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Abstract

Health care costs in the U.S. have grown dramatically over the past several decades, with one possible cause being physicians providing unnecessary services out of fear of being sued for malpractice – a phenomenon known as "defensive medicine". States responded by enacting different types of tort reforms. This paper reviews the literature on the effects of these tort reforms on outcomes related to malpractice risk, quantity and quality of health care services, overall utilization and expenditures, physician supply, and patient affordability. The preponderance of evidence points towards non-economic damage caps reducing malpractice risk, quantity of services (aside from diagnostics and obstetrics), and overall health care utilization and expenditures while increasing physician supply and not having detrimental effects on patient outcomes. In general, the effects of other types of tort reforms are less clear. The literature would benefit from further research utilizing recent methodological advances related to combining machine learning with causal inference and eliminating bias from heterogeneous treatment effects in staggered-treatment-time models.

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I. Introduction

The possibility of being sued for medical malpractice is a major concern of health care providers. Thirty-one percent of physicians have been sued for medical malpractice over the course of their careers, according to data from 2016 to 2022 (Guardado 2023). While over seventy percent of these do not result in indemnity payments, physicians nevertheless face a relatively high risk of being sued at some point (Guardado 2023). Periods of elevated malpractice claims, payouts, and or premiums have been labeled as crises of malpractice, such as during the mid-1970s, early 1980s, and early 2000s (Black 2021).

To prove professional negligence by a physician, a patient must show that four criteria are met. First, the physician had a duty to care for or treat the patient. Second, this duty was breached by a failure to adhere to professional standards. Next, there was a causal link between this breach and injury to the patient. Finally, there were damages proceeding from the injury that the legal system can redress (Bal 2009). Embedded in these elements is the belief that legal recourse is a necessary option to maintain professional standards and compensate patients for injuries suffered.

The risk of malpractice litigation has led most physicians to carry malpractice insurance. However, insurance only partly solves the problem. Even if physicians do not personally bear the cost of a lawsuit, being sued leads to stress, reputational damage, and substantial time costs during the litigation process. A favorable environment for litigation could increase malpractice insurance premiums, leading to reduced labor supply and therefore longer wait times and higher prices. While the ability for harmed patients to receive compensation is important, an inefficient malpractice liability system could lead to social costs that exceed its benefits (Kessler and McClellan 1996).

The monetary and psychological costs of malpractice liability for physicians can lead to the practice of defensive medicine. This term typically refers to "positive" defensive medicine, which involves inducing demand for unnecessary services in order to avoid being accused of not taking all possible steps to avoid an adverse outcome. This could crowd out the ability to provide necessary services, leading to further increases in wait times and prices. Another form of defensive medicine, called "negative", refers to physicians avoiding risky procedures to curtail the possibility of being sued if something goes wrong. This could make it harder for patients to obtain potentially high-value treatments. A host of physician surveys document the existence of both positive and negative defensive medicine (Bishop et al. 2010; Nahed et al. 2012; Reschovsky and Saiontz-Martinez 2018; Sethi et al. 2012; Studdert et al. 2005).

Another response may be to avoid patients and states where malpractice pressures are greatest (Mello and Kelly 2005). This could take the form of new physicians choosing to start practice in less litigious states, established physicians relocating, or adjustments to patient volume or hours worked. Even if physicians do not relocate, they could pass through the cost of rising malpractice premiums to patients through higher charges or added services.

Over the last forty years, concerned over these possible effects, states have implemented reforms to malpractice laws when they perceive a significant elevation in malpractice risk. Ronen Avraham's Database of State Tort Law Reforms, which contains tort reform data from 1980 to 2021, suggests all states have at least some tort reforms in place (Avraham 2021). Figure 1 shows the changes in states' count of tort reforms from 1980 to 2020 in five-year increments. Most changes occurred by 2005, in line with the periods of crisis, with relatively few changes occurring between 2010 and 2020.

These reforms vary across states in form and effect. Caps on noneconomic damages (NED caps) limit awards for intangible experiences like pain and suffering. Caps on punitive damages (PDs), on the other hand, limit the amounts juries can impose as punishment beyond compensating plaintiffs for their injury. Some damage reforms do not explicitly cap amounts but influence the calculation or the distribution of them. The collateral source rule (CSR) states that a plaintiff's receipt of payments from third parties who are not responsible for the plaintiff's injury, such as from their health insurer, is not admissible as evidence. This precludes consideration of such payments when determining an award, which might otherwise be used to reduce its size. Reforms in states such as Arizona allow such payments to be considered in at least some situations (Arizona Revised Statutes 2024). Split recovery reforms redirect part of an award for punitive damages to the state. Utah, for example, uses a fifty-fifty split recovery for punitive damages over $50,000 (Utah Code Annotated 2025). Periodic payment reforms turn certain awards into annuities rather than lump sums, such as those for future medical expenses due to an injury (Florida Statutes 2024).

Some reforms modify how easily and from whom damages can be obtained. For example, in 2020, Missouri imposed a "clear and convincing" evidence standard for plaintiffs seeking punitive damages. Clear and convincing is a higher standard than the preponderance of evidence, but not as high as beyond a reasonable doubt (Missouri General Assembly 2020). In cases where there are multiple defendants, when liability is joint and several (JSL), all defendants are found independently liable for the full extent of an injury. If a monetary award is granted, it may be sought in full from any one of the defendants. The defendant from whom payment is sought may seek a contribution from their codefendants, but a codefendant's inability to contribute does not reduce the award. Reforms to JSL often place limits based on fault. For

instance, a 2005 West Virginia reform prohibited plaintiffs from seeking full damages from defendants found thirty percent or less at fault (American Tort Reform Association n.d.).

Next, some reforms limit or prohibit seeking damages when an injury is at least partly the fault of a plaintiff. States allowing for contributory negligence as an affirmative defense, such as Alabama, prevent a plaintiff from seeking damages if it can be shown the plaintiff shares any fault in their injury (Justia 2024). Most states, however, use some form of comparative negligence. In the case of modified comparative negligence, plaintiffs are prohibited from seeking damages when at least half of the fault is theirs. With pure comparative negligence, plaintiffs can seek damages so long as any of the fault is the defendant's; however, award amounts are reduced by the percentage of the fault that is the plaintiff's (Thompson Law n.d.).

Other reforms turn their focus from plaintiffs to their attorneys. For example, in 1987, Connecticut limited contingency fees for attorneys in personal injury, wrongful death, and property damage lawsuits (Connecticut General Statutes § 52-251c, 2025). The statute caps attorney fees at one-third of the first 300,000 dollars, and scales down to ten percent for awards over 1.2 million dollars.

While not affecting torts directly, certain states have patient compensation funds that provide excess malpractice insurance to participants. Participation in these funds is predicated on a health care provider maintaining certain levels of malpractice coverage. Such funds may give physicians more peace of mind, but also make them subject to an added malpractice premium.

As of late 2025, with indications of rising malpractice premiums in recent years, there are rumblings about another malpractice crisis and advocacy for further malpractice reforms by the American Medical Association (AMA) (Henry 2025; Hardiman 2025). Critical evaluations of the effects of reforms are therefore valuable to policymakers seeking to improve health care delivery.

This review evaluates the existing empirical evidence on the effects of these different types of tort reforms on outcomes related to malpractice risk, quantity and quality of health care services, overall utilization and expenditures, physician supply, and patient affordability. To our knowledge, this is the most comprehensive review to date of the tort reform literature. We discuss studies using both associational and causal research designs but emphasize the latter.

The literature on NED caps is particularly extensive. The preponderance of evidence suggests that NED caps reduce malpractice risk, quantity of services (excluding diagnostics and obstetrics), and overall health care utilization and expenditures while increasing physician supply and not leading to worse patient outcomes. All these effects are content-dependent to some extent, but the evidence is sufficient to conclude that they occur frequently enough to be meaningful. The finding that the service reductions induced by NED caps are not generally accompanied by worse outcomes implies that defensive medicine existed prior to the reforms. Other types of tort reforms have not been studied as extensively, making drawing broad conclusions more difficult. One possible exception is JSL limits, which appear to improve the quality of non-diagnostic, non-obstetric services as well as some measures of affordability.

Therefore, tort reforms appear to achieve their intended objectives in at least some settings. However, more research is needed, particularly on reforms besides NED caps. Future research should utilize recent advances in combining machine learning with causal inference and eliminating bias from heterogeneous treatment effects in staggered-treatment-time models.

II. Methodology

Our primary means of locating evidence was the use of Google Scholar. The review's scope includes studies on the effects of different types of tort reforms on the malpractice environment (claims, premiums, and perceived risk), use of diagnostic services such as testing

and imaging, utilization of and expenditures on health care services (both in general and for specific procedures and conditions), quality of care (i.e. treatment outcomes), supply of physicians, prices, and health insurance coverage rates and premiums. We also gathered studies linking the malpractice environment to the other outcomes, which are indirectly suggestive about the effects of tort reform. In total, our evaluation includes over 100 pieces of empirical evidence.

In our discussion, we distinguish between studies with a "causal" research design and those that are associational in nature. Causal research designs attempt to identify effects based on plausibly exogenous sources of variation utilizing "quasi-experimental" methods such as difference-in-differences (DiD), difference-in-difference-in-differences (DDD), regression discontinuity (RD), and synthetic control (SC). In contrast, studies we consider "associational" use simpler regression techniques to adjust for some potential confounders, but ultimately rely on cross-sectional identifying variation in tort reforms. To illustrate, suppose a study uses a single year of data to examine the relationship between whether or not a state has implemented a particular tort reform and a particular outcome. This methodology would be classified as "associational" because it requires the strong assumption that the presence of state tort reforms is uncorrelated with unobserved characteristics than influence the outcome. However, an analysis that uses data spanning multiple years and controls for state and year fixed effects would be considered "causal". This is because it relies on the more plausible assumption that *changes over time* in state tort reforms are uncorrelated with changes in unobservables that influence the outcome.

With that said, these classifications are admittedly imperfect. There could be scenarios in which the presence of state tort reform is indeed uncorrelated with unobservables, or in which changes over time *are* correlated with unobservables. Studies classified as "causal" vary in the

level of rigor with which they test their identifying assumptions. Moreover, given their publication dates, studies in the tort reform literature rarely address the newly understood issue of bias from heterogeneous treatment effects in models with staggered treatment time (e.g. Goodman-Bacon 2021). Therefore, we emphasize that when we refer to a study as "causal", this is a statement about methods rather than results.

Many of the papers included in our review utilize several regression specifications, often leading to some degree of ambiguity about the results. In such cases, we report the findings from the preferred specification when the authors identify one. When they do not, we aim to report the results supported by the preponderance of evidence. Additionally, if the study utilizes both associational and causal methodology, we prioritize the results from the causal approach.

Interpreting null results poses a particular challenge when attempting to synthesize the results from various studies. A null finding could indicate the genuine absence of a meaningful effect, but it could also occur if the estimates are not precise enough to rule out either zero or a meaningfully large effect. Distinguishing between these two possibilities is difficult and often subjective. The latter case is particularly common when examining aggregate-level treatments such as state policies using data-intensive quasi-experimental research designs. Our overall assessments will implicitly acknowledge this ambiguity. For instance, if a given policy improves a given outcome in half the studies and has null results for the other half, we interpret this as evidence of favorable impacts in "at least some cases". A strict interpretation of null results as "true zeros" would mean that exactly half of the evidence points to improvements. On the other hand, a strict interpretation of nulls as being too imprecise to be informative would effectively necessitate discarding those results, leading to the conclusion that the policy has beneficial

impacts in *all* observable cases. Our use of vaguer language allows for an interpretation that is somewhere between these extremes.

Finally, for ease of interpretation, we present the results so that within each category of outcomes the directions have the same meaning. For example, suppose most studies measure supply as the number of physicians but some examine the likelihood of physicians leaving the state. Higher numbers mean more supply in the former case, but lower numbers mean more supply in the latter case. We would therefore reframe the latter type of outcome as the likelihood of physicians *not* leaving the state in order to ensure a consistent ordinal meaning.

III. Results

Malpractice Claims, Premiums, and Perceived Risk

Table 1 summarizes results from the literature examining how tort reforms influence the malpractice environment, as measured by frequency of claims (Panel A), premiums (Panel B), and physician assessments of the risk of a malpractice suit (Panel C). A large literature documents that these measures influence – to at least some extent – important health care outcomes such as spending, fees, utilization, birth outcomes, physician supply, quality of care, and patient experience.[1]

The associational and causal evidence largely points to a reduction in claims from NED caps and tort reform generally (Kessler et al. 1997; Kessler and McClellan 2002b; Durance 2010;

[1] See Rock (1988), Danzon et al. (1990), Localio et al. (1993), Baldwin et al. (1995), Sloan et al. (1995), Tussing and Wojtowycz (1997), Quinn (1998), Dubay et al. (1999), Dubay et al. (2001), Thurston (2001), Kessler and McClellan (2002b), Baicker and Chandra (2004), Grant and McInnes (2004), Dranove and Gron (2005), Mello and Kelly (2005), Robinson et al. (2005), Pauly et al. (2006), Baicker et al. (2007), Rodriguez et al. (2007), Dhankar et al. (2009), Helland and Showalter (2009), Dranove and Watanabe (2010), Grimm (2010), Polsky et al. (2010), Thomas et al. (2010), Zwecker et al. (2011), Lakdawalla and Seabury (2012), Shurtz (2013), Jena et al. (2016), Bilmoria et al.(2017), Minami et al. (2017), Durance and Hankins (2018), Reschovsky and Saiontz-Martinez (2018), Ellyson and Robertson (2019), Studdert et al. (2019), Chan et al. (2020), Caroll et al. (2021), Villalobos et al. (2021), Holmgren et al. (2022), Pierce et al. (2022), Quinn et al. (2023), and DeCicca and Malak (2025).

Paik et al. 2013a; Zuckerman 1990). However, one causal study did not find an effect from NED caps, and an associational study found no evidence of an effect from other reforms (Baum 2020; Zuckerman 1990). The evidence on premiums is more mixed. Earlier causal papers find decreases in premiums from at least some reforms, typically NED caps (Kessler and McClellan 1997; Thorpe 2004; Kilgore et al. 2006; Grave and Leverty 2013). However, outside of Kessler and McClellan (1997), these studies also find mixed or no evidence of effects of other reforms. Two later papers focusing on NED caps found no evidence of impact on premiums, though a third study did find an effect in North Carolina specifically (Baum 2020; Black et al. 2022; Yu and Baker 2022). A single causal study on physicians' perceptions of malpractice pressures suggests tort reform reduces perceived pressure, while an associational study suggests little to no relationship (Kessler and McClellan 1997; Carrier et al. 2010; Carrier et al. 2013).

Taken in their totality, these results suggest that tort reform reduces the malpractice risk facing physicians in some contexts but not all. Across Table 1, there are 17 significant findings consistent with decreased malpractice risk, 19 null results, and four findings consistent with increased risk. Removing the associational studies yields a somewhat clearer picture, with 13 decreases, eight null results, and just two increases. Narrowing further to causal evidence on NED caps – arguably the most prominent tort reform – and general tort reform – which likely reflects NED caps to a large extent, there are ten decreases, three null findings, and no increases. For all other reforms, the causal evidence is more balanced: three decreases, five nulls, and two increases. Therefore, the preponderance of evidence points to NED caps – but not the other types of tort reforms – improving the malpractice environment for physicians. Since it is difficult to envision a mechanism besides malpractice risk through which tort reform would affect

downstream variables related to health care delivery, we might anticipate a similar pattern of results as we turn to these other outcomes.

Utilization and Spending on Testing/Imaging/Diagnostic Services

Table 2 reports evidence from studies on diagnostic services. Unnecessary testing is one of the most widely acknowledged potential forms of defensive medicine, implying that it might be especially responsive to tort reform. Instead, the evidence is mixed. Among associational studies, one finds that general tort reform reduces diagnostic service use (Esposto 2008); one suggests an increase (Bilmora et al. 2017); one finds no evidence of any relationship (Carrier et al. 2013); and one associates NED caps, CSR, and periodic payments with increased use but limits on contingency fees with decreased use (Smith-Bindman et al. 2011). Causal studies focusing on individual states find no evidence of an effect of increased negligence standards and NED caps (Waxman et al. 2014; Ellenbogen et al. 2024). Li et al. (2016) find that damage caps, periodic payments, and general tort reforms decrease radiography orders from office visits, though CSR and JSL reform may have no effect. Moghtaderi et al. (2019), however, find NED caps increase imaging and radiography laboratory spending among Medicare beneficiaries.

Frakes and Gruber (2019) study a unique setting in which physicians treating active-duty patients on a military base are immune from malpractice suits. While not explicitly a tort reform, we include this study because it mirrors the most extreme possible reform – no liability risk at all. One would therefore expect a particularly strong response in this setting, and accordingly, Frakes and Gruber find that military immunity reduces diagnostic procedures.

Utilization and Spending on Obstetric Services

Table 3 turns to studies on obstetric services. Most of these (Panel A) focus on cesarean sections (c-sections), though some also look at inductions (Panel B) and episiotomies (Panel C).

Obstetrics are frequently studied in the defensive medicine literature because of the clear variation in service intensity and the somewhat subjective nature of decisions related to delivery methods. The effect of NED caps is mixed. Five causal papers find no evidence of an effect for either their primary sample or at least a key subsample (Frakes 2012; Cotet-Grecu 2015; Cano-Urbina and Montanera 2017; Malak and Yang 2019; Mushinski et al. 2022). Currie and MacLeod (2008) find an increase in c-sections, as do Frakes and Gruber (2020) using the same military immunity setting discussed above. An associational study, Yang et al. (2009), finds a decrease for NED caps under $500,000, but no evidence of an effect from higher caps. Malak and Yang (2019) and Mushinski et al. (2022), however, find a decrease in c-sections for non-high-risk pregnancies – which arguably provide a better test of defensive medicine than all pregnancies since c-sections are generally medically appropriate in high-risk cases. Cano-Urbina and Montanera (2023) find a decrease in c-sections for those receiving timely prenatal care, which may align with the results for lower-risk pregnancies but find increased c-sections for women obtaining late or no prenatal care.

Turning to other reforms, PD caps and CSR reforms largely show no evidence of impact (Currie and MacLeod 2008; Yang et al. 2009; Frakes 2012; Cano-Urbina and Montanera 2017; Mushinski et al. 2022; Cano-Urbina and Montanera 2023). Only one study finds PD caps to increase c-sections for non-high-risk pregnancies but finds no such evidence for high-risk pregnancies (Malak and Yang 2019). Findings for JSL reform are mixed. Two studies find subsample increases in c-sections for riskier pregnancies only (Malak and Yang 2019; Cano-Urbina and Montanera 2023). Two find no evidence of a wider effect of JSL reform on c-sections, while one finds a decrease (Currie and MacLeod 2008; Yang et al. 2009; Cano-Urbina and Montanera 2017).

Evidence on induced labor and episiotomies is limited to a handful of papers. An associational paper by Roth (2016) finds that NED and PD caps increase inductions but that JSL reform reduces them. Currie and MacLeod (2008), however, find no evidence that NED caps or CSR reforms affect inductions, but do find that JSL reforms decrease them. The two studies on episiotomies also reach conflicting conclusions. Frakes (2012) finds either decreases (NED caps and tort reform more generally) or no evidence of an effect (PD caps and CSR reform). Malak and Yang (2019) find an increase from NED caps but a decrease from PD caps. They find no evidence of an effect of CSR reform among lower-risk pregnancies but an increase among those that are higher-risk, and they find no evidence of an effect from JSL reform.

In total, the preponderance of evidence points towards no clear effect of tort reforms on obstetric services. There are ten findings of reductions in the relatively intensive obstetric procedures, but also ten findings of increases and 30 null results. The evidence is just as split for NED caps as it is for the other reforms.

Utilization and Spending on Non-Diagnostic, Non-Obstetric Services

Table 4 examines utilization and expenditures for other services besides diagnostic and obstetric. Most of the available evidence is for NED caps, with causal studies finding that they reduce rates of angioplasty or bypass procedures (Avraham and Schanzenbach 2015), stent and bypass procedures (Moghtaderi et al. 2019), and antibiotic prescription (Panthöfer 2022). Associational studies find null results for the odds of having surgery for early-stage bladder cancer (Konety et al. 2025), rotator cuff tear, and humerus fracture (Chen et al. 2021) and a positive association with charges for head trauma admissions (Hennesey and O'Neil 2004) and the odds of having surgery for late-stage bladder cancer (Konety et al. 2005).

Evidence on the effects of other types of reforms is more limited. Three causal studies examine tort reform generally, with two finding that it reduces hospital expenditures for heart disease patients (Kessler and McClellan 1996; Kessler and McClellan 2002a) and one finding null results for Medicare payments for AMI, breast cancer, stroke, and diabetes (Sloan and Shadle 2009). Two of the aforementioned associational studies contain reforms beyond damage caps. Hennesey and O'Neil find that charges for head trauma admissions are negatively associated with PD caps, periodic payments, contingency fee limits, and JSL reform but positively associated with CSR reform. Chen et al. find that surgeries for rotator cuff tears and humerus fractures are not statistically associated with CSR reform but are positively correlated with PD caps and JSL reforms.

In short, the limited available causal evidence points to NED caps and general tort reforms reducing utilization and expenditures for at least some conditions. The associational evidence is divided between reductions, null results, and increases, depending on the type of reform and outcome. The existence of some estimated positive associations between tort reforms and utilization or expenditures points to likely endogeneity bias in these analyses.

Utilization and Spending: Broad Categories

Table 5 reports results from studies examining utilization and expenditures more generally, as opposed to for particular conditions or procedures. Again, the majority of evidence is for NED caps. Two associational studies find that they reduce general utilization or expenditures (Encinosa and Hellinger 2006; Xu et al. 2013). However, the causal evidence is more mixed. Cotet (2012) finds that NED caps reduce surgeries, hospital admissions, and outpatient visits but have no detectable effect on emergency visits. Paik et al. (2017) and Moghtaderi et al. (2019) both find that they increas*e* Medicare Part B spending while having no

discernable impact on Part A spending. Moghataderi et al. note that the finding of an increase is surprising, and they suggest that perhaps physicians are comfortable with greater treatment ambiguity in a lower-risk environment, which could lead to treatment choices that are either more or less expensive depending on the situation.

Evidence on other tort reforms is either null or negative. Encinosa and Hellinger's (2006) aforementioned associational study finds null results for punitive damage caps, CSR reform, and JSL reform. Frakes and Gruber's (2019) investigation of physician immunity for treatment of active-duty patients on military bases finds that immunity reduces inpatient spending. Waxman (2014) finds that a higher malpractice standard reduces per-visit charges for Georgia emergency room patients but has null effects in South Carolina and Texas. Two studies of tort reform in general find no detectable effects on overall expenditures or health insurers' amount of claims paid (Paik et al. 2012; Born et al. 2017).

In all, the available causally interpretable evidence suggests that, in most cases, tort reform either reduces utilization or has no effect. A somewhat puzzling increase in Medicare Part B spending from non-economic damage caps stands as a notable exception.

Obstetric Quality

Table 6 summarizes the literature on the effect of tort reform on quality of obstetric services. Quality is notoriously difficult to measure, and researchers generally rely on procedure outcomes which reflect numerous factors besides just quality of care. Note that, since procedure outcomes are measured in terms of the number of adverse events, lower means better in the table. All studies reported in the table use a causal research design.

The results should be interpreted alongside those for quantity of obstetric services in Table 3. Recall that we found mixed results for quantity, with reductions in intensive delivery

services only occurring in some cases. If quantity remains unchanged, quality is not likely to change either. If anything, quality outcomes could worsen if physician focus or effort declines in response to the reduction in risk from tort reform. If quantity does lower in response to tort reform, examining quality is necessary to identify defensive medicine. If services eliminated by tort reforms truly reflect defensive medicine, no changes in adverse events should be observed. In fact, adverse events could lower if defensive medicine previously increased wait times for high-value care, or if high malpractice risk previously limited physician supply. An increase in adverse events would suggest that at least some of the eliminated services did have value and therefore did not qualify as defensive medicine.

Generally, the literature finds that NED caps had little impact on infant mortality and other birth-related complications (Klick and Stratmann 2007; Yang et al. 2012; Iizuka 2013; Malak and Yang 2019). Currie and MacLeod (2008) and Cano-Urbina and Montanera (2023) find that NED caps increase complications and reduce late prenatal care and fetal alcohol syndrome, respectively. Two studies found no evidence of PD caps affecting childbirth complications and other undesirable outcomes (Currie and MacLeod 2008; Yang et al. 2012). Iizuka (2013) suggests PD caps result in more injuries to mothers/babies during delivery, while Cano-Urbina and Montanera (2023) find a reduction in fetal alcohol syndrome and no evidence of an effect on prenatal care or newborn anemia.

Most other types of reforms also yield predominantly null results. Two studies examine both periodic payments and attorney contingency fee limits. Klick and Stratmann (2007) find no evidence of an effect on infant mortality, and Yang et al. (2012) find no evidence of an effect for any of their multiple child health-related outcomes. Reforms of the CSR are not typically found to have an effect on birth outcomes (Klick and Stratmann 2007; Currie and MacLeod 2008; Yang

et al. 2012; Malak and Yang 2019). However, two studies suggest CSR reform may lead to increased injuries for mother or child and increase fetal alcohol syndrome (Iizuka 2013; Cano-Urbina and Montanera 2023). Reforms of JSL either show no evidence of an effect on child birth outcomes (Klick and Stratmann 2007; Yang et al. 2012) or a decrease in undesirable outcomes (Currie and MacLeod 2008; Iizuka 2013; Cano-Urbina and Montanera 2023). Frakes and Jena (2016) find that increased malpractice standards reduce maternal trauma and preventable complications in lower-quality-of-care areas but have no detectable effect in higher-quality-of-care areas. Frakes and Gruber (2020) found no evidence of an effect of military malpractice immunity on various birth-related outcomes.

JSL reforms have the most evidence to support improved quality of obstetric services, with six results showing improvement compared to three null results and no negative findings. Malak and Yang (2019) find improvements for multiple birth outcomes from JSL reforms for higher-risk patients, but not among lower-risk patients. Can-Urbina and Montanera show that these reforms improve adherence to prenatal care guidelines while reducing the rates of fetal alcohol syndrome and newborn anemia. Currie and MacLeod find reduced complications and Iizuka (2013) documents fewer injuries to the mother or baby during delivery. In contrast, Klick and Stratman (2007) find no evidence of an effect on infant mortality, while Yang et al. (2012) also obtain null results for birthweight, rates of preterm birth and birth injury, and Apgar scores.

In short, with the exception of JSL reforms, the literature on the effect of tort reforms on quality of obstetric services mostly contains null results. This could arise either from quantity of services not being meaningfully affected or from defensive medicine being reduced. Given the ambiguous results on quantity from Table 3, it is difficult to distinguish between these two

possibilities. Additionally, null results could arise simply from the outcomes being noisy measures of quality.

Quality of Non-Obstetric Services

Table 7 covers impacts of tort reforms on quality outcomes for other services besides obstetrics. Recall from Table 4 that the literature more strongly supports reductions in quantity for these other services than it does for obstetrics. Therefore, the results in Table 7 can be considered relatively cleaner tests of defensive medicine than were those from Table 6. Table 7 shows that null results are the most frequent, which supports the contention that tort reform reduces defensive medicine.

For NED caps, causally interpretable studies reach different conclusions. The only two results indicating improved quality are for non-vehicular accidental deaths (Shepherd 2008; Sloan and Shadle 2009). Null results are found for mortality from coronary heart disease (Avraham and Schanzenbach 2015), mortality after hospitalization (Moghtaderi et al. 2019; Zabinski and Black 2022), and admissions for conditions preventable by antibiotics (Panthöfer, 2022). However, increases are observed in mortality from medical or surgical complications (Cotet 2012) as well as non-fatal patient safety incidents (Zabinski and Black). An associational study by Konety et al. (2025) finds improved survival odds for bladder cancer patients.

Evidence on other types of tort reforms is scarce. A causal study by Frakes and Jena (2016) finds that increasing the standard required to show malpractice improves several indicators of quality in low-service-quality areas but has no discernable effect in high-service-quality areas. This perhaps points to supply being more constrained in lower-quality areas prior to the reform. Kessler and McClellan (1996, 2002a) find no evidence that tort reform in general affects mortality and readmissions for heart disease patients, while Sloan and Shadle (2009) find

a null result for post-admission survival rate. An associational study by Chen et al. (2022) finds that general tort reform is associated with more successful humerus fracture surgeries and no detectable change in adverse event rates, but a higher mortality rate after surgery.

Physician Supply

Table 8 turns to supply of physicians. The effects of NEDs have been studied extensively using causal research designs, including one that is only applicable to this particular topic: a difference-in-difference-in-differences (DDD) model where the third difference comes from specialties facing high vs. low malpractice risk. Since responses should be minimal in low-risk specialties, they serve as a control group. Indeed, one study that examined the effect of NED caps separately for high- and low-risk specialties found an increase in supply for high-risk but null results for low-risk, supporting the DDD approach (Pesko et al. 2017). For the number of physicians in general, several studies find increases from NED caps (Encinosa and Hellinger 2025; Klick and Stratmann 2007; Lieber 2014; Helland and Seabury 2015) but others find null results (Paik et al. 2016; Baum 2020). Matsa (2007) find a null result overall but an increase in physicians in rural areas, which are generally particularly vulnerable to supply shortages. Perry and Clark (2012) show that NED caps increase physician retention within states. Turning to studies on particular types of physicians, Encinosa and Hellinger (2005) document an increase in the number of ob-gyns, but Cotet-Grecu (2015) and Yang et al. (2008) find no evidence of an effect, as does an associational study by Chou and Lo Sasso (2009). Encinosa and Hellinger (2005) and Chou and Lo Sasso (2009) find an increase in the supply of surgeons, with Chou and Lo Sasso (2009) also finding a null result for primary-care providers. Finally, Pesko et al. (2017) finds no evidence of effects on older physicians, which could be attributable to them being more settled in their locations.

There is little evidence that any of the other types of tort reforms influence physician supply. In studies with causal research designs, null effects on numbers of physicians are reported for punitive damage caps (Lieber 2014), periodic payment reforms (Klick and Stratmann 2007), CSR reforms (Encinosa and Hellinger 2005; Klick and Stratmann 2007), attorney fee limits (Klick and Stratmann 2007), JSL limits (Encinosa and Hellinger 2005; Klick and Stratmann 2007; Lieber 2014), and general tort reform (Klick and Stratmann 2007; Helland and Seabury 2015). For specialty providers, null effects on number of ob-gyns are found for periodic payment reforms (Yang et al. 2008), CSR reforms (Encinosa and Hellinger 2005), and attorney fee limits (Yang et al. 2008), while Encinosa and Hellinger (2005) also find null effects of CSR and JSL reforms on surgeons. The only study that finds significant effects of these other reforms is Perry and Clark (2012), and their results are mixed: increased physician retention from JSL reforms, reduced retention from CSR reforms, and no evidence of a change in either direction from periodic payment reforms. For tort reform in general, Perry and Clark (2012) find evidence of a net increase in physicians (increase from direct reforms accompanied by a smaller decrease from indirect reforms), while an associational study by Hyman et al. (2015) finds no evidence of an association in either direction.

In short, physician supply is one of the most extensively studied outcomes in the tort reform literature. A large body of evidence shows that NED caps increase physician supply in some – though not all – circumstances. In contrast, the other types of reforms appear to be less important.

Affordability and Insurance

In Table 9, we lump together studies on three outcomes related to affordability: prices of services (Panel A), health insurance premiums (Panel B), and rates of health insurance coverage

(Panel C). We could only find one study that looks specifically at prices of services as opposed to expenditures, which depend on both price and quantity. Friedson (2017) examines the effects of NED caps on charges and reimbursement rates for a number of procedures, finding a mix of reductions and null results.

Turing to health insurance premiums, we again see a mix of reductions and nulls. Morrisey et al. (2008) finds no evidence of an effect of NED caps on employer-sponsored health insurance premiums. Avraham et al. (2009) shows that the effects of NEDs, CSR reforms, and JSL reforms vary depending on the type of insurance. All three policies reduce premiums on plans for which employers self-insure, but there is no evidence that any of them influence premiums for HMO plans.

Finally, Avraham and Schanzenbach (2010) is the only paper we could find that examines health insurance coverage, but it covers several types of reforms and multiple outcomes. While they do not find evidence that tort reforms influence health insurance coverage for the population in general, a different story emerges when the focus on particular price-sensitive groups. NED caps, caps on punitive damages, and CSR and JSL reforms all increase health insurance coverage for young and single people. Punitive damage caps and JSL reforms increase coverage among those who are self-employed, while NED caps and CSR reforms have no evidence of an effect.

In sum, the available evidence – while limited – suggests that tort reforms either improve affordability or have no effect. The distinction depends on the type of individual, procedure, and insurance plan.

IV. Discussion

This paper reviewed the empirical literature on the effects of tort reforms on outcomes related to malpractice risk, quantity and quality of health care services, overall utilization and

expenditures, physician supply, and patient affordability. Of the different types of tort reforms, NEDs have received the most attention. The evidence is sufficient for us to conclude that NEDs appear to have either favorable or null effects on the outcomes of interest, depending on the specific outcome, methodology, time period, and study population. The preponderance of evidence points towards reduced malpractice risk, no clear change in the amount of diagnostic testing, no clear change in the quantity or quality of obstetric services, lower quantity of other services with no clear change in quality (implying a reduction in defensive medicine), reduced overall health care utilization and expenditures, increased physician supply. There is also some evidence of improvements in certain dimensions of affordability for patients, but the number of studies on that topic is relatively small. We do not view the evidence as extensive enough for other reforms to draw clear conclusions, with the possible exception of JSL limits improving the quality of non-diagnostic, non-obstetric services as well as some measures of affordability.

Perhaps the central challenge in the empirical tort reform literature is the dilemma between modeling policy variation in detail and obtaining precise enough estimates to be informative. There are several different types of tort reforms, each of which can be implemented with varying levels of intensity (e.g. high versus low damage caps). The ideal econometric model would include each possible intensity level of each type of reform as well as their interactions with each other. However, this would require a large number of collinear treatment variables, likely leading to very large standard errors. Consequently, most quasi-experimental studies in the literature examine only one or a few types of tort reforms, modeled as indicators. While this improves efficiency, it makes the other reforms omitted variables that could bias treatment effect estimators, while also missing potentially important heterogeneity in the treatment effects.

Relatively recent advances in combining machine learning methods with causal inference could provide a path forward. These approaches, summarized by Athey and Imbens (2019), would allow for data-driven selection of the most important reforms and interactions to include in the model as well as their functional forms. This may help future researchers strike an appropriate balance between detail and precision.

Additionally, since the tort reform literature spans decades, little of it addresses the concerns about bias from heterogeneous and dynamic treatment effects in staggered treatment time two-way fixed effects models that have been identified by recent econometric advances (e.g. Goodman-Bacon, 2021). A number of estimators are now available to correct for these biases, and the tort reform literature would benefit from their utilization in future work.

Finally, we encourage researchers to move beyond econometric investigations of the outcomes most likely to be favorably impacted by tort reform towards a more comprehensive welfare analysis. Finding that certain tort reforms improve these health-care-related outcomes does not necessarily imply that they are social-welfare improving, as a full welfare analysis would also account for losses among victims of malpractice and even their attorneys. To illustrate, consider the extreme case in which malpractice liability was completely eliminated. This would eliminate all defensive medicine while also likely increasing the supply of physicians, thereby appearing to be a beneficial policy according to the outcomes measured in the literature. However, few people would consider this an optimal policy from a social-welfare perspective, as patients who are the victims of malpractice presumably ought to have some right to compensation. Identifying the optimal amount of malpractice liability and the best tools to reach that level is therefore extremely challenging and would require sophisticated mathematical

analysis. At a minimum, we recommend that future work include a clear discussion of the challenges with identifying optimal policy.

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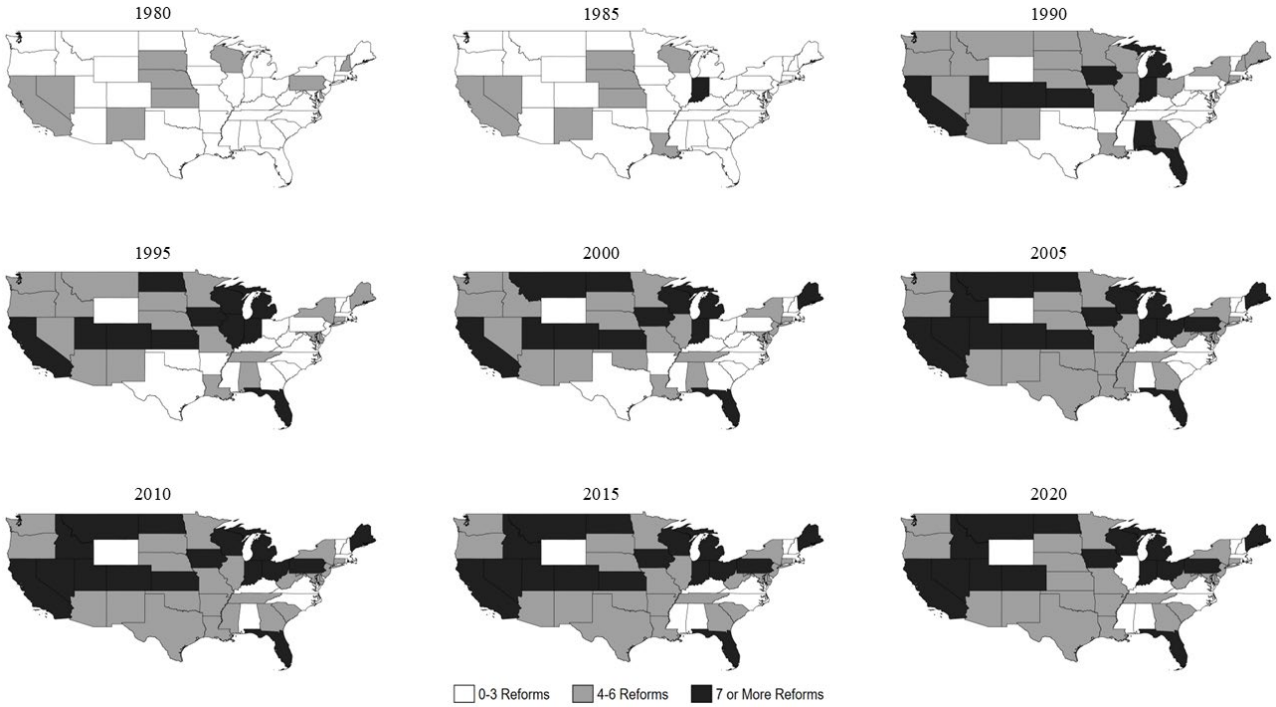
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Figure 1. Changes in Total Malpractice Reforms for U.S. States from 1980 to 2020



Notes: Alaska (1980 & 1985: 4 reforms in place, 1990 & 1995: 6 reforms in place, 2000-2020: 8 reforms in place) and Hawaii (1980 & 1985: 1 reform in place, 1990-2020: 5 reforms in place) are not shown. Data source: Avraham, Ronen, Database of State Tort Law Reforms (7.1) (October 26, 2021). U of Texas Law, Law and Econ Research Paper No. e555, Available at
SSRN: https://ssrn.com/abstract=902711 or http://dx.doi.org/10.2139/ssrn.902711

Table 1: Effects of Tort Reforms on Malpractice Environment

Study	Data	Method	Damage Caps		Periodic Payments	Collateral Offset	Attorney Fee Limits	Increased Negligence Standard	Physician Liability Caps	Joint and Several Liability Limits	Statute of Limitations	General Tort Reform
			Non-Economic	Punitive								
Panel A: Claims												
Kessler and McClellan (1997)	AMA SMS	TWFE										-
Kessler and McClellan (2002b)	PIAA	TWFE										-
Durance (2010)	NPDB	TWFE[1]	-									
Paik et al. (2013a)	NPDB	TWFE	-									
Baum (2020)	MLM, NAIC	TWFE	0									
Zuckerman et al. (1990)	Claims	Associational	-			0	0		0		0	
Panel B: Premiums												
Kessler and McClellan (1997)	AMA SMS	TWFE										-
Thorpe (2004)	NAIC	TWFE	-			-	0					
Kilgore et al. (2006)	MLM	TWFE	-		+	+				0	-	
Grace and Leverty (2013)	NAIC	TWFE	-	0		0				0		
Baum (2020)	MLM, NAIC	TWFE	0									
Black et al. (2022)	MLM	TWFE	0									
Yu and Baker (2022)	MLM for NC	TWFE	-									
Zuckerman et al. (1990)	HCFA	Associational	0			0	0		-		+	
Viscusi and Born (2005)	NAIC	Associational	-									-
Panel C: Perceived Risk												
Kessler and McClellan (1997)	AMA SMS	TWFE										-
Carrier et al. (2010)	Physician survey	Associational	0	+		0	0	0		-		

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include multiple outcomes and several specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects; AMA SMS=American Medical Association Socioeconomic Monitoring System survey; PIAA=Physician Insurers Association of America; NPDB=National Practitioner Data Bank; NAIC=National Association of Insurance Commissioners; MLM=Medical Liability Monitor; HCFA=Health Care Financing Administration. [1] Durance (2010) also reported results from instrumental variables regressions using state political variables as instruments. We focus on their TWFE results due to the questionable validity of the exclusion restriction in the IV models.

Table 2: Testing/Imaging/Diagnostic Services

Study	Data	Outcome(s)	Method	Damage Caps		Periodic Payments	Collateral Offset	Attorney Fee Limits	Increased Negligence Standard	Immunity for Physicians	Joint and Several Liability Limits	General Tort Reform
				Non-economic	Punitive							
Waxman (2014)	Medicare claims	CT scans and MRIs for emergency department patients	DiD[1]						0			
Li et al. (2016)	NAMCS	Radiography orders from office visits	TWFE	-	-	-	0				0	-
Moghtaderi et al. (2019)	Medicare claims	Imaging rates, radiology and lab spending	TWFE	+								
Frakes and Gruber (2019)	Military medical records	Rates of various diagnostic procedures	DiD[2]							-		
Ellenbogen et al. (2024)	CMS	Per-user costs of tests and imaging	Synthetic DiD[2]	0								
Bilmoria et al. (2017)	HCAHPS	Imaging utilization rate	Associational									+
Esposto (2008)	Hospital-level data	Availability of diagnostic technologies	Associational									-
Smith-Bindman et al. (2011)	Medicare claims	Neurologic imaging rates for emergency department patients with head injuries	Associational	+		+	+	-				
Carrier et al. (2013)	CSHSCH-TS	Conventional imaging, advanced imaging, and supplemental testing after emergency and non-emergency visits for chest pain, headache, and low back pain	Associational	0 [3]								

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include multiple outcomes and several specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, DiD=difference-in-differences, CT=compound topography, MRI=magnetic resonance imaging, NAMCS= National Ambulatory Medical Care Survey, CMS=Centers for Medicare and Medicaid Services, HCAHPS=Hospital Consumer Assessment of Healthcare Providers and Systems, and CSHSCHTS=Center for Studying Health System Change Health Tracking Physician Survey. [1] They conducted separate DiD regressions for each treated state: Texas, Georgia, and South Carolina. [2] Their DiD approach leveraged immunity for active-duty patients treated on base. [3] They conducted separate analyses for both treated states: North Carolina and Tennessee. [4] They examined the effects of any damage cap and found null results for most of these outcomes, with a few exceptions: (i) increases in supplemental testing for chest pain and conventional imaging for low back pain within seven days of non-emergency visits and (ii) advanced imaging within seven days of both non-emergency visits for headache and emergency visits for low back pain.

Table 3: Utilization and Expenditures for Obstetric Services

Study	Data	Method	Damage Caps		Periodic Payments	Collateral Offset	Attorney Fee Limits	Immunity for Physicians	Joint and Several Limits	General Tort Reform
			Non-economic	Punitive						
Panel A: C-Sections										
Currie and MacLeod (2008)	NVSS natality	TWFE	+			0			-	
Frakes (2012)	NVSS natality	TWFE	0	0		0				0
Cotet-Grecu (2015)	NVSS natality	TWFE	0							
Cano-Urbina and Montanera (2017)	NVSS natality	TWFE	0			0			0	
Malak and Yang (2019)	Linked birth and death records	TWFE	-	+		0			0	
	High-risk subsample		0	0		0			+	
Frakes and Gruber (2020)	Military records on childbirths	DiD leveraging immunity when treating active-duty patients on base	+					+		
Mushinski et al. (2022)	NVSS natality; low-risk pregnancies	DiD for Oregon vs. Washington[1]	-							
	NVSS natality; high-risk pregnancies		0							
Cano-Urbina and Montanera (2023)	NVSS natality; timely prenatal care	TWFE	-	0		0			0	
	NVSS natality; late or no prenatal care		+	0		0			+	
Yang et al. (2009)	NVSS natality	Associational	Mixed[2]	0	0	0	-		0	
Panel B: Inductions										
Currie and MacLeod (2008)	NVSS natality	TWFE	0			0			-	
Roth (2016)	NVSS natality	Associational	+	+					-	
Panel C: Episiotomies										
Frakes (2012)	NVSS natality	TWFE	-	0		0				-
Malak and Yang (2019)	Linked birth and death records	TWFE	+	-		0			0	
	High-risk subsample					+				

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include multiple outcomes and several specifications, and there could be particular regressions in which the results are different than we report here. [1] Mushinski et al. (2022) examined the effect of the *removal* of Oregon's damage cap due to a court ruling. We report the sign of their coefficient estimate in reverse to ensure comparability with the other studies that examined the initiation of caps. [2] They found a reduction for a cap ≤ $500k but a null for > $500k.

Table 4: Utilization and Expenditures for Other Services

Study	Data	Outcome	Method	Damage Caps		Periodic Payments	Collateral Offset	Attorney Fee Limits	Increased Malprac-tice Standard	Joint and Several Limits	General Tort Reform
				Non-Economic	Punitive						
Kessler and McClellan (1996)	Medicare claims	Hospital expenditures for heart disease patients	TWFE								-
Kessler and McClellan (2002a)	Medicare claims	Hospital expenditures for heart disease patients	TWFE								-
Sloan and Shadle (2009)	NLTCS hospital data for 65+	Medicare payments for AMI, breast cancer, stroke, diabetes	TWFE								0
Avraham and Schan-zenbach (2015)	NIS; heart disease patients age 45-90	Rate of angioplasty or bypass procedures	TWFE	-							
Moghtaderi et al. (2019)	Medicare claims	Stent and bypass rates	TWFE	-							
Panthöfer (2022)	NAMCS, NIS	Antibiotic prescriptions	TWFE	-							
Hennesey and O'Neil (2004)	NIS	Charges for head trauma admissions	Associa-tional	+	-	-	+	-		-	
Konety et al. (2005)	SEER	Surgery odds for those with early-stage bladder cancer	Associa-tional	0							
		Odds with late-stage bladder cancer		+							
Carrier et al. (2013)	CSHSCHTS	Readmission within a week after emergency or non-emergency visits for chest pain, headache, and low back pain	Associa-tional	0 [1]							
Chen et al. (2021)	Medicare claims	Surgeries for rotator cuff tear or humerus fracture	Associa-tional	0	+		0		-	+	

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include multiple outcomes and several specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, NLTCS=National Long-Term Care Survey, AMI=acute myocardial infarction, NIS=Nationwide Inpatient Sample, SEER=Surveillance, Epidemiology, and End Results, CMS=Centers for Medicare and Medicaid Services, and CSHSCHTS=Center for Studying Health System Change Health Tracking Physician Survey. [1] The only exception is an increase in emergency admissions following non-emergency visits for headache.

Table 5: General Utilization and Expenditures

Study	Data	Outcome	Method	Damage Caps		Collateral Offset	Increased Malprac. Standard	Immunity for Physicians	Joint and Several Limits	General Tort Reform
				Non-Economic	Punitive					
Cotet (2012)	Area Resource File	Surgeries, hospital admissions, and outpatient visits	TWFE	-						
		Emergency visits		0						
Paik et al. (2012)	Texas Medicare	Expenditures	DiD[1]							0
Waxman (2014)	Medicare claims	Per-visit charges for Georgia emergency room patients	DiD				-			
		Same outcome for South Carolina patients					0			
		Same outcome for Texas patients					0			
Born et al. (2017)	NAIC statutory filings in Texas	Health insurers' amount of claims paid	DiD and DDD[2]							0
Paik et al. (2017)	Medicare spending	Part A spending per enrollee	TWFE	0						
		Part B spending per enrollee		+						
Frakes and Gruber (2019)	Military medical records	Inpatient spending	DiD[3]					-		
Moghtaderi et al. (2019)	Medicare claims	Part A spending	TWFE	0						
		Part B spending		+						
Ellenbogen et al. (2024)	CMS	Interventional procedures, surgeries, radiation therapy, and dialysis	Synthetic DID, NC and TN analyzed separately	0						
Encinosa and Hellinger (2006)	CMS state-level data	Per capita health care expenditures	Associa-tional	-	0	0			0	
Xu et al. (2013)	NAMCS	Referrals	Associa-tional	-						

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include multiple outcomes and several specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, CMS=Centers for Medicare and Medicaid Services, and NAMCS=National Ambulatory Medical Care Survey. [1] Their DiD model compares high-claims-rate versus low-claims-rate counties after comprehensive tort reform in Texas. [2] The third difference in their DDD model comes from insurers in unaffected industries. [3] Their DiD model leverages immunity when treating active-duty patients on base.

Table 6: Quality Indicators for Obstetric Services (lower indicates better)

Study	Data	Outcome	Method	Damage Caps		Periodic Payments	Collateral Offset	Attorney Fee Limits	Increased Malpractice Standard	Immunity	Joint and Several Liability Limits
				Non-Economic	Punitive						
Klick and Stratmann (2007)	CDC deaths	Infant mortality	DDD[1]	0		0	0	0			0
Currie and MacLeod (2008)	Vital Statistics natality	Complications	TWFE	+	0		0				-
Yang et al. (2012)	NCHS Natality Detail File	Null birthweight, preterm, birth injury, low Apgar	Mixed effects models	0	0	0	0	0			0
Iizuka (2013)	NIS data	Injuries to mother or baby during delivery	TWFE	0	+		+				-
Frakes and Jena (2016)	NHDS and BRFSS	Maternal trauma and preventable delivery complications in low-quality-of-care areas	TWFE						-		
		Same outcomes in high-quality areas							0		
Malak and Yang (2019)	Linked Birth and Infant Death Records	Preventable complications, breech birth and infant mortality in high-risk areas	TWFE	0			0				-
		Same outcomes in low-risk areas		0			0				0
Frakes and Gruber (2020)	Military records on childbirths	Complications, neonatal trauma, maternal trauma and infant mortality	DiD[2]							0	
Cano-Urbina and Montanera (2023)	Vital Statistics natality data	Lack of prenatal visits or timely prenatal care	TWFE	-	0		0				-
		Fetal alcohol syndrome		-	-		+				-
		Newborn anemia		0	0		0				-

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include numerous specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, DDD=difference-in-difference-in-differences, DiD=difference-in-differences, NIS=National Inpatient Sample, CDC=Centers for Disease Control, NHDS=National Hospital Discharge Survey, BRFSS=Behavioral Risk Factor Surveillance System, and NCHS=National Center for Health Statistics. [1] Their third difference is high- vs. low-risk specialties. [2] Their DiD leverages immunity when treating active-duty patients on base.

Table 7: Quality Indicators for Other Services (lower indicates better)

Study	Data	Outcome	Method	Non-Economic Damage Caps	Increased Standard	General Tort Reform
Kessler and McClellan (1996)	Medicare claims	Mortality and readmissions for heart disease patients	TWFE			0
Kessler and McClellan (2002a)	Medicare	Mortality and readmissions for heart disease patients	TWFE			0
Rubin and Shepherd (2007)	CDC deaths	Non-vehicular accidental deaths	TWFE	-		
Shepherd (2008)	CDC deaths	Non-vehicular accidental deaths	TWFE	-		
Sloan and Shadle (2009)	NLTCS for those 65+	Survival rate after admission to hospital	TWFE			0
Cotet (2012)	DSTLR	Mortality related to medical or surgical complications	TWFE	+		
Avraham and Schanzenbach (2015)	National Vital Statistics mortality	Mortality from coronary heart disease	TWFE	0		
Frakes and Jena (2016)	NHDS and BRFSS	Mortality, avoidable hospitalizations, maternal trauma, preventable delivery complications in low-service-quality areas	TWFE		-	
		Same outcomes in high-quality areas			0	
Moghtaderi et al. (2019)	Medicare claims	Mortality after hospitalization	TWFE	0		
Panthöfer (2022)	NAMCS and NIS	Admissions for conditions preventable by timely antibiotics	TWFE	0		
Konety et al. (2005)	SEER	Mortality rate for those with bladder cancer	Associational	-		
Chen et al. (2022)	Medicare claims	Unsuccessful surgery following humerus fracture	Associational			-
		Adverse event rates				0
		Mortality rate after surgery				+
Zabinski and Black (2022)	AHRQ and TX, FL, and SC inpatient data	Mortality after admission	TWFE	0		
		Non-fatal patient safety incidents		+		

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include numerous specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, SEER=Surveillance, Epidemiology, and End Results Program, CDC=Centers for Disease Control, NLTCS=National Long-Term Care Survey, DSTLR=Database of State Tort Law Reforms, NHDS=National Hospital Discharge Survey, NAMCS=National Ambulatory Medical Care Survey, NIS=National Inpatient Sample, AHRQ=Agency for Health Care Research and Quality, TX=Texas, FL=Florida, and SC=South Carolina.

Table 8: Physician Supply

Study	Data	Outcome	Method	Damage Caps		Periodic Pay-ments	Collater-al Offset	Attorney Fee Limits	Joint Liability Limits	General Tort Reform
				Non-Econ.	Punitive					
Encinosa and Hellinger (2005)	ARF	Physicians, ob-gyns, and surgeons per capita	TWFE	+ [1]			0		0	
Kessler et al. (2005)	AMA	Physicians	TWFE							+ [2]
Klick and Stratmann (2007)	AMA	Physicians	DDD; 3rd diff. is high-vs. low-risk specialties	+		0	0	0	0	0
Matsa (2007)	ARF	Physicians per capita	TWFE	0						
		Rural areas only		+						
Perry and Clark (2012)	ACS	State-level physician retention[3]	DDD: 3rd diff. is MD vs. DDS	+		0	-		+	
Lieber (2014)	AHRF	Physicians	DiD identifying effect in border state	+ [4]	0		0		0	
Cotet-Grecu (2015)	ARF	Ob-gyns per capita	TWFE	0						
Helland and Seabury (2015)	AHRF	Physicians	DDD; 3rd diff. is high-vs. low-risk specialties	+						0
Paik et al. (2016)	AHRF	Physicians	TWFE, DDD with high-vs. low-risk specialties, synthetic control	0						
Pesko et al. (2017)	ARF	Younger physicians in high-risk specialties	TWFE	+						
		Younger physicians in low-risk specialties		0						
		Older physicians		0						
Baum (2020)	ARF	Physicians per capita	TWFE	0						
Chou and Lo Sasso (2009)	Survey of exiting New York residents	Locations of surgeons	Associational	+						
		Locations of ob-gyns		0						
		Location choices of primary care physicians		0						
Yang et al. (2008)	AMA	Ob-gyns	Mixed methods	0		0	0	0	0	
Hyman et al. (2015)	Texas State Health	Physicians per capita	Associational							0

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include numerous specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, DDD=difference-in-difference-in-differences, DiD=difference-in-differences, ARF=Area Resource Files, AMA=American Medical Association, ACS=American Community Survey, AHRF=Area Health Resource Files. [1] The increases are from caps of less than $250,000. [2] Having a "direct" reform (damage caps, abolition of punitive damages, no mandatory pre-judgment interest, or collateral source reform) increased physician supply. Having an "indirect" reform decreased supply, but by less than the increase from direct reform. [3] They actually examined the effect on migration of physicians out of the state; we frame the outcome as retention in order to keep the signs consistent with those of the studies on numbers of physicians. [4] Technically, they found a reduction in states that border reform states, which implies an increase in the state that actually passed the reform.

Table 9: Affordability/Insurance Coverage

Study	Data	Outcome	Method	Damage Caps		Periodic Payments	Collateral Offset	Attorney Fee Limits	Patient Compen-sation Fund	Joint and Several Liability Limits	General Tort Reform
				Non-Economic	Punitive						
Panel A: Prices											
Friedson (2017)	Medical/Surgical module of FAIR Health private health insurance claims database	Charges for obstetric and cardiovascular procedures	TWFE	0							
		Reimbursement for c-sections, vaginal birth, transvaginal ultrasound, abdominal ultrasound, angioplasty with stent, and echocardiogram		-							
		Reimbursement for balloon angioplasty, echocardiogram, and stress echocardiogram		0							
Panel B: Health Insurance Premiums											
Morrisey et al. (2008)	Kaiser/HRET Employer Health Insurance Surveys	Health insurance premiums	TWFE	0							
Avraham et al. (2009)	LEHID: employer health insurance plan data	Premiums on employer-sponsored self-insured plans	TWFE	-			-			-	
		HMO premiums		0			0			0	
Panel C: Health Insurance Coverage											
Avraham and Schanzenbach (2010)	CPS data on health insurance coverage	Population-wide health insurance coverage	TWFE	0	0		0			0	
		Health insurance coverage for young and single people		+	+		+			+	
		Coverage for self-employed people		0	+		0			+	

Notes: The above characterizations as increasing, decreasing, or null are based on our interpretation of the preponderance of evidence from the given study. Studies often include numerous specifications, and there could be particular regressions in which the results are different than we report here. TWFE=two-way fixed effects, AMI=acute myocardial infarction, NIS=National Inpatient Sample, HRET=Health Research & Educational Trust, LEHID=Large Employer Health Insurance Dataset, HMO=health maintenance organization, CPS=Current Population Survey.