American Medical Malpractice Tort Law: The Effect of Variations in Caps on Attorney Contingency Fees on State Health Expenditures as a Proxy for Defensive Medicine

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Abstract

Past studies on the impact of state-level medical malpractice reforms on health spending have asserted that caps on attorney contingency fees reduce health expenditure. This paper extends the literature by exploring the effect of different types of caps on state-level health expenditures in a broadened time period. I utilize a merged database of State Tort Law Reforms (Avraham, 2019) with the Center for Medicare & Medicaid Services' (CMS) Health Expenditures by State of Provider data from 1980 to 2014. On this merged database, I use a difference-in-differences approach to examine the difference in health spending growth between states with and without a reform. The analysis is three-fold; first, this study analyzes the general effect of any cap on attorney contingency fees on state health expenditure to confirm previous studies. Secondly, this study analyses how different types of caps on attorney contingency fees affect state health expenditure. Finally, this study looks at how different types of caps on attorney contingency fees affect different categories of providers' state-level health expenditures. The results, in contrast with previous studies, show that while caps in general cannot be linked to statistically significant negative effects on state health expenditure, hard caps as a sub-type can. In addition, provider categories with downstream expenditures tied to procedures as opposed to providers with face-to-face patient interactions were tied to decreased expenditures as a result of cap implementation. This study concludes that hard cap implementation can lead to low magnitude state level health expenditure decreases, and more specifically in provider categories with direct exposure to number of procedures performed.

I. Introduction

In the United States, the medical malpractice liability system has two main goals: (1) to compensate patients who are injured as a result of negligence during their care, and (2) to

disincentivize physicians and other providers from engaging in negligent behavior when practicing medicine (Kessler 2011). There is a strong general agreement that the medical malpractice liability system is particularly inefficient. National annual estimates of medical liability system costs (including settlements, legal and administrative costs, and defensive medicine) range from 55.6 billion to 200 billion U.S. dollars. This amounts to between 2.4 and 10 percent of all U.S. health care spending (NCSL 2014).

National costs arise from a multitude of different side effects of the system. Most importantly, the system only provides awards to a small share of injured individuals—some of whom may not have been injured due to negligence. According to a 1991 publication from the New England Journal of Medicine, 4% of hospital patients suffer complications from treatment which prolong their hospital stay or result in disability or death (Lucian et al. 1991). Two-thirds of these complications are actually due to errors in care, and one-fourth of those errors involve actual negligence. Given that medical malpractice litigation is meant to compensate for negligent care, this consistently small proportion makes it difficult to award patients who have actually suffered from negligent care and incorrectly provides compensation to those who have not.

In addition to its systemic difficulty to provide justified awards, the medical malpractice system does not provide the correct incentives for reducing medical injuries that arise from negligence. Reviews of patient medical records show that despite recent 20th-century reform, negligent medical injuries are still quite common. Empirical studies on Harvard Medical Practice Study data report that 3.7 percent of hospital admissions in New York State in 1984 involved an injury due to previous care complications, and around one-quarter of these were due to negligence—despite new malpractice tort law reforms (Brennan et al. 2000). Similar conclusions

were reached based on an analysis of adverse medical events in Utah and Colorado in 1992 (Thomas et al. 2000).

Physicians are highly incentivized to practice "defensive medicine," which entails unnecessary hospitalizations, tests, invasive procedures, drug prescriptions, etc.—all of which lead to increased health expenditures. On the lower end, national estimates of medical liability system costs are at around 55.6 billion. Of this staggering number, defensive medicine contributes over 82% (Vento et al. 2018). Defensive medicine is thought to stem from physicians' perception that they can easily face litigation from patients for what is perceived to be medical error. Empirically, it has been shown that higher resource use by physicians is associated with fewer malpractice cases (Jena et al., 2015).

Although providers have faced medical malpractice liability for centuries, action on malpractice in the United States was rare until the 1970s (Bal 2008). During this time, malpractice claims, and the size of the awards tied to those claims increased severely. Malpractice insurance premiums were proposed to increase by almost 500% (Bal 2008). States quickly fell into crisis—traditional provider insurers restricted coverage or withdrew from the market entirely. In response to this crisis, states enacted laws, specifically tort reform, to control the growth in claim costs and guarantee that providers could obtain insurance. These reforms were implemented as an emergency cost control measure. Although the cost crisis was averted, a clear question remains—which tort reforms adopted during this period and in the following decades, if any, assisted in reducing the negative externalities (i.e., defensive medicine) of the system?

More recently, the academic and political conversation surrounding reform has erupted, as some experts have raised concerns that the Affordable Care Act (ACA) has brought about

increased exposure to medical malpractice liability for medical practitioners (Yu et al. 2017). Government policymakers have taken actions in the past 5 years to enact both national and state-level tort reform—take the 2015 Medicare Access and CHIP Reauthorization Act (MACRA) at the federal level for example. However, many lawmakers are still calling for greater tort reform, given that the limited number of provisions that MACRA, amongst other policies, has concerning controlling medical malpractice awards (Yu et al. 2017).

More recently, the COVID-19 pandemic has rapidly changed health care, particularly in the United States. On March 27, 2020, the Coronavirus Aid Relief and Economic Security Act (CARES) was signed into law (AMA 2020). The law clarifies that medical practitioners who "provide volunteer medical services during the public health emergency related to COVID-19 shall not be liable for providing such services that relate to the diagnosis, prevention or treatment of COVID-19 or the assessment or care of a patient-related to an actual or suspected case of COVID-19" (AMA 2020). While there are exceptions to this for gross negligence, criminal misconduct, and providing care while intoxicated, this new law is likely to have had a multitude of effects. Legislation is allowing errors to go uncorrected. Although the medical malpractice system is inefficient, it does at least compensate some patients for true negligence. Given this context, now more than ever, it is critical for lawmakers to understand what elements of medical malpractice tort reform are compatible with the most efficient forms of medical practice.

While the initial logic of tort reform was to reduce the risk of litigation, lower malpractice insurance rates for providers, and temper the practice of defensive medicine, it is quite clear that in the face of new legislation, we must be aware of the elements of tort reform that reduce the presence of the negative externalities from the medical malpractice litigation system. This study will take advantage of the previously mentioned myriad of tort reform

implementations in the ’70s and ’80s in the United States, allowing for deeper analysis on a particular type of tort reform that has already been empirically shown to reduce health care expenditure—caps on attorney contingency fees (Yu et al., 2017). However, unlike past research, this analysis will look at the different implementations of attorney contingency fee reform and determine which approaches provide for the most effective decreases in medical expenditure on the whole and by provider category. Ideally, I would like to measure quality of care and health outcomes as well, however this is not explored in this study. If decreases in medical expenditure are truly coming from reductions in defensive medicine, then we would see only cost-saving effects without harm to the patient. However, if some important procedures are not performed when a policy is enacted, it could be harmful for some patients. This provides space for future research.

I hypothesize that the clear, monetarily defined instances of caps as opposed to those determined by the court will result in larger decreases in medical expenditure—a proxy for a reduction in the practice of defensive medicine. In addition, I hypothesize that providers that have greater face-to-face interaction with their patients will experience greater negative expenditure effects as a result of cap implementation, given the aforementioned relationship between patient-provider interaction and the practice of defensive medicine. This research may be the key to understanding how and at what level state legislatures should implement new medical malpractice tort reform with caps on attorney contingency fees. Conversely, this research may fail to replicate and compound upon previous findings given the varying empirical conclusions on the effect of tort legislation changes on medical expenditures in the existing literature.

II. Literature Review

Extensive research has been done on the impact of state-level tort reform on both payout per claim and general health care costs. Mello and Kachalia (2016) review this literature. Primarily, Mello and Kachalia (2016) show that there is a consensus that liability pressure doesn't curb the overuse of health services, but disagreement about the magnitude of said effect. Amongst all studies, with the exception of research on caps on noneconomic damages (providing compensation for abstract losses, i.e., physical injury), there has been very little evidence that other traditional tort reforms reduce payout per claim and general health expenditures.

Concerning the impact of state-level tort reform on payout per claim, Mello and Kachalia (2016) reveal that on average, studies have found that when caps on noneconomic or total damages ("damage caps") are implemented, awards are reduced by 20 to 30 percent and that premiums in states with these types of caps rise 6 to 13 percent more slowly than premiums in states with caps on non-economic damages. However, evidence on their effect on healthcare costs is inconclusive. A more recent evaluation of damage caps by Paik and Black (2016) looked at the "third reform wave" from 2002 to 2005, revisited the same twentieth-century caps, and found no evidence of a post-adoption drop or rise in healthcare spending for damage caps.

As a proxy for the practice of defensive medicine, studies have analyzed changes in medical expenditures. This portion of the literature seeks to evaluate the downstream effect of tort reform on health care spending. However, even when using health care expenditures as a proxy for decreases or increases in the practice of defensive medicine, the literature has been quite inconclusive, and often contradictory. Kessler and McClellan (1996) for example, showed that damage caps reduced general expenditures for Medicare patients hospitalized for myocardial infarction or ischemic heart disease. However, the Congressional Budget Office (2004) and

Sloan and Shadle (2009) applied the same method to looking at Medicare patients with other diagnoses and conditions as well. No evidence was found that any tort reforms reduced Medicare spending on the whole. Hellinger and Encinosa (2006) found that caps on noneconomic damages did, in fact, lead to lower health spending in agreement with Kessler and McClellan, but only analyzed data at the state-level without controlling for key variables like health status or socioeconomic status.

Moving away from damage caps, Carvell, Currie, and MacLeod (2012) indicated that different types of tort reform like the joint-and-several liability reform could even increase liability risk. Joint-several-liability allows for responsibility to be shared by two or more parties to a lawsuit. Carvell et al. (2012) thus showed that by implementing joint-several-liability, one was increasing a provider's risk of being sued rather than decreasing it. Not all tort reforms will have the intended effects, especially when looking at health care expenditures as a proxy for defensive medicine behavior.

Clearly, the academic conversation has remained quite open, leaving space for more studies to enter the sphere. As a response to the limited and contradictory nature of the literature, Yu, Greenberg, and Haviland (2017) presented a work to which this study will primarily respond to. Yu et al. agreed that if a tort reform succeeds in reducing the practice of defensive medicine, then there should be a reduction in health spending as a result. Yu et. al (2017) investigated the exact effects that different tort reforms had on health expenditure between 1996 and 2012. More importantly, this study overcame some of the previous studies' limitations. Firstly, Yu et al. looked at the general population, not at just specific conditions or individuals. Studies like Kessler and McClellan (1996) only chose to examine conditions and individuals most prone to

malpractice, for one. It is important to additionally inspect the impact of tort reforms on individuals with conditions or cases of medium or low risk of litigation.

In order to draw this fuller picture, Yu, Greenberg, and Haviland (2017) focused on the effects in the more general population, given that medical malpractice reforms do not focus on individual conditions, rather the practice on the whole. Defensive medicine is practiced not based on the condition that a patient suffers from, but across the board until a diagnosis is reached. To the reference study's knowledge, it was the first to use a nationally representative sample of the general population in order to see the full impact of state-level tort reforms on health care spending. This study controlled for individual-level characteristics like sociodemographic and health status unlike previous studies, and most importantly, investigated a very extensive set of malpractice reform measures at the state level. In their findings, Yu et al. was able to show that two types of malpractice reform—caps on attorney contingency fees and comparative fault reform—were significant in reducing and increasing health care expenditure respectively.

The logic behind caps on attorney contingency fees is that they should make malpractice cases less financially attractive to the attorneys arguing for the plaintiff—as such, plaintiffs should have a difficult time finding an attorney to represent them and on the whole, litigation should be reduced, leading to decreased pressure on physicians to practice defensive medicine. While decreasing healthcare expenditure implies that physicians may perceive their liability risk to decrease and therefore, they will practice less defensive medicine, there are other potential consequences as well. Physicians may reduce their defensive practice of medicine in areas that require it, like ordering expensive diagnostic tests for low-likelihood diseases and afflictions. Despite the two-sided element of consequences, this study asserts that there is more research to be done on how, where, and in what manner a cap on attorney contingency fees has been set

affects the downstream effects of medical expenditure as a proxy for defensive medicine practice. States have implemented and revised their caps on attorney contingency fees—increasing them, lowering them, and even turning them into piecewise functions. This study uses some of the same data as Yu, Greenberg, and Haviland (2017), and looked to not only re-determine the negative effect of attorney contingency fee caps on healthcare expenditure on the whole but fill the gap as to how different implementations of said caps are effective. In addition, Yu, Greenberg, and Haviland (2017) only examined periods between 1996 and 2012, while most tort reforms occurred in the ’70s and ’80s. This study uses a more expansive outcome variable data set for health expenditures to fill this gap.

III. Data and Methodology

A. Variables of State-Level Malpractice Reforms on Attorney Contingency Fees

Like the Yu et al. study, I use data about state-level malpractice reforms from the 2019 Avraham Database of State Tort Law Reforms. According to Avraham, this dataset contains the most detailed, complete, and comprehensive legal dataset of the most prevalent tort reforms in the United States between 1980 and 2018. The dataset records state laws in all fifty states and the District of Columbia. For each reform, the dataset records the effective date, a short description of the reform, whether or not the jury is allowed to know about the reform, whether the form was upheld or struck down by the states’ courts, and whether it was later amended by a different state legislator.

To perform an analysis on the effects of introducing caps in different manners, I will extract the instances in which regulations on contingency fees occur by state. However, given the varied nature of implementations of contingency fee caps across states, I will categorize instances of caps on attorney contingency fees into three types: (1) hard caps, (2) caps relative to

the total award to the plaintiff, and (3) regulations which subject caps on attorney fees to court approval. There are, of course, states that have never seen regulation on attorney contingency fees, and as such can be used as a control group, in addition to the states that had not implemented a regulation yet when examining changes in a certain year.

When a state *k* implements a reform categorized by one of the above variables in year *t*, I will set the corresponding dummy variable to one for the year of adoption *t* and all years following *t.* As is the case from some of the reforms in the dataset, when they are repealed, I will reset the variable equal to zero for the year of repeal *t* and all years after *t.*

Given that I only track reforms between 1980 and 2014 due to the limitations of my outcome variable set, I need to account for attorney contingency fee regulations implemented before 1980. Following a similar method to Yu et al., I identify the status of reforms beginning in 1980—the beginning of my study period. If a reform was adopted prior to 1980 and remained effective in 1980, I set the dummy variable for the category in which it falls in to 1. Dummy variables will be set to zero in two cases, (1) if the reform was repealed prior to 1980, and (2) if the reform was simply not adopted prior to 1980.

B. Expenditure Variable

To measure effects on health expenditures, I utilize the Center for Medicare & Medicaid Services' (CMS) Health Expenditures by State of Provider data from 1980 to 2014. This data set contains estimates of health care spending by type of establishment delivering care and for medical products purchased in retail outlets. Per the CMS website, these estimates are "particularly useful in measuring health spending's role in a state's economy."

However, in order to provide greater comparison between states, I take the CMS Health Expenditures by State of Provider data and transform it into total expenditure per capita. In logs,

we see percentage changes rather than absolute changes. Initial sizes may be different between states. Fixed effects in the following regression absorb state-specific variation in log expenditures that is time-invariant while utilizing per capita measurement accounts for state size. In order to perform these transformations, I utilize state population data from Population Estimates Branch of the U.S. Bureau of Census from 1980 to 2014. (Population Estimates Branch U.S. Bureau of Census, 1990, 1999, 2009, 2014)

C. Regression

I perform a difference-in-difference analysis (DID), taking advantage of the natural experiment created by states implementing, repealing, or never implementing different caps on attorney contingency fee reforms at different points in time. DID allows us to employ a quasi-experimental design that uses the longitudinal data that we have from our treatments—states that implemented a type of cap on attorney contingency fees—and controls—states that did not implement any type of cap. As such, we can compare the outcomes in health expenditures over time.

In my regression, I will also take fixed state and time effects into account. I control for other factors that might contribute to state health expenditures, hoping that they will account for time-varying omitted variable biases. Due to the fact that this study does not perform an individual-level regression like Yu, Greenberg, and Haviland (2017), I control for average income, the composition of race/ethnicity, religious composition, amongst other factors.

Equation:

$$\mathbf{log(Y_{k,t})= \beta_0 + \beta_1 1\{Law = hardCap\}_{k,t} + \beta_2 1\{Law = percent\}_{k,t} + \beta_3 1\{Law = jury\}_{k,t} + StateFEs(\delta)_k + YearFEs(\eta)_t + Controls_{k,t}}$$

In the above equation, $Y_{k,t}$ is the per capita state health expenditure. Again, *k* is the state, and *t* is the year in which we are regressing for the outcome. $\mathbf{1\{Law = hardCap\}_{k,t}}$ is the

indicator variable representing whether a state had a cap implemented with a ceiling in a certain year, $\mathbf{1\{Law = percent\}}_{k,t}$ is the indicator variable representing whether a state had a cap implemented as a percent of the total award in some manner during a certain year, and $\mathbf{1\{Law = jury\}}_{k,t}$ is the indicator variable representing whether a state allowed for juries to determine the cap at a reasonable standard in a certain year. Controls in the equation above will be a vector of the controls. It will be important as well to include clustering standard errors by state in the regression.

D. Other Methodology Comments

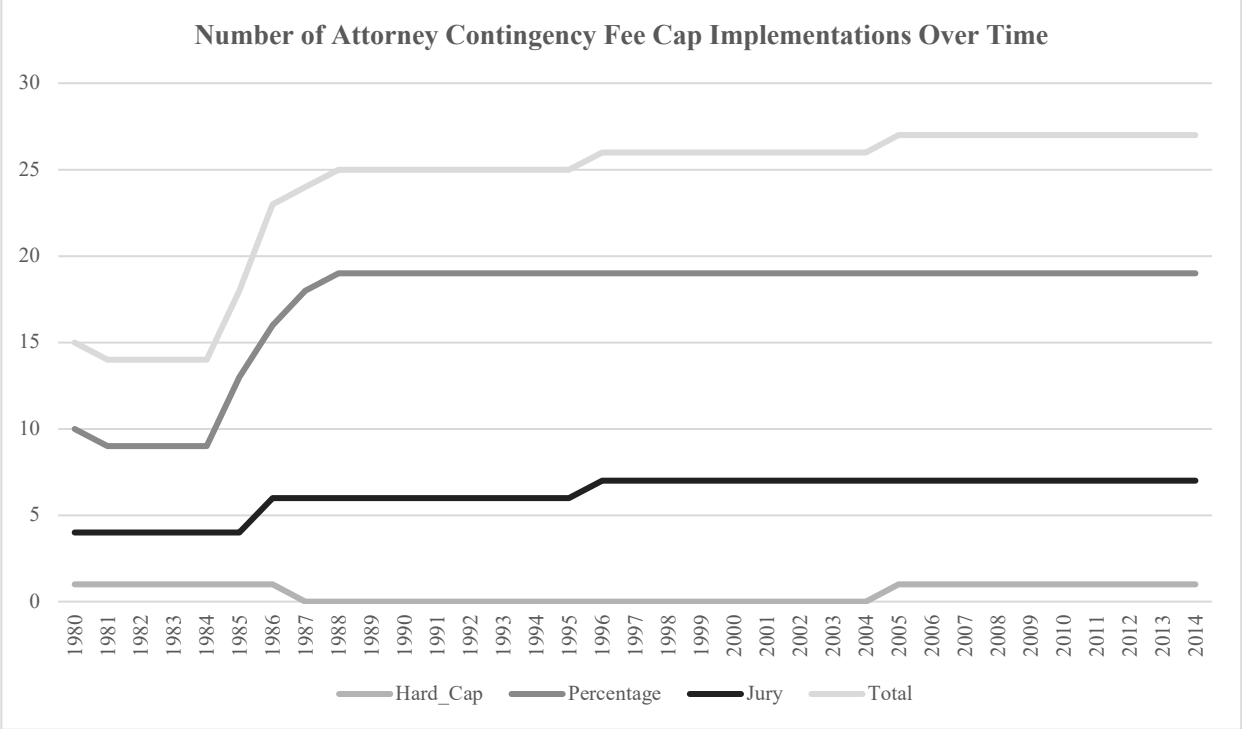
TABLE 1: Summary Statistics on Different Cap Implementations

VARIABLES	(1) All States	(2) Hard Cap	(3) Percentage Cap	(4) Jury
Avg. Total Expenditure	46,980.99	40,760.76	75,189.92	23,872.35
Avg. Hospital Care Expenditure	8,887.54	6659.94	13,789.51	4589.10
Avg. Physician & Clinical Services Expenditure	5676.70	4538.41	9181.12	2944.68
Avg. Prescription Drugs Expenditure	2395.61	2,550.71	3776.72	1123.09

*all amounts are in millions of dollars, and not on per capita or log basis

While it may initially appear that Jury-related caps on attorney contingency fees lead to lower expenditure, this does not account for state size, and the time period in which most Jury caps were implemented—Jury caps were commonly one of the earliest implementations by states.

FIGURE 1: Summary Statistics; Number of Attorney Contingency Fee Cap Implementations Over Time



At any point in time during our observation period, there have been a maximum of 27 states with a cap implemented. Of the total caps over time, hard caps have comprised a very small portion, while percentage caps have comprised most of caps.

It is vital to add that with this study one should be cautious of pre-trends, given that they are unaccounted for. Before a cap policy was implemented, it is very likely that the state in question had steeply increasing per-capita expenditures. This is particularly relevant given the previous context that malpractice claims and size of awards increased quickly in the 1970s before the enactment of tort law. Instead of a drop in costs, one could simply have seen a less steep incline in expenditures as a result of a cap implementation. If the policies discussed in this piece are non-random but rather depend on the magnitude of pre-trends, then estimating treatment effects ignoring pre-trends could be potentially misleading.

Primarily, this study examines whether the different coefficients on types of caps on attorney contingency fees impact healthcare expenditure across the board. Apart from this, I test whether the coefficients on these different types of caps are different from one another as this gives us an intuition for which implementation has the most significant effects on expenditure.

However, this study pushes the analysis further, looking at the effects of varying cap implementations on different types of providers within states. The expenditure outcome dataset for this study provides for a breakdown in expenditures by type of provider. The provider breakdown is as follows: personal health care, hospital care, physician and clinical services, other professional services, dental services, home health care, prescription drugs, other non-durable medical products, durable medical products, nursing and home care, and other health/residential personal care. Some providers are intuitively more likely to be affected by changes in cap implementations over others given their exposure to direct patient care. It is critical to future policy implementation to understand who tort law reform truly affects in terms of reducing the practice of defensive medicine.

IV. Results

The regression that tests the effect of any attorney contingency fee cap implementation on state health expenditures is shown in Table 2. As expected, we see the relationship that Yu, Greenberg, and Haviland (2017) suggested. While not statistically significant here, we see decreases in health expenditures when some type of cap on attorney contingency fees is implemented. Reduced growth is consistent with the logic that the intended downstream effect of caps is to reduce litigation against physicians and in turn the pressure to practice defensive medicine. We can look at the exponentiated coefficient $\exp(B_{Any\_Cap}) = \exp(-.0180) = .9821$. More specifically, if a state has any type of attorney contingency fee implemented, on average,

their total expenditure per capita will be approximately 1.79% lower. While without statistically significant results we cannot confirm what Yu, Greenberg, and Haviland suggested in their study, this is a positive signal given the broadened time frame this piece regressed on. We must look to examining which forms of implementation are correlated with decreased forms of health expenditure.

TABLE 2: Regression of any Attorney Contingency Fee Cap on Log Total Medical Expenditure Per Capita

VARIABLES	(1) Log Total Expenditure Per Capita
Any Cap	-0.0180
	(0.0153)
Constant	-2.739***
	(0.00741)
Observations	1,680
Number of State1	48
R-squared	0.993

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This study hypothesized that the clear, monetarily defined instances of caps as opposed to those determined by the court would result in larger decreases in medical expenditure—a proxy for a reduction in the practice of defensive medicine. This study also expected that the difference between the effect on health expenditures with respect to hard caps versus other implementations would be statistically significant, with hard caps having a greater negative effect. This hypothesis laid in the economic intuition behind percentwise implementations; large awards still allowed for large compensation for attorneys, while the original intention of caps was to drive attorneys away from choosing cases with the greatest potential payouts and towards those with merit. A certain percent of a large payout can still remain much larger than where a hard cap implementation might restrict one to. This hypothesis tracked to jury implementations—with a

jury cap implementation, there is no pre-determined cap prior to the day in which the medical malpractice case actually sits before a judge. Therefore, the attorney's incentivization with respect to selecting cases would be rarely affected, and one could further argue that attorney caps would not be a priority during the following litigation process.

Looking at the results in Table 3, one can see that this study's hypothesis can be somewhat supported. While yes, hard cap implementation had the smallest negative effect on total expenditure, it was uniquely statistically significant, specifically at the five percent level. Jury implementations had larger negative effects on total expenditure than percentwise implementations, however neither statistically significant. We can look at the exponentiated coefficients to tell us more about the effects of the hard cap implementation. $\exp(B_{Hard\_Cap}) = \exp(-.00934) = .9907$. This entails that if a state has a hard cap implementation of an attorney contingency fee cap, on average, their total expenditure per capita will be .929% lower. With respect to percentage and jury implementations, $\exp(B_{Percentage}) = \exp(-.0144) = .9857$ and $\exp(B_{Jury}) = \exp(-.0253) = .9750$. Ignoring lack of statistical significance, this entails that if a state has a percentwise implementation of an attorney contingency fee cap, on average, their total expenditure per capita will be 1.43% lower. On the other hand, if a state has a jury implementation of an attorney contingency fee cap, on average, their total expenditure per capita will be 2.50% lower.

While it is clear that my results support the concept that hard caps should be significant with respect to decreasing total expenditure, the fact remains that its effect on total expenditure is not large in comparison to the other implementations. There are a few potential explanations for this. For one, jury implementations of caps in a state could be well understood by stakeholders. Individuals in the provider ecosystem could well understand that juries set low caps on attorney

contingency fees, and attorneys would know this as well when selecting cases for litigation. While my initial hypothesis emphasized that it is likely that attorney caps would not be a priority during the medical malpractice litigation process, my regression outcome may suggest a different intuition; setting attorney caps are in fact important during the litigation process and the average cap level is low and common knowledge. Secondly, one must take into account the effect of pre-trends previously discussed in the methodology. Thirdly, there is a concern that in our data, not many states had hard cap implementations and therefore it is difficult to derive statistically significant effects of greater magnitude.

However, focusing on hard cap implementations, a statistically significant negative result once more follows the intuition that reform gives physicians the impression of a reduction in litigation risk, and may reduce pressure on physicians to engage in other sorts of defensive practice, such as ordering expensive diagnostic tests to look for unlikely clinical issues.

TABLE 3: Regression of Types of Attorney Contingency Fee Cap on Log Total Medical Expenditure Per Capita

	(2)
VARIABLES	Log Total Expenditure Per Capita
Hard_Cap	-0.00934**
	(0.00444)
Percentage	-0.0144
	(0.0134)
Jury	-0.0253
	(0.0367)
Constant	-2.739***
	(0.00696)
Observations	1,680
Number of State1	48
R-squared	0.993

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Beyond aggregate expenditures, this study examines an extension of the original problem

by looking at expenditure effects on different types of providers. This study's initial hypothesis was that if statistically significant negative results were to appear by provider segmentation, those results should concentrate in the types of providers that engage in the largest amount of patient-provider interaction given that they are directly tied to the practice of defensive medicine. This follows the economic and empirical intuition that patient-provider interactions are key to medical malpractice; there have been studies that have shown that poor communication skills in the practice of medicine increase the likelihood that patients with poor outcomes will sue, whether or not negligence occurred (Schleiter 2009). There could also be other provider segments that do not engage in face-to-face interactions with patient, but still could be directly tied to the practice of defensive medicine—for example, prescription drugs. For example, a provider practicing defensive medicine is more likely to prolong antibiotic duration, prescribing multiple combinations of agents to rule out the possibility of another infection (Vento et al. 2018).

The results from the following regressions in Table 4, Table 5, and Table 6 on a myriad of provider expenditure types do not necessarily support the initial hypothesis. Given the previous argumentation on patient provider interaction, this study would have expected to see negative effects on expenditure as a result of the attorney contingency fee caps primarily on Hospital Care, Physician Clinical Services, and potentially Prescription Drugs. For Hospital Care, only jury implementations showed a negative effect on expenditure, however not at a statistically significant level. In fact, there is a statistically significant positive relationship between hard cap implementation and expenditure per capita. For Physician Clinical Services, there are no statistically significant relationships, however there is a negative relationship between jury cap implementation and expenditure per capita. Conversely, there is a positive

relationship between hard cap and percentwise implementations on expenditure per capita. In looking at Prescription Drugs, there again is no statistically significant relationships, but negative relationships on expenditure with respect to hard cap and percentwise implementations.

Positive relationships, some of them significant based on the following tables, indicate a different behavioral relationship between physicians and caps on attorney contingency fees than that suggested by the regression in Table 3. Yes, caps reduce a physician's liability risk by making it less financially attractive for any attorney to engage in a malpractice lawsuit. However, physicians could then become less defensive in their medicinal practices, and more willing to schedule a preliminary or follow-up with their patients. This scenario would be consistent with the positive coefficient we see with caps on attorney contingency fees, given that patients use health services, but not necessarily procedures, with a higher probability.

Given that the only statistically significant relationships in the expected provider categories are positive, we must look to other types of providers. Hard cap implementations are able to show statistically significant negative relationships with Other Professional Services Expenditure, Dental Services Expenditure, Other Nondurable Medical Product Expenditure, Durable Medical Products Expenditure, and Other Health Residential Personal Care Expenditure. We can see that while the affected providers do not necessarily have to do with seeing patients in an appointment themselves, they are tied to the overuse of medical services and products in the practice of defensive medicine. Given that professional services like X-Rays or non-durable and durable medical product expenditure are a direct indicator of how many procedures a certain physician may be ordering, this follows the previous behavioral argumentation that physicians may be more willing to schedule follow-ups with patients as opposed to performing procedures in the immediate.

TABLE 4: Regression of Types of Attorney Contingency Fee Cap on Log Personal Healthcare, Hospital Care, Physician Clinical Services, and Other Professional Services Expenditure Per Capita

VARIABLES	(3)	(4)	(5)	(6)
Hard_Cap	**0.369***	**0.220***	0.149	**-0.157*****
	(0.185)	(0.127)	(0.0890)	(0.0577)
Percentage	0.0919	0.0351	0.0307	-0.0828
	(0.0810)	(0.0450)	(0.0277)	(0.0724)
Jury	-0.0266	-0.00581	-0.0398	-0.0125
	(0.0430)	(0.0338)	(0.0534)	(0.00986)
Constant	-3.070***	-3.389***	-3.703***	-4.791***
	(0.0167)	(0.0134)	(0.0216)	(0.0510)
Observations	1,680	1,680	1,680	1,680
R-squared	0.886	0.908	0.935	0.962
Number of State1	48	48	48	48

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note:
Regression (3): Log Personal Healthcare Expenditure Per Capita
Regression (4): Log Hospital Care Expenditure Per Capita
Regression (5): Log Physician Clinical Services Expenditure Per Capita
Regression (6): Log Other Professional Services Expenditure Per Capita

TABLE 5: Regression of Types of Attorney Contingency Fee Cap on Log Dental Services, Home Health Care, Prescription Drugs, and Other Nondurable Medical Product Expenditure Per Capita

VARIABLES	(7)	(8)	(9)	(10)
Hard_Cap	**-0.0236***	-0.217	-0.0289	**-0.141*****
	(0.0133)	(0.154)	(0.0288)	(0.0475)
Percentage	-0.0338	-0.0649	-0.0419	-0.0596
	(0.0375)	(0.111)	(0.0456)	(0.0650)
Jury	0.00175	0.0168	0.0262	-0.101
	(0.0293)	(0.0637)	(0.0198)	(0.0692)
Constant	-4.238***	-5.060***	-4.255***	-4.322***
	(0.0355)	(0.0662)	(0.0389)	(0.0469)
Observations	1,680	1,680	1,680	1,680
R-squared	0.950	0.929	0.976	0.827
Number of State1	48	48	48	48

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note:
Regression (7): Log Dental Services Expenditure Per Capita
Regression (8): Log Home Health Care Expenditure Per Capita
Regression (9): Log Prescription Drugs Expenditure Per Capita
Regression (10): Log Other Nondurable Medical Product Expenditure Per Capita

TABLE 6: Regression of Types of Attorney Contingency Fee Cap on Log Durable Medical Products, Nursing Home Care, and Other Health Residential Personal Care Expenditure Per Capita

VARIABLES	(11)	(12)	(13)
Hard_Cap	**-0.242****	-0.0185	**-0.114***
	(0.101)	(0.0220)	(0.0680)
Percentage	-0.132	**-0.0995****	**-0.167****
	(0.102)	(0.0408)	(0.0687)
Jury	0.0256	0.00256	-0.0597
	(0.0571)	(0.0209)	(0.0615)
Constant	-4.678***	-4.154***	-4.416***
	(0.0610)	(0.0365)	(0.0475)
Observations	1,680	1,680	1,680
R-squared	0.913	0.938	0.945
Number of State1	48	48	48

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Note:
Regression (11): Log Durable Medical Products Expenditure Per Capita
Regression (12): Log Nursing Home Care Expenditure Per Capita
Regression (13): Log Other Health Residential Personal Care Expenditure Per Capita

TABLE 7: Regressions 3-6 Transformed Outcomes: Average Percent Effect on Expenditure

VARIABLES	(3)	(4)	(5)	(6)
Hard_Cap	44.629%*	24.608%*	16.067%	-14.530%***
Percentage	9.626%	3.572%	3.118%	-7.946%
Jury	2.625%	-0.579%	-3.902%**	-1.242%

Note:
Regression (3): Log Personal Healthcare Expenditure Per Capita
Regression (4): Log Hospital Care Expenditure Per Capita
Regression (5): Log Physician Clinical Services Expenditure Per Capita
Regression (6): Log Other Professional Services Expenditure Per Capita

TABLE 8: Regressions 7-10 Transformed Outcomes: Average Percent Effect on Expenditure

VARIABLES	(7)	(8)	(9)	(10)
Hard_Cap	-2.332%*	-19.507%	-2.849%	-13.151%***
Percentage	-3.324%	-6.284%	-4.103%	-5.786%
Jury	0.175%	1.694%	2.655%	-9.607%

Note:
Regression (7): Log Dental Services Expenditure Per Capita
Regression (8): Log Home Health Care Expenditure Per Capita
Regression (9): Log Prescription Drugs Expenditure Per Capita
Regression (10): Log Other Nondurable Medical Product Expenditure Per Capita

TABLE 9: Regressions 11-13 Transformed Outcomes: Average Percent Effect on Expenditure

VARIABLES	(11)	(12)	(13)
Hard_Cap	-21.494%**	-1.833%	-10.774%*
Percentage	-12.366%	-9.471%**	-15.380%**
Jury	2.593%	0.256%	-5.795%

Note:
Regression (11): Log Durable Medical Products Expenditure Per Capita
Regression (12): Log Nursing Home Care Expenditure Per Capita
Regression (13): Log Other Health Residential Personal Care Expenditure Per Capita

While this study contributes to the ongoing literature regarding medical malpractice tort law implementation in the late 20th century, it is important to acknowledge potential limitations of the above results. These limitations provide for directions for further research. First, the data utilized in this study in provider-specific regressions does not give specific indication as to how expenditures are assigned to different providers. This is vital to the economic interpretation as to how and what agents are impacted in the healthcare ecosystem as a result of cap implementation.

Secondly, pre-trends were not accounted for in the regressions in this study. Future studies in this field need to examine the endogeneity of these policies, as states with rapidly increasing malpractice litigation expenses and health care costs are more likely to adopt reform laws. Other studies in a myriad of fields have been able to successful do so (Monras 2018). Even prior studies in this field have investigated the endogeneity between tort reform and other health

outcomes. In 2010, Durrance was able to show that with medical malpractice claims, there is a lack of empirical evidence regarding endogeneity between tort reform and health care spending. Allowing for a pre-trend prior to the policy changes would better refine the connection between cap implementations and expenditure and should likely be the first step in further research. However, if endogeneity were to exist, the way that it would affect the outcomes of this study is entirely unclear. Increasing health care costs could continue which would bias the outcomes in not finding an effect, while a potential regression to the mean could bias outcomes towards finding an effect.

As a sense check, this study added leading indicators as to whether a cap implementation in 1, 2, or 3 years to the two primary regressions previously shown in Table 2 and Table 3. The new outcomes are shown in Table 10 and Table 11 in the appendix. This addition did not change the results of this study, which allows for some security in making conclusions in the face of uncertainty regarding endogeneity. Hard caps were still the only statistically significant negative effect on log total expenditure per capita, although in this case, at the 10% level.

This study could also be elevated by utilizing more complex strategies for regression similar to those used in the Yu, Haviland, and Greenberg study. Recycling prediction methods and bootstrapping techniques would allow for a refinement in examining the difference in health spending growth between states with and without a reform. This study is yes, using the database of tort reforms that is considered to be the most comprehensive (Grace and Leverty 2012), but also struggles in that it relies on just one method to code tort reform measures; specific dollar amounts in certain reforms are not a focus of this study and could be important to outcome. Finally, this study, while expanding on the Yu, Haviland, and Greenberg study, used an alternative outcome variable for measurement of expenditure. While this study utilized state

health expenditures which were then broken down to per capita given census data, the previous study utilized individual health expenditures provided by the Medical Expenditure Panel Survey. While this study was not able to obtain access to the Medical Expenditure Panel Survey for individualized expenditures, it would be important for further research to compare outcomes between per capita state expenditures and individual health expenditures provided by a more expansive data set. Greater available data may provide for different outcomes and affect the economic intuition proposed in this piece.

The limitations of this study reflect on the ability to study the impact of these tort law reforms in their entirety. There is a lot of focus by this study and other works on these specific implementations. However, in reality, in order to cleanly identify effects, we would need more variation in these tort law implementations across space and time—there isn't much to study and utilize outside of this one period of tort law implementation. Estimates are simply speaking to the periods in which there was change, and not current time periods which have relatively stagnant tort law. In this field, if we would like to know more about this topic, one would have to think about other strategies to combat lack of variation.

V. Conclusion

Despite any outcome, we must begin to understand the impact of different implementations of tort law in an attempt to curb the practice of defensive medicine. In order to continue to create greater efficiency in one of the United States' most inefficient public systems, we need to have a preliminary understanding of where to look for effective solutions. There are significant policy implications that can be derived from the statistical outcomes reached. Across the board, caps on attorney contingency fees are not commonly implemented by states. In our data set, there were only twenty-seven who had done so, with only two of those twenty-seven

having implemented a hard cap. While we could not statistically support Yu, Greenberg, and Haviland's claim that in aggregate, caps on attorney contingency fees do decrease healthcare expenditures, one could suggest that hard cap versions of the tort reform do. This leads us to the conclusion that other states who have existing caps on attorney contingency fees, new states, and possibly even the federal government, may want to engage in this sub-type of reform to reduce costs.

Above all, remember that any reforms suggested by this study impact all forms of tort law. Medical malpractice, while subject to tort law, only accounts for a minority of personal injury claims in state and federal courts. This study can only stress what previous studies have continually stated; results here are only related to the impact of caps on attorney contingency fees, particularly hard caps in the sphere of medical malpractice.

However, this is not without loss for motivation. Americans are dissatisfied with their healthcare system (Schoen et al.., 2007) but spend far more than the citizens of other nations: 15 percent of GDP was spent health care in 2006, compared to 11 percent in France and Germany, 10 percent in Canada, and 8 percent in the United Kingdom and Japan (OECD, 2008). On the provider side, physicians continue to engage in the practice of defensive medicine for fear of litigation, and as previously revealed, this comprises a large extent of the United States' exorbitant health care costs. Our findings simply suggest that the behavioral impact of caps on attorney contingency tort reform on physician defensive practice is more subtle than previously detailed. One cannot rely on the simple intuition that tort reforms necessarily lead to highly correlated and causal reductions in the practice of defensive medicine.

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Appendix

TABLE 10: Pre-trend Robustness Check on Regression of any Attorney Contingency Fee Cap on Log Total Medical Expenditure Per Capita (Table 2)

VARIABLES	(1) Log Total Expenditure Per Capita
Any Cap	-0.0236
	(0.0180)
Implementation Lead 1 Year	-0.0133
	(0.0108)
Implementation Lead 2 Years	-0.0122
	(0.00920)
Implementation Lead 3 Years	-0.00946
	(0.00744)
Constant	-2.737***
	(0.00792)
Observations	1,680
Number of State1	48

R-squared	0.993

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 11: Pre-trend Robustness Check on Regression of Types of Attorney Contingency Fee Cap on Log Total Medical Expenditure Per Capita (Table 3)

	(1)
VARIABLES	Log Total Expenditure Per Capita
Hard Cap	-0.0124*
	(0.00647)
Percentage	-0.0196
	(0.0155)
Jury	-0.0295
	(0.0359)
Implementation Lead 1 Year	-0.0124
	(0.00920)
Implementation Lead 2 Years	-0.0114
	(0.00812)
Implementation Lead 3 Years	-0.00871
	(0.00697)
Constant	-2.738***
	(0.00700)
Observations	1,680
Number of State1	48
R-squared	0.993

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1