment, with the effect increasing until year four (the median settlement time for a malpractice case in the dataset), and decreasing afterwards, consistent with the shift in settlement time sketched in Figure 3. Unfortunately, most of the laws are too recent to extend the analysis beyond 5 years.

It should be noted that the interpretation of the large settlement increases should be tempered by the fact that since most of the apology laws were passed after 2004, and these results are only for the effect of laws conditional on settlement before 2009. From Figure 1, we see there are relatively few settlements observed within four years and thus the 49%-53% increase in observed settlements caused by the law likely accounts for only a small fraction of the total events that occurred in that year.

We further investigate the cause of the increase by looking into the composition of cases settled in Table 7. The dependent variable is the log number of cases in each medical injury category (i.e. insignificant injury, 'somewhat' significant injury and major permanent injury/death).[19] Restricted by the sample of cases that occurred after 2002[20], Table 7 shows that the overall increase in settlements observed is due entirely to the increase of settlements for Major/Permanent Injury and Death. For Insignificant Injuries, which normally settle quickly enough to see the laws' full effect, we see a net reduction in the number of cases of 16.7%-18.5% as predicted by theory. The results in Table 7 suggest that after passing the law, there is an overall decrease in the number of the least significant injuries, but a short-term increase in the cases that normally take years to resolve. This is consistent with Figure 3A and Figure 3B where the apology laws cause a shift of case settlement distribution to the left.

Individual Level Analysis

Since we have data on the year when the incident occurred and the year it settled, hazard models provide a natural framework for modeling settlement probabilities (e.g., Hannan and McDowell, 1984). Let t be the time elapsed from the time of incidents to settlement. $X_i(t)$ be a vector of relevant explanatory variables and β be a vector of coefficients. Denoting the cumulative density function as $F_i(t|X,\beta)Prob\ (T \leq t|X,\beta)$ and the density function as $f_i(t|X,\beta)$, the hazard function which indicates the probability of settlement at period t conditional upon no settlement by time $\{t-1\}$ is defined as $h_i(t|X,\beta) = f_i(t)/[1 - F_i(t)]$

The general form of the proportional hazard function is $h(t|X(t),\beta) = h_0(t)\ exp\{X'(t)\beta\}$ where $h_0(t)$ is the baseline hazard. We use a Weibull baseline hazard specification since our regression result has indicated the hazard is time-dependent:

$$h(t|X(t),\beta) = \delta_i t^{\delta_i - 1} exp\{X'(t)\beta\ \}$$

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[19] In the NPDB, there are 9 categories of injuries, and we group them into 3 categories for the ease of analysis and presentation (see Table 3 for subcategories).
[20] Medical outcome variable is only available for cases report after 2003. For similar analysis done divided by the size of payment, see Appendix Table A1.

In Table 8, the hazard ratio from the above regressions are reported. To interpret the coefficient, one needs to be cautious that the hazard ratios reported are conditional on resolution. Here, we see the law has no significant effect on the speed of resolution for Insignificant Injuries whereas for a case involving a Major/Permanent Injury, conditional on resolution, the probability it resolves in any given year is increased by 24%-25% when the law is in effect.

In Table 9, we consider the impact the law has on the dollar value of malpractice payments using a difference-in-difference model. We find that the payment amounts would be reduced by approximately $17,000 to $27,000 after the law is adopted for the somewhat severe case and $56,000~$73,000 after the law is adopted for the most severe case.[21]

Taken together, Tables 7, 8 and 9 suggest that the law is consistent with the symmetric information model presented above as well as the framer's intent: the law's combined effect is to increase apologies and decrease expected settlement time, and should in the long term speed up settlements and reduce the total number and value of malpractice payments. We see that the law reduces the total number cases which tend to settled quickly, and reduces the payment size while increasing the settlement speed of major cases.

Our model does not directly offer predictions as to which specialties should be most impacted by the adoption of apology laws, nevertheless it is still interesting to examine whether there is differential impact in different subgroups. In the NPDB, there is no data on the specialties of physicians, but it does divide allegation natures into 11 categories: Diagnosis Related, Anesthesia Related, Surgery Related, Medication Related, IV & Blood Product, Obstetrics Related, Treatment Related, Monitoring Related, Equipment/Product Related, Other Miscellaneous and Behavioral Health Related. In Table 10, we interact the allegation natures categories with the apology law dummy, controlling for medical outcome, gender, age of the patients, experience of physicians, and timing of other tort reform. The results suggest that

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[21] Regressing the same specification on different payment size quantiles finds that the law has the largest effects on the 3rd quantile and no effect on the 1st and 4th quantile. The lack of effect on 4th quantile payments could be due to the fact that apologies are likely to be less important in cases worth millions of dollars, or that the largest cases take many years to resolve and are thus cases of this size have yet to resolve in most States where the law has been passed.

relative to the diagnosis-related cases, anesthesia, surgery and obstetrics-related cases would experience a greater reduction in payments. We also perform the same analysis controlling for the same set of covariates, but where our main coefficients of interest is the health practitioner's age. We find that compared to younger health practitioners, those who are between 31-59 year old experience a $25,000 ~ $30,000 payment reduction per case due to the adoption of apology laws.

Threat to Validity: Robustness Check

We examine the sensitivity of our results with a number of alternative specifications. First, we omit in turn each of the 36 States and each of the available year, and the regressions yield similar results, suggesting that the results are not driven by a single outliner or a particular year. Furthermore, median regression and population weighted least squires yields the similar positive significant results.

It could be worrisome if the effect of the States is spurious to the structure of the data or the time period that we estimate the data on. Therefore, we perform various robustness checks. First, we randomly assign half of the States as having adopted the law between 2000 to 2005 and estimate the same difference-in-difference regression. The results are presented in the Appendix Table A2. As we intend to interpret the result as a causal interpretation, we need to check to see if the increasing in settlements came after the adoption of the apology laws. Therefore, we include a series of lead dummy variables, which specifies whether an apology laws will be adopted in that State, 1 year, 2 years, 3 years, 4 years or 5 years in the future to our differences-in-differences specification. We find that all coefficients on the lead dummies are not statistically different from zero, suggesting that the effects that we find do not predate the passing of the apology laws. Lastly, for all the States that have adopted apology laws, we subtract three years from the year of adoption and perform the same analysis to capture any possible spurious effect attributable to properties of the States in question rather than to the laws themselves. The coefficients remain insignificant.

Our regressions above are analyzed based on the year the offense occurred because the laws largely only apply to apologies that were made for adverse events that occurred after the law was passed.

Also, arguably apologies are most effective shortly after the adverse event occurred, so medical errors that occurred years before the law was passed should be unaffected. As a robustness check, we provide a difference-in-difference analysis where the dependent variable is the natural log of settlements grouped by the year of settlements, and we find that laws have no impact on the on the incidents that occurred before the passing of the laws. The results are presented in Appendix Table A3.

6. Conclusion

We have demonstrated in theory and empirics that laws that exempt apologies from being used as evidence in cases of medical malpractice should increase settlements and decrease total litigation. We find that in the short run the law increases the number of closed and settled cases, while decreasing the average settlement payment for the cases with more significant and permanent injuries. While the short term increase in malpractice settlements could be a surprise to policymakers and advocates for the apology laws, we believe this is an artifact of data limitations. We find that apology laws reduce settlement time for protracted lawsuits (which normally take five years on average to settle), leading to more settlements in the short run as cases that would have taken six or more years to resolve are now being resolved is six or fewer. In the long run, we expect fewer cases overall once all cases have been accounted for.

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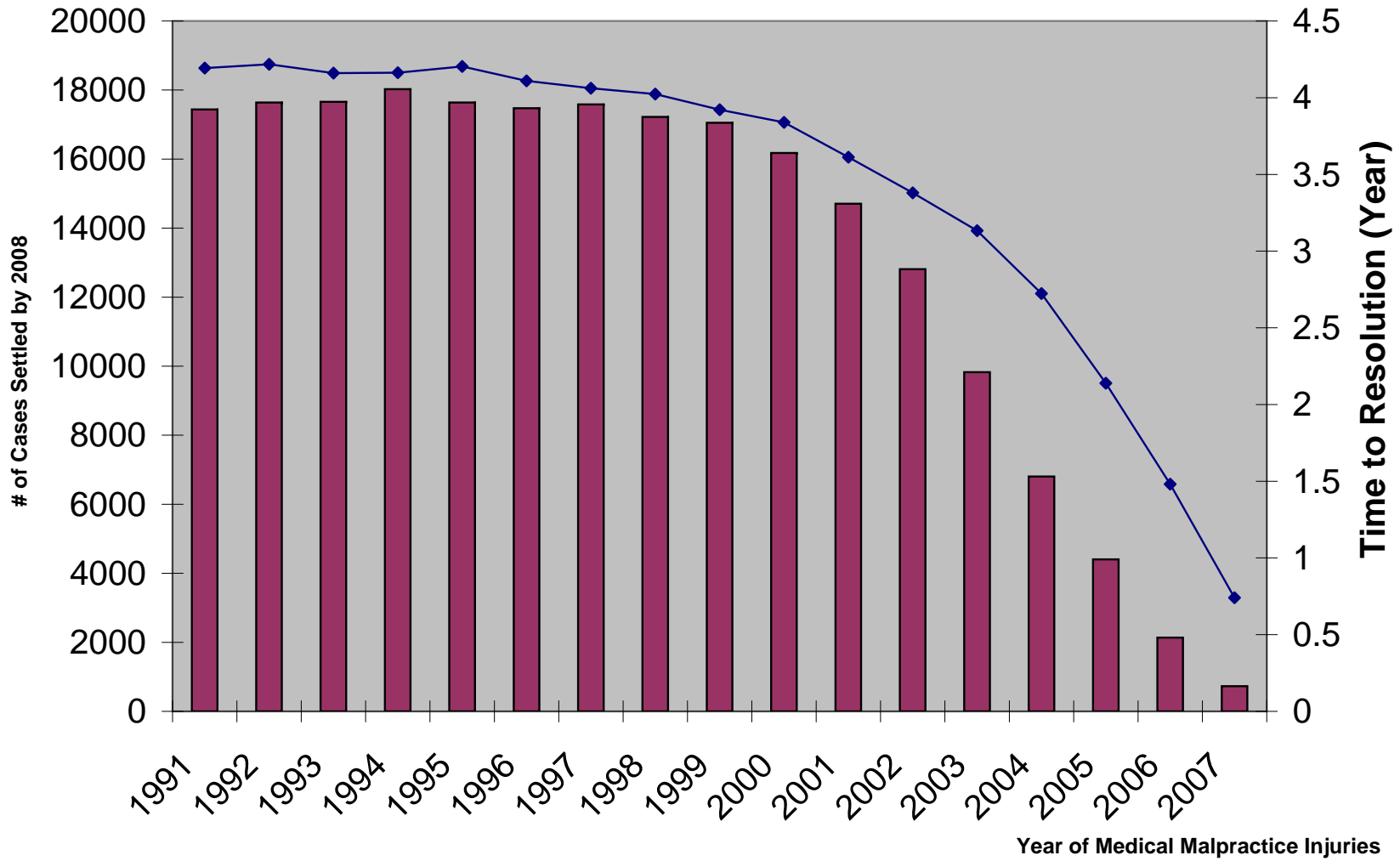Figure 1: Cases Settled By Year of Incidents

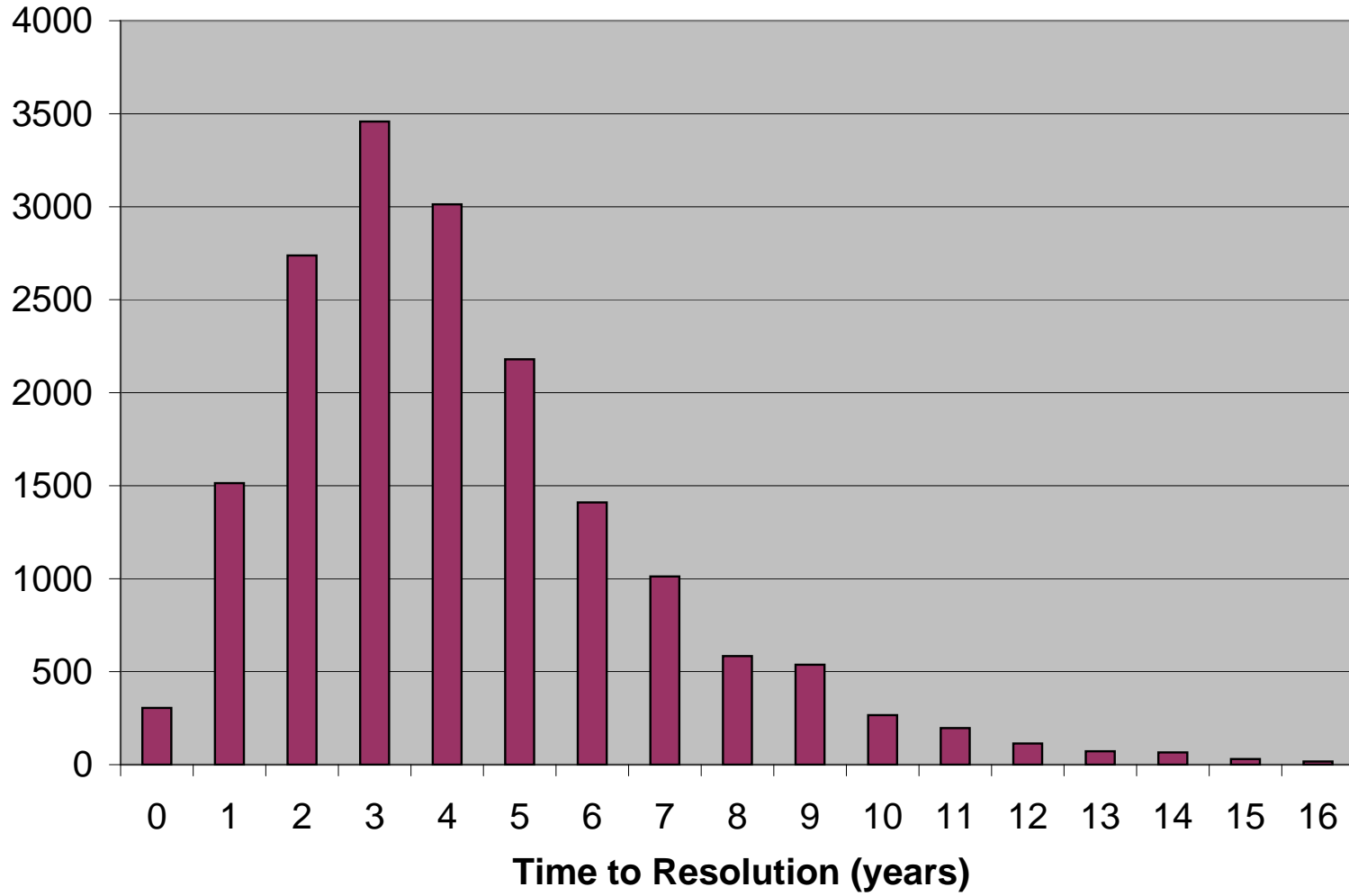**Figure 2: Histogram of Claims By Time to Resolution**
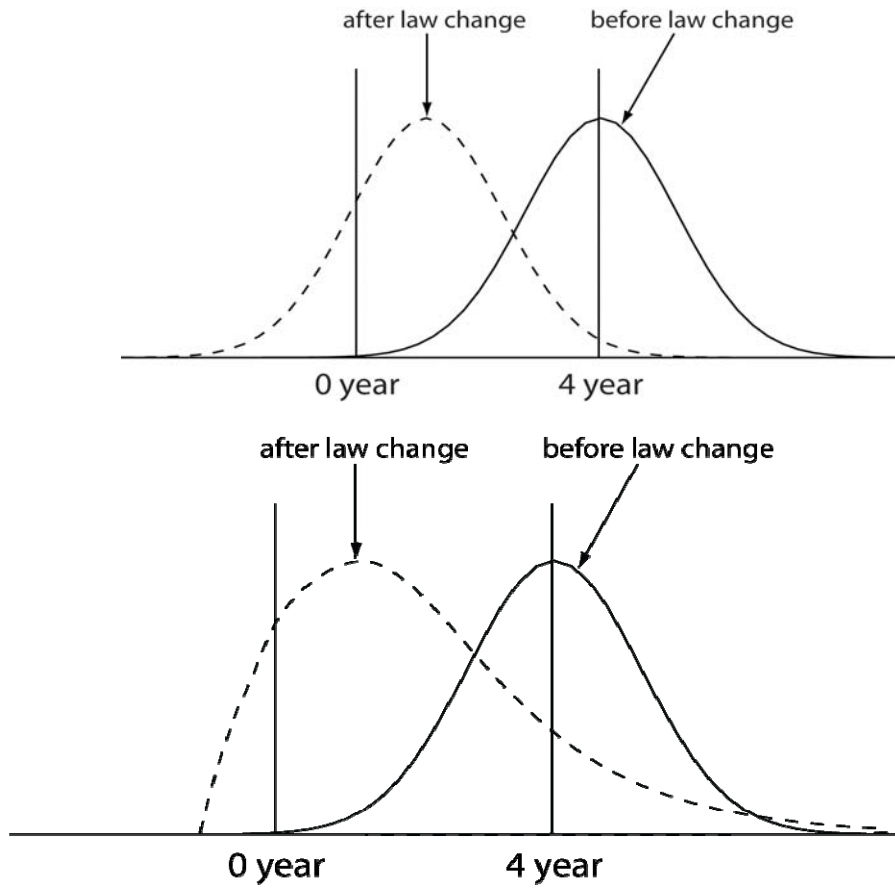
Figure 3: Two Scenarios of Shifting of Distribution

Table 1 State with Statutes Pertaining to Apology Law

State	Year Law Passed	Full Versus Partial	Statutes
Massachusetts	1986	Partial	ALM GL ch. 233, § 23D (1986)
Texas	1999	Partial	Tex Civ Prac & Rem Code Ann 18.061 (1999).
California	2000	Partial	Cal Evid Code 1160 (2000).
Florida	2001	Partial	Fla Stat Ann Ch 90.4026 (2004).
Washington	2002	Partial	Rev. Code Wash. §5.66.010(2002)
Tennessee	2003	Partial	Tenn. Evid. Rule §409.1
Colorado	2003	Full	Colo Rev Stat Sec 13-25-135 (2003)
Oregon	2003	Partial	Oreg Rev Stat Sec 677.082 (2003).
Maryland	2004	Partial	Md. COURTS AND JUDICIAL PROCEEDINGS Code Ann. § 10-920
North Carolina	2004	Partial	N.C. Gen. Stat. § 8C-1, Rule 413 (2004)
Ohio	2004	Partial	ORC Ann. 2317.43 (2006)
Oklahoma	2004	Partial	(63 Okl. St. § 1-1708.1H
Wyoming	2004	Partial	Wyo Stat. § 1-1-130
Connecticut	2005	Full	Conn. Gen. Stat. § 52-184d (2005)
Louisiana	2005	Partial	La. R.S. 13:3715.5 (2005)
Maine	2005	Partial	24 M.R.S. § 2907 (2005)
Missouri	2005	Partial	Mo.Rev.Stat §538.229 (2005)
New Hampshire	2005	Partial	N.H.Rev. Stat. Ann. § 507-E:4 (2005)
South Dakota	2005	Partial	S.D. Codified Laws § 19-12-14 (2005)
Virginia	2005	Partial	Va. Code Ann. §8.01-581.20:1 (2005)
Arizona	2005	Full	A.R.S. § 12-2605
Georgia	2005	Full	O.C.G.A. § 24-3-37.1
Illinois	2005	Partial	735 ILCS 5/8-1901 (2005)
Montana	2005	Partial	Mont. Code Anno., § 26-1-814 (2005)
West Virginia	2005	Partial	W. Va. Code § 55-7-11a (2005)
Delaware	2006	Partial	Delaware Del. Code Ann. Tit. 10, 4318 (2006)
Idaho	2006	Partial	Ida. ALS 204; 2006 Idaho Sess. Laws 204;
Indiana	2006	Partial	Ind. HEA 1112
Iowa	2006	Partial	Iowa HF 2716 (2006)
South Carolina	2006	Full	South Carolina Ch.1, Title19 Code of Laws 1976, 19-1-190 (2006)
Utah	2006	Partial	2006 Ut. SB 41
Vermont	2006	Partial	Vermont S 198 Sec. 1. 12 V.S.A. 1912 (2006)
Hawaii	2006	Partial	HRS section 626-1, Hawaii Rules of Evidence Rule 409.5
Nebraska	2007	Partial	Nebraska Neb. Laws L.B. 373 (2007)
North Dakota	2007	Partial	North Dakota ND H.B. 1333 (2007)
District of Columbia	2007	Partial	D.C. Code 16-2841 (2007)

Table 10: Change in Payment By Allegation Nature

	Value of Payment
Anesthesia	-65,066
	(29,004.545)**
Surgery	-19,218
	(9,146.214)**
Medication	-18,751
	(18718.375)
IV & Blood Product	35,064
	(48472.791)
Obstetrics	-88,968
	(45,384.762)*
Treatment Related	8,456
	(13864.155)
Monitoring Related	-25,346
	(20158.421)
Equipment/Product Related	8,950
	(26086.331)
Other Miscellaneous	-1,275
	(16156.876)
Behavioral Health Related	38,893
	(49428.881)
Other Law Change[a]	X
Other Covariates[b]	X
State-Year Fixed Effects	X
N	63640
R-squared	0.2

Note: The default category is diagnose related cases.

Table 2: Examples of Tort Reform Timing

	NE cap	PD cap	CSR	JSL	Disclosure	Apology
Texas	2003	1987	-	1987	-	2000
Maryland	1986	-	-	-	-	2004
Idaho	1987	2003	1990	1987	-	2007
North Carolina	-	1996	-	-	-	2004
Nevada	2002	1989	-	2004	2003	-

Source: American Tort Reform Assocation (2009), Currie and Macleod (2009)

Table 3 Summary Statistics--Individual Level

Individual Level

Number of Observation	224,904
Average Amount of Settlement	$200,120
(standard deviation)	(378,986)
Average Years to Settlement	3.86
(standard deviation)	(2.15)
Practitioners' License Field (%)	
Physicians and Physician Intern	72.9
Osteopatic and Osteopatic Intern	4.81
Dentist and Dentist Intern	13.13
Others (RN, Pharmacist, Chriopractor)	9.16
Outcomes (Available If Reported After 2004) (%)	
Emotional Injury Only ⎤	2.09
Insignificant Injury } Insignificant injury	3.04
Minor Temporary Injury ⎦	14.89
Major Temporary Injury ⎤	9.36
Minor Permanent Injury } "Somewhat" Sign. injury	13.77
Signifant Permanent Injury ⎦	13.94
Major Permanent Injury ⎤	9.17
Quadriplegic } Significant Injury	4.32
Death ⎦	27.68
Cannot be Determined	1.76
Payment Type (%)	
Settlement	90.28
Judgment	2.54
Unknown	7.18

Table 4 Summary Statistics--State Level

State Level	Mean	SD	Median
Incidents occurred in 2000	316.9	444.6	155.0
Payments in 2000	$71,332,844	$105,560,095	$28,030,700
Physicians in 2000	13,892	16,724	8,581
Population in 2000	5,532,783	6,184,308	5,532,783
Noneconomic Damage Cap	0.51	0.50	1.0
Punitive Damage Cap	0.33	0.48	0.0
Collateral Source Rule	0.53	0.50	1.0
Joint & Several Liablity	0.61	0.49	1.0
Law on Disclosure	0.12	0.33	0.0
Apology Law	0.63	0.49	1.0

Note: All laws are tabulated in 2007

Table 5
The Impact of Apology Law on Medical Malpractice Settlements
(% Change)

Depentant Variable	# of Cases			Value of Payments		
	(1)	(2)	(3)	(1)	(2)	(3)
Apology Law Change	0.142	0.153	0.146	0.279	0.276	0.205
	(0.086)	(0.083)*	(0.095)	(0.163)*	(0.163)*	(0.182)
Other Law Change[a]		X	X		X	X
Other Covariates[b]			X			X
State Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
N	867	867	867	867	867	867
R-squared	0.97	0.97	0.97	0.97	0.97	0.97

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustered at the state level. The dependent variables are either Log (Number of Cases) in a state-year or Log (Total amount of Settlement) in a state-year.
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr_tort and jsl_tort
b. Covariates include population, % Black, % White and # of Physicians.

Table 6
The Effect of Apology Law Over Time
(% Change)

	# of Cases			Value of Payments		
	(1)	(2)	(3)	(4)	(5)	(6)
1 Year Later	0.049	0.038	0.051	0.073	0.061	0.04
	(0.077)	(0.074)	(0.080)	(0.200)	(0.201)	(0.207)
2 Years Later	0.173	0.168	0.199	0.41	0.399	0.384
	(0.109)	(0.111)	(0.125)	(0.218)*	(0.222)*	(0.236)
3 Years Later	0.247	0.275	0.311	0.441	0.438	0.414
	(0.147)*	(0.148)*	(0.165)*	(0.346)	(0.344)	(0.383)
4 Years Later	0.371	0.489	0.528	0.483	0.539	0.499
	(0.128)***	(0.121)***	(0.141)***	(0.358)	(0.381)	(0.419)
>=5 Years Later	0.197	0.305	0.336	0.583	0.651	0.534
	(0.230)	(0.215)	(0.245)	(0.402)	(0.385)*	(0.466)
Other Law Change[a]		X	X		X	X
Other Covariates[b]			X			X
State FE and Year FE	X	X	X	X	X	X
N	867	867	867	867	867	867
R-squared	0.97	0.97	0.97	0.97	0.97	0.97

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustered at the state level. The dependent variables are either Log (Number of Cases) in a state-year or Log (Total value of payments) in a state-year.
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr_tort and jsl_tort
b. Covariates include Population, % Black, % White and # of Physicians.

Table 7
The Impact of Apology Law on Medical Malpractice Cases by Severity of Outcomes (% Change)

	Insignificant Injury			"Somewhat" Significant Injury			Major Permanent Injury/Death		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	-0.167	-0.182	-0.185	0.118	0.091	0.05	0.27	0.265	0.23
	(0.099)*	(0.104)*	(0.098)*	(0.124)	(0.124)	(0.118)	(0.129)**	(0.133)*	(0.138)
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	255	255	255	255	255	255	255	255	255
R-squared	0.91	0.91	0.92	0.93	0.93	0.93	0.93	0.93	0.94

Note: Each column shows the results from a separate Diff-in-Diff regressions. Standard errors are clustered at the state level. The dependent variables are Log (Number of Cases by severity of outcome) in a state-year
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure, csr and jsl tort
b. Covariates include Population, % Black, % White, and # of Physicians,

Table 8
The Impact of Apology Law on Prob of Resolution By Severity of the Outcome

	Insignificant Injury			*"Somewhat" Significant Injury*			*Major Permanent Injury/Death*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	1.094	1.099	1.089	1.202	1.209	1.209	1.255	1.243	1.252
	(0.103)	(0.102)	(0.097)	(0.126)*	(0.124)*	(0.129)*	(0.125)**	(0.130)**	(0.130)**
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	12864	12864	11242	23945	23945	22586	26437	26437	25153

Note: Numbers reported above are hazard ratios. Each column shows the results from a separate duration analysis with Weibull Specification. The dependent variable is time to settlement (year of settlement minus the year of incident). Errors are clustered at the state level

a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information disclosure

b. Other covariates include allegation nature, patient gender, settlement type, experience of physician

Table 9
The Impact of Apology Law on Payments By Severity of Outcome

	Insignificant Injury Baseline Mean $45,019			"Somewhat" Significant Injury Baseline Mean $155,070			Major Permanent Injury/Death Baseline Mean $342,869		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Apology Law Change	-431	632	3,132	-24,017	-27,264	-16,990	-73,097	-67,645	-55,248
	(4,236)	(4,132)	(3,894)	(13,432)*	(13,564)**	(9,538)*	(17,334)***	(21,188)***	(18,022)***
Other Law Change[a]		X	X		X	X		X	X
Other Covariates[b]			X			X			X
State Fixed Effects	X	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X	X
N	13317	13317	11618	24156	24156	22780	26561	26561	25273

Note: Numbers reported above are payments in Y2000 dollar. Each column shows the results from a separate OLS regression. The dependent variable is amount of payment

a. Other law change includes non-economic damage cap, punitive damage cap, csr_tort, jsl_tort & law on information closure

b. Other covariates include allegation nature, patient gender, patient age, experience of physician, exp2

Appendix Table A1
The Impact of Apology Law on # of Cases by Size of Payments(% Change)

	1st Quantile ($775-$22,500)		2nd Quantile ($22,500~$84,322)		3rd Quantile ($84,322~$229,288)		4th Quantile (>$229,288)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Apology Law	0.032	0.075	0.186	0.27	0.369	0.392	0.008	0.152
	(0.084)	(0.056)	(0.096)*	(0.104)**	(0.122)***	(0.129)***	(0.142)	(0.145)
Other Law Change[a]	X	X	X	X	X	X	X	X
Other Covariates[b]		X		X		X		X
State Fixed Effects	X	X	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X	X	X
N	867	867	867	867	867	867	867	867
R-squared	0.94	0.94	0.93	0.94	0.93	0.94	0.92	0.93

Appendix Table 2
Threat to Validity (% Change)

Depentant Variable	Randomly Assign Law Year			Earlier Law Year		
	(1)	(2)	(3)	(4)	(5)	(6)
Apology Law Change	0.044	0.041	0.046	0.044	0.041	0.046
	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)	(0.032)
Other Law Change[a]		X	X		X	X
Other Covariates[b]			X			X
State Fixed Effects	X	X	X	X	X	X
Year Fixed Effects	X	X	X	X	X	X
N	867	867	859	867	867	859
R-squared	0.97	0.97	0.97	0.97	0.97	0.97

Note: Columns 1-3: Randomly assigned half of the states with year of law change between 2000 to 2005.
Columns 4-6: Reassign law adoption years as 3 years prior to the actual adoption
The dependent variables are either Log (Number of Cases) in a state-year
a. Other law change includes non-economic damage cap, punitive damage cap, law on medical malpractice disclosure.
b. Covariates include Population, % age 65 or above, % Black, % White and # of Physicians.

Appendix Table 3
Threat to Validity (% Change)

Dependant Variable	# of Cases		
	(1)	(2)	(3)
Apology Law Change	-0.053	-0.055	-0.03
	(0.045)	(0.046)	(0.050)
Other Law Change[a]		X	X
Other Covariates[b]			X
State Fixed Effects	X	X	X
Year Fixed Effects	X	X	X
N	911	860	860
R-squared	0.96	0.96	0.96