



## Does tort reform affect physician supply? Evidence from Texas ☆,☆☆,☆☆☆,★



David A. Hyman<sup>a,\*</sup>, Charles Silver<sup>b,1</sup>, Bernard Black<sup>c,2</sup>, Myungho Paik<sup>d,3</sup>

<sup>a</sup> University of Illinois, School of Law and School of Medicine, Champaign, IL, United States

<sup>b</sup> University of Texas School of Law, Austin, TX, United States

<sup>c</sup> Northwestern University, School of Law and Kellogg School of Management, Evanston, IL, United States

<sup>d</sup> Hanyang University, Department of Policy, Seoul, Korea

### ARTICLE INFO

#### Article history:

Received 10 April 2013

Accepted 3 February 2015

Available online 26 February 2015

### ABSTRACT

Does state tort reform affect physician supply? Tort reformers certainly believe so. Before Texas adopted tort reform in 2003, proponents claimed that physicians were deserting Texas in droves. After tort reform was enacted, proponents claimed there had been a dramatic increase in physicians moving to Texas due to the improved liability climate. We find no evidence to support either claim. Physician supply was not measurably stunted prior to reform, and it did not measurably improve after reform. This is true for all patient care physicians in Texas, high-malpractice-risk specialties, primary care physicians, and rural physicians.

© 2015 Elsevier Inc. All rights reserved.

### 1. Introduction

The United States recently completed its third medical malpractice (“med mal”) crisis in the last forty years. As with previous crises, a precipitous increase in malpractice premiums prompted a push for tort reform, especially in states that had not already enacted caps on non-economic or total damages (“damage caps”). Both sides deployed the standard mélange of anecdotes, slogans, talking points, and heartfelt appeals to larger principles. As in prior crises, physicians often had the upper hand, with nine states adopting new damage caps between 2002 and 2006, and seven more adopting caps on punitive damages or other reforms intended to limit malpractice suits.<sup>1</sup>

We focus on Texas, which adopted a strict cap on non-economic (“non-econ”) damages and other reforms in 2003. These reforms contributed to a drop in total payouts on med mal claims of over 70% from 2003 to 2009. Physician supply issues played a prominent role in the tort reform debate in Texas. Proponents argued that physicians were fleeing Texas because of lawsuit risk and high insurance premiums, but would stop leaving if the state adopted tort reform. After the reforms took effect, they claimed that the reforms also brought new physicians to the state in droves—a more impressive result than the original prediction, which was only that doctors already in Texas would stay put.

In a previous article, we examined the number of physicians practicing in Texas post-tort reform.<sup>2</sup> Using active, direct patient-care (DPC) physicians per 100,000 Texas residents as a measure, we found no evidence of a pre-2003 decline and no evidence of a post-reform improvement. To the contrary, the rate of increase in Texas DPC physicians per capita was lower after reform. We did not suggest that tort reform caused the slowdown, which seems implausible. Instead, we hypothesized that physician supply is driven primarily by other factors, such as economic growth and the size of Texas’ population of insured patients.

☆ Northwestern University Law School, Law and Economics Research Paper No. 12-11.

☆☆ University of Illinois, Program in Law, Behavior and Social Science Research Paper No. LE12-12.

☆☆☆ University of Texas Law School, Law and Economics Research Paper No. 225.

\* This paper can be downloaded without charge from the Social Science Research Network electronic library at: <http://ssrn.com/abstract=2047433>.

\* Corresponding author. Tel.: +1 217 333 0061.

E-mail addresses: [dhyman@illinois.edu](mailto:dhyman@illinois.edu) (D.A. Hyman), [csilver@law.utexas.edu](mailto:csilver@law.utexas.edu) (C. Silver), [bblack@northwestern.edu](mailto:bblack@northwestern.edu) (B. Black), [mpaik@hanyang.ac.kr](mailto:mpaik@hanyang.ac.kr) (M. Paik).

<sup>1</sup> Tel.: +1 512 232 1337.

<sup>2</sup> Tel.: +1 312 503 2784.

<sup>3</sup> Tel.: +82 2 2220 2083.

<sup>1</sup> States adopting new damage caps were Florida, Georgia, Illinois, Mississippi, Nevada, Ohio, Oklahoma, South Carolina, and Texas. The caps in Georgia and Illinois

have since been invalidated by the state courts. Arizona, Idaho, Missouri, and Montana adopted punitive damage caps; Pennsylvania and West Virginia adopted other reforms; and Alaska reduced the level of its existing cap on non-economic damages.

<sup>2</sup> Silver et al. (2008).

Our prior study was tentative. We had data on DPC physicians for only four post-reform years (2004–2007). Moreover, the Texas Medical Board (“TMB”) had reported a large increase in applications from doctors wanting to practice in the state. Texas’ physician population could have grown rapidly in later years, perhaps reflecting a delayed impact of tort reform.

In this article, we extend our analysis through 2011—sufficient time to have a clearer view of the connection between Texas’ tort reforms and patients’ access to physicians. The bottom line: There is no evidence that the number of active Texas physicians per capita is larger than it would have been without tort reform. Any effect of tort reform is too small for us to measure, against the background of other, larger forces affecting physician supply, both in Texas and nationally. This “non-result” is consistent with other studies, most of which find that state-level tort reforms increase physician supply modestly, if at all. When we focus on three high-malpractice risk specialties highlighted by tort reform advocates – neurosurgeons, orthopedic surgeons, and ob-gynecologists – we again find no evidence of a relative increase in Texas after tort reform. We also find no increase in primary care physicians or rural physicians.

Our findings offer a counterpoint to the multi-state studies that do report statistically significant (albeit modest in magnitude) effects for high-risk specialties and/or rural physicians. Tort reform may not meaningfully affect physician supply in any individual state, even one which, like Texas, adopts far-reaching reform. In subsequent work, we study all none states that adopted damage caps in the early 2000x, and find no evidence of an increase in physician supply, whether total, patient care, high-risk, or rural.<sup>3</sup>

Part II briefly reviews prior research on the connection between liability risk and physician supply, describes the tort reforms enacted by Texas in 2003, and details how those reforms affected liability risk. Part III details the claims made by proponents, both before and after tort reform, about the impact of tort reform on physician supply. Part IV assesses the merits of those claims. Part V discusses our findings. Part VI concludes.

## 2. Background: Prior research and the Impact of Texas’ 2003 reforms

### 2.1. Prior research

A number of prior multi-state studies have examined the extent to which tort reform influences physician supply. We summarize these studies here, but relegate details to [Appendix A](#). The stronger multi-state studies use a difference-in-differences (DiD) research design. Taken as a whole, these studies provide evidence that damage caps, on average, have a small positive impact on physician supply in rural areas and some specific specialties, but mixed evidence for statewide physician counts. One recent review reports evidence of “modest improvement in physician supply” after cap adoption.<sup>4</sup> Another concludes, more equivocally, that research “has not convincingly established what role, if any, liability pressure plays in determining the size of the physician workforce, particularly within individual physician specialties”.<sup>5</sup> Helland and Seabury (also published in this issue), study “third-wave” reforms, and find evidence of a post-reform rise in high-risk specialists, but our own study of these reforms finds no such evidence.<sup>6</sup> Given these modest multi-state findings, it would be surprising if tort reform

advocates’ claims of large effects (as described in Part III) were true.

We are aware of two Texas-specific studies (one unpublished) of the impact of tort reform on physician supply. The published study finds that the number of licensed physicians in Texas (whether engaged in patient care or not) increased modestly faster than Texas’ population during the post-reform period (which we find as well, see [Figs. 3 and 5](#)). The authors found a 46% increase in physicians in metro areas v. a 9% increase in non-metro areas. This study does not compare Texas to national trends.<sup>7</sup> For the unpublished study, we have the text but not the supporting figures and tables. This study reports mixed evidence on whether reform affected the number of physicians engaged in patient care, but argues (relying on a prior study) that Texas physicians are likely to be working more hours as a result of tort reform.<sup>8</sup>

### 2.2. Tort reform, Texas style

In mid-2003, Texas enacted a package of med mal litigation reforms. The core reform was a cap on non-econ damages in cases filed after September 1, 2003. The cap limits non-econ damages against physicians and other individual licensed health care providers to \$250,000 (nominal, not adjusted for inflation) for all of these individuals together. A separate \$250,000 cap applies to each hospital or other licensed health care facility, with total non-econ damages capped at \$500,000 for all health care facilities. Thus, the cap will be \$250,000 if there is one liable defendant, but can be as high as \$750,000 if there are multiple liable defendants.<sup>9</sup> The 2003 tort reforms also included a variety of less significant provisions.<sup>10</sup>

Post-reform, med mal claim rates and payouts dropped sharply.<sup>11</sup> As [Fig. 1](#) reflects, from 1990 to 2003, per capita claim frequency and payouts were generally stable. We measure claim frequency as the number of “large” paid claims – those that closed with payments exceeding \$25,000 – per 100,000 Texas residents that closed in a given year, and payout as the sum of all payments on these claims. (All amounts in this article are in 2008 dollars unless specified otherwise.)

Post-reform, large paid claims per 100,000 residents fell by 61% from 2003 to 2009, and the average payout per large paid claim dropped by 45%, for a combined drop of over 75% in total payouts. Payout per Texas resident dropped from \$24.39 to \$5.27.

Insurance premiums also fell. The largest insurer, Texas Medical Liability Trust, reported in 2009 that the 2003 reforms “dropped the cost of medical liability insurance by 50%” for its policyholders.<sup>12</sup> The Texas Tort Reform Association reported that other med mal carriers also reduced prices substantially.

To what extent did this transformation of the malpractice environment affect access to health care, proxied by the number of patient care physicians per capita in Texas? Part III reviews the claims made by reform proponents, both before and after reform.

<sup>7</sup> Stewart et al. (2013).

<sup>8</sup> Magee (2010) (relying on Helland and Showalter 2008).

<sup>9</sup> Texas Civil Practice and Remedies Code § 74.301.

<sup>10</sup> Other reform components include making the separate cap on damages in death cases apply per claim, rather than per defendant, higher evidentiary standards for cases involving emergency room care, a requirement that plaintiffs file an expert report within 120 days of suit with regard to each defendant’s negligence (by a practicing physician, if the defendant is a physician), and a ten year statute of repose.

<sup>11</sup> Paik et al. (2012a,b).

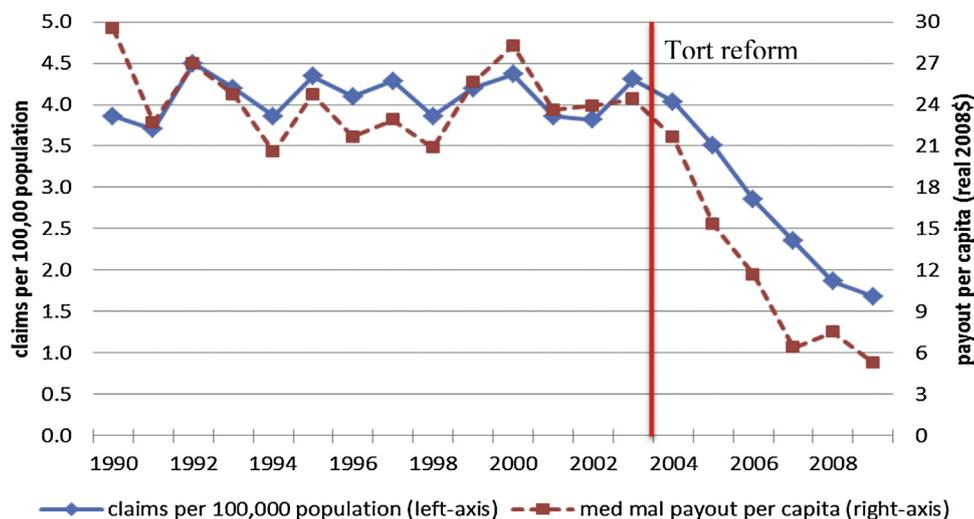
<sup>12</sup> Texas Medical Liability Trust, 2009 Annual Report, p. 4. This is in nominal dollars; the decline would be larger if adjusted for inflation.

<sup>3</sup> Paik, Black, and Hyman (2015).

<sup>4</sup> Kachalia and Mello (2011), at 1568.

<sup>5</sup> Yang et al. (2008), at 30.

<sup>6</sup> Helland and Seabury (2015); Paik, Black, and Hyman (2015).



**Fig. 1.** Medical Malpractice Claim Rates and Payouts in Texas Claims per 100,000 population by year for all claimants (left scale), and payouts per capita (right scale), for 14,995 nonduplicate, non-nursing-home, med mal cases closed from 1990 to 2009 with payout >\$25,000 in 1988 dollars. Texas tort reform in 2003 is depicted by vertical line. Amounts in 2008 dollars. This figure is taken from Paik, Black and Hyman (2012b), Fig. 3.

### 3. Physician supply: Claims

#### 3.1. Pre-reform

During the campaign to persuade the legislature to restrict lawsuits and to convince Texans to amend the state constitution (which had been held to forbid caps on damages), proponents argued that doctors were leaving Texas and that patients were losing their access to care.<sup>13</sup> For example, proponents mailed a brochure to Texas residents warning them that “doctors were fleeing Texas, leaving scores of counties with no obstetricians to deliver babies, [and] no neurologists or orthopedic surgeons to tend to the ill”.<sup>14</sup> Similarly, a “flier printed by the [Texas Medical Association] in English and Spanish and posted in waiting rooms across the state told patients that ‘152 counties in Texas now have no obstetrician. . . . The primary culprit for this crisis is an explosion in awards for non-economic (pain and suffering) damages in liability lawsuits’.”<sup>15</sup>

Immediately after tort reform was enacted, Governor Rick Perry gave a speech at the Manhattan Institute, in which he explained:

The threat of litigation has a domino effect. . . causing malpractice carriers to raise rates, which in turn force many doctors to leave Texas, or in some cases to leave the practice of medicine altogether. And ultimately this hurts patient access the most.

\*\*\*

We’ve seen neurosurgeons leave hospitals in medically underserved areas of the state. Women in three out of five Texas counties do not have access to obstetricians. Imagine the hardship this creates for many pregnant women in our state, but especially those women with high-risk pregnancies.<sup>16</sup>

<sup>13</sup> See, e.g., Paul Adrian, Tort Reform Benefits Questioned, May 16, 2008 (“Tort, or lawsuit, reform supporters accused trial lawyers of filing frivolous lawsuits, which jacked up malpractice insurance rates so high, that doctors were leaving in droves.”)

<sup>14</sup> Suzanne Batchelor, *Baby I Lied*, Texas Observer, Oct. 19, 2007.

<sup>15</sup> Id. There was, as we show in separate work, no such explosion in awards. Black et al. (2005).

<sup>16</sup> Rick Perry, How Texas Tackled Tort Reform: Taking on Trial Lawyers, Inc., Manhattan Institute, Oct. 8, 2003, at <http://www.manhattan-institute.org/html/clp10-8-03.htm>.

As these statements reflect, a core argument for reform was that Texas was hemorrhaging physicians and limiting lawsuits would stop the bleeding. Consistent with this theme, the core pro-tort-reform lobbying organization was named “Texas Association for Patient Access” (“TAPA”). The emphasis in the lobbying rhetoric was keeping physicians in Texas and practicing medicine. Reform proponents did not directly claim that the reforms would bring more new physicians to Texas.

#### 3.2. Post-reform

Post-reform, the claim that tort reform would stop the bleeding was quickly overshadowed by the stronger claim that tort reform was bringing new doctors into the state. In 2006, two prominent advocates of limits on med mal lawsuits wrote of an “amazing turnaround” across Texas and asserted that there had been “substantial increases” in several types of specialists.<sup>17</sup> In 2007, Drew Thornley of TAPA wrote that tort reform had the following effects:

Over the past four years, doctors and insurers have returned in droves, premiums are falling, and health care is more available and affordable.

\*\*\*

In May 2003, there were 35,723 in-state medical doctors. Today, there are 6,000 more. . . Doctors view Texas as an attractive place to practice.<sup>18</sup>

A 2007 article in the New York Times similarly quotes the executive director of the Texas Medical Board as saying that “doctors are coming to Texas because they sense a friendlier malpractice climate”.<sup>19</sup> The article’s headline summarized the proponents’

<sup>17</sup> Howard Marcus and Bruce Malone, *2003 Reforms Helping Doctors Do Their Work*, Austin American-Statesman, Apr. 10, 2006, available at <http://www.tortreform.com/node/220> (“This amazing turnaround is occurring across Texas, with a statewide gain of 93 orthopedic surgeons, 81 obstetricians and 32 neurosurgeons. We’ve also seen substantial increases in hard-to-recruit children’s doctors such as pediatric cancer physicians, pediatric endocrinologists, child neurologists and doctors who specialize in newborns and premature infants.”)

<sup>18</sup> Drew Thornley, *Tort Reform the Right Cure for Texas’ Doctor Shortage*, Houston Chronicle, Nov. 24, 2007, available at [http://www.tapa.info/html/newsroom/2007/11\\_24\\_2007.html](http://www.tapa.info/html/newsroom/2007/11_24_2007.html).

<sup>19</sup> Ralph Blumenthal, *After Texas Caps Malpractice Awards, Doctors Rush to Practice There*, N.Y. Times, Oct. 5, 2007.

claim: “After Texas Caps Malpractice Awards, Doctors Rush to Practice There.”

Similarly, in 2008, an op-ed in the *Wall Street Journal* by Texas legislator Joseph Nixon, the chief author of the tort reform bill, opened as follows:

When Sam Houston was still hanging his hat in Tennessee in the 1830s, it wasn't uncommon for fellow Tennesseans who were packing up and moving south and west to hang a sign on their cabins that read “GTT”—Gone to Texas.

Today obstetricians, surgeons and other doctors might consider reviving the practice. Over the past three years, some 7,000 M.D.s have flooded into Texas, many from Tennessee.

Why? Two words: Tort reform.<sup>20</sup>

In a longer article published in 2008, Representative Nixon expanded on his argument:

Amazingly, the Texas Board of Medical Examiners has licensed over 14,500 new doctors since 2003, doubling the number of physicians the Board would have licensed in that same time period. Each year since 2003 has set a new record number of applicants. Most surprising is the number of doctors with mature practices relocating to Texas from other states, solely because of [tort reform]. In fact, the Legislature in 2007 made a special, emergency appropriation to the Board to fund the salaries of additional employees to complete background examinations of all the physician applicants.<sup>21</sup>

Representative Nixon renewed these claims in 2012. After observing that the Texas Medical Board had “issued licenses to 24,584 new doctor applicants since the tort reform passed,” he boasted that “the Texas tort reform’s stated goal of increased access to health care is a documented winner” and that “Texas citizens, as patients, have greatly increased access to needed health care since 2003.”<sup>22</sup>

Other sources picked up these themes. A 2008 editorial in *American Medical News* asserted that Texas’s tort reform “is being credited for slashing liability insurance premiums, boosting the ranks of doctors in the state, and improving medical access to patients.”<sup>23</sup> In 2009, Dr. Howard Marcus, chair of TAPA, was quoted in the *Austin Chronicle* as stating that there were an “extra 16,000 doctors practicing in Texas since 2003 . . . [and] ‘when insurance premiums drop, doctors want to practice medicine and come to Texas’.”<sup>24</sup> Also in 2009, Newt Gingrich and Texas Governor Rick Perry wrote an op-ed in the *Washington Post* in which they stated that tort reform had “attracted record numbers of doctors to the state.”<sup>25</sup> Senator John Cornyn of Texas also jumped on the bandwagon. In a lecture delivered at the Heritage Foundation, he recited grim statistics about “the exodus of doctors from 2001 through

2003,” followed by the assertion that tort reform “encourage[d] doctors to move back to the state.”<sup>26</sup>

In 2010, Representative Lamar Smith, the ranking Republican on the House Judiciary Committee, wrote a piece entitled “The Truth About Tort Reform.” He claimed that, as a result of tort reform, “[m]ore than 14,000 doctors have returned to Texas or set up new practices in the state.”<sup>27</sup> In a 2010 press release, Governor Rick Perry asserted that after tort reform was enacted, “the number of doctors applying to practice in Texas has increased 60 percent and 17,625 doctors either returned to practice in Texas, or began practicing here for the first time, bringing critical specialties to underserved areas of the state.”<sup>28</sup>

In 2011, tort reform proponents used Texas’ experience to support a national cap on non-econ damages arguing that the reforms had made Texas “an enormously popular destination for doctors.”<sup>29</sup> Two Texas Representatives echoed these claims. Representative Kevin Brady stated: “the real benefit in Texas has been more doctors – over 21,000 new doctors – since tort reform was passed in 2003.” For families in the suburbs and rural areas of Texas, that means access to local specialists in emergency and children’s care that simply didn’t exist before.”<sup>30</sup> Similarly, when introducing a bill to cap non-econ damages nationwide, Representative Michael Burgess quoted the head of the Texas Medical Association that since tort reform “took effect, Texas has licensed 21,000 new physicians, including a record 3,621 in fiscal year 2008.”<sup>31</sup>

Reform proponents also claimed that specialists were moving into parts of the state where the need for them was especially great. For example, Governor Perry claimed in 2004 that:

Medical liability reform has been the catalyst for finally bringing critical specialties to underserved areas, including an 18% growth in doctors applying to practice in the Rio Grande Valley . . . [including] an increase of more than 23 percent in Hidalgo County and more than 16 percent in Cameron County.<sup>32</sup>

In 2009, Senator Cornyn stated that tort reform had “attracted hundreds of doctors to Texas’ rural and border communities.”<sup>33</sup> Senator Cornyn provided additional detail in his Heritage Foundation speech:

125 counties added at least one high-risk specialist between 2004 and 2008. . . [M]any of these counties had simply lost access to a doctor or never had it in the first place. For example:

- 70 counties added an emergency room doctor, 20 of which had not had one in 2003;
- 52 counties added an obstetrician, 10 of which had not had one at all;
- 50 added a general surgeon, 12 of which had not had one;

<sup>20</sup> Joseph Nixon, *Why Doctors are Heading For Texas*, *Wall St. J.* May 17, 2008, at <http://online.wsj.com/article/SB121097874071799863.html>.

<sup>21</sup> Joseph Nixon, *The Purpose, History and Five year Effect of Recent Lawsuit Reform in Texas*, 44 *Texas Observer* 9, 18 (2008).

<sup>22</sup> Joseph M. Nixon, *Negligent Consumer Advocacy*, *Wilson County News*, April 24, 2012, at <http://www.wilsoncountynews.com/article.php?id=42686&n=commentaries-negligent-consumer-advocacy>.

<sup>23</sup> Editorial, *5 years of tort reform: Lone Star success story*, Sep. 15, 2008, at <http://www.ama-assn.org/amednews/2008/09/15/edsa0915.htm>.

<sup>24</sup> Richard Whittaker, *Smith Prescribes a Spoonful of Tort Reform*, *Austin Chronicle*, Sep. 25, 2009, at <http://www.austinchronicle.com/news/2009-09-25/877738/>.

<sup>25</sup> Newt Gingrich & Rick Perry, *Let states lead the way: Washington’s one-size-fits-all reform won’t work*, *Wash. Post*, Nov. 6, 2009, at <http://www.rickperry.org/media-articles/let-states-lead-way-washingtons-one-size-fits-all-reform-wont-work>.

<sup>26</sup> John Cornyn & Edwin Meese, *Health Care and Medical Malpractice Reform: The Necessity of Reform in the Current Debate*, Heritage Lectures, Nov. 17, 2009 (published Jan. 28, 2010), at <http://www.heritage.org/research/lecture/health-care-and-medical-malpractice-reform-the-necessity-of-reform-in-the-current-debate>.

<sup>27</sup> Lamar Smith, *The Truth About Tort Reform, Critical Condition*, Mar. 8, 2010, at <http://www.nationalreview.com/critical-condition/47473/truth-about-tort-reform/lamar-smith>.

<sup>28</sup> Rick Perry, *We Need Increased Accountability, Efficiency in Our Legal System*, Sept. 15, 2010, at <http://www.rickperry.org/press-releases?page=4>.

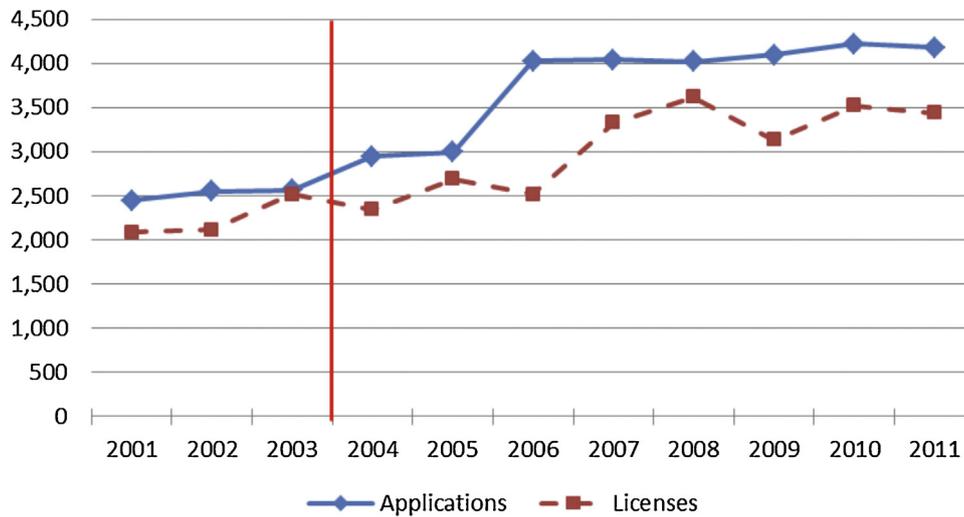
<sup>29</sup> Sarah Tung, *Doctors laud Texas’ brand of tort reform*; Brady’s bill similar to state’s limits on lawsuits, *Houston Chron.* May 27, 2011.

<sup>30</sup> *Id.*

<sup>31</sup> Burgess Reintroduces Legislation to End Unnecessary Health Care Lawsuits, Mar. 3, 2011, at <http://burgess.house.gov/News/DocumentSingle.aspx?DocumentID=227180>.

<sup>32</sup> Rick Perry, *Medical Liability Reform*, Nov. 15, 2004 at [http://www.governor.state.tx.us/priorities/economy/tax\\_regulatory\\_reform/medical\\_liability\\_reform/](http://www.governor.state.tx.us/priorities/economy/tax_regulatory_reform/medical_liability_reform/).

<sup>33</sup> <http://www.myharlingennews.com/?p=4230>.



**Fig. 2.** Texas Medical Licenses Applied for and Granted, FY2001–FY2011. Number of applications and licenses for fiscal years 2001–2011, as reported by TMB at <http://www.tmb.state.tx.us/TMBstats-FY01-10.pdf>, and <http://www.tmb.state.tx.us/TMBstats-FY02-11.pdf>. Texas tort reform in 2003 is depicted by vertical line.

- 45 added an orthopedic surgeon, nine of which had not had one before; and
- 20 counties added a vascular surgeon, 11 of which had not had one before.<sup>34</sup>

Thus, proponents have boasted repeatedly, in multiple venues and over many years, that Texas' 2003 tort reforms produced miraculous results, reversing dismal pre-reform trends. If these claims were true, the Texas miracle would be an important argument in favor of tort reform. But they are not true. Part IV compares these claims to the empirical reality, both before and after 2003.

#### 4. Texas physician supply: Empirical reality

##### 4.1. Initial facts: Licensed and active physicians

Most of the claims quoted in Part III are based on reports by the Texas Medical Board (TMB) showing the number of applications to practice medicine it receives, the number of licenses it issues, and the number of doctors practicing in identified specialties by county.<sup>35</sup> Fig. 2 presents the numbers of applications and licenses reported by TMB for its 2001–2011 fiscal years (ending August 31).

As Fig. 2 indicates, applications rose moderately in 2004, then substantially in 2006, but have been roughly flat since. Issued licenses lagged applications, but increased in 2007 and 2008, and have been roughly flat since. Tort reform proponents relied on these figures to claim that doctors flooded into Texas after tort reform was enacted. The claims for new doctors entering Texas noted in Part III correspond closely to the total number of licenses issued by TMB since the reforms were adopted. So, case closed, right?

Unfortunately, there are four distinct problems with relying on the number of licenses granted by TMB to claim that tort reform made Texas more attractive to physicians. First, simply adding up post-reform licenses, as tort reform advocates do, effectively assumes that tort reform deserves the credit for every physician who came to Texas after 2003. That assumption is wrong; physicians came to Texas every year before 2003—and many would have

come to Texas in 2004 and subsequent years, even if tort reform was never enacted.

Second, some physicians may have come to Texas during the post-reform period for reasons that had nothing to do with tort reform. For example, after Hurricane Katrina struck Louisiana in 2005, many Louisiana citizens relocated to Texas. In a 2010 report, the Texas Department of State Health Services suggested that an increase in “direct patient care” physicians in 2005 was “partially due to Hurricane Katrina”.<sup>36</sup> Tort reform did not cause Hurricane Katrina, and tort reform advocates should not take credit for the physicians the storm brought into the state. Hurricane Katrina could also explain why applications rose sharply in 2006.

Third, licensing data do not indicate how many physicians are engaged in patient care. Many licensed physicians are researchers, administrators, or otherwise occupied with non-clinical tasks. When assessing the claim that tort reform improved access to care, non-practicing physicians should be excluded from the calculation. Focusing on physicians in active practice also makes it possible to measure a possible impact of tort reform that would otherwise be obscured. Some licensed physicians may have switched from patient care to research or administration before the reforms, because of Texas' once-hostile malpractice climate, and switched back after the reforms. That switch should count as an increase in physician supply due to the reforms. TMB's data would not capture this change.

Finally, data on applications and new licenses (which is what tort reform proponents have focused on) is severely flawed because it does not reflect physicians who leave Texas or retire. Without knowing both how many new doctors arrived and how many old doctors departed, one cannot tell whether the number of doctors in Texas rose, fell, or was unchanged.

##### 4.2. Which dataset to use?

For reasons we discuss in greater detail below, we believe the best within-Texas data series with which to assess trends in patient care physicians is the one created by the Texas Department of State Health Services (“TDSHS”). (Both reform proponents and Stewart et al. (2013) used TMB's data series, not TDSHS's.) TDSHS begins

<sup>34</sup> Cornyn and Meese (2009), supra note 25.

<sup>35</sup> TMB's reports on physician demographics are available at <http://www.tmb.state.tx.us/agency/statistics/demo/docs/docdemo.php>. Data on applications and licenses is available at: <http://www.tmb.state.tx.us/TMBstats-FY01-10.pdf>.

<sup>36</sup> Texas Department of State Health Statistics, Characteristics of New Physicians in Texas: 2000–2009 2 (August 2010) (emphasis added), available at <http://www.dshs.state.tx.us/chs/hprc/NewPhys.pdf>.

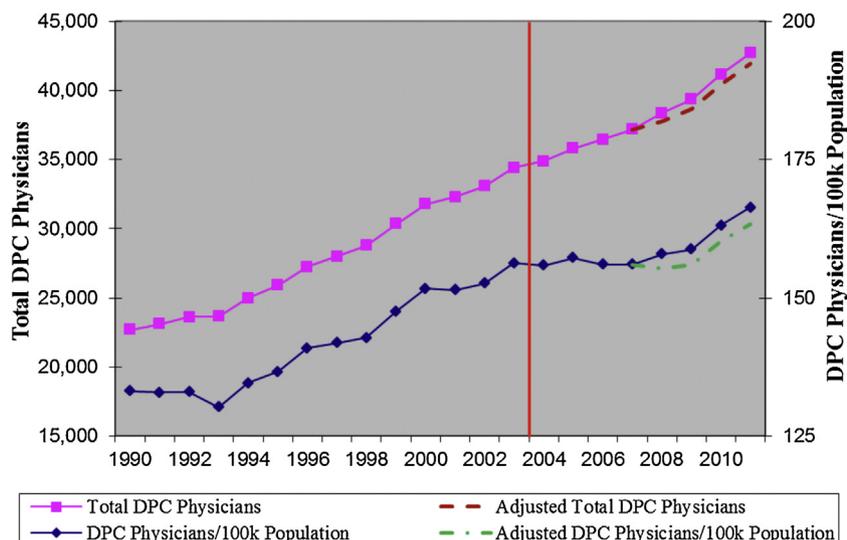


Fig. 3. Total DPC Physicians and DPC Physicians per 100,000 Texans, 1990–2011. Source: TDSHS. Texas tort reform in 2003 is depicted by vertical line.

with data from TMB on the number of active physicians in Texas, and makes a number of adjustments designed to measure how many physicians are engaged in direct patient care. For example, TDSHS excludes residents and fellows. This is a judgment call, but one which is useful for our research question, which is how tort reform affects physicians' location decisions. The number of residents and fellows is determined by the number of funded positions in Texas, not by tort reform.<sup>37</sup>

In robustness checks, we obtain similar results if we instead use the number of patient care physicians in Texas from the national "Area Resource File" (ARF) data series, which relies on data from the American Medical Association.<sup>38</sup> We also use the ARF series to compare Texas to national trends, and to assess trends in particular specialties (which are available from ARF but not TDSHS).<sup>39</sup>

#### 4.3. Comparing Texas to itself: Pre- versus post-reform

We begin by comparing Texas to itself—that is, comparing the number of DPC physicians practicing in Texas pre- and post-reform. Fig. 3 presents the number of DPC physicians from 1990 to 2011. The top line shows absolute numbers; the bottom line shows physicians per 100,000 population.

We note that TDSHS loosened its definition of DPC physicians in 2008.<sup>40</sup> This change increased the number of reported DPC physicians by 627 in 2008, 674 in 2009, and 738 in 2010, or about 1.8% of the total number of DPC physicians in 2010. In Fig. 3, we add dashed

<sup>37</sup> The yearly estimates, and details on how TDSHS develops its figures for DPC physicians, are available at <http://www.dshs.state.tx.us/chs/hprc/PHYS-ink.shtm>. To measure physicians per capita, both in Texas and nationally, we use population counts and intercensal estimates from the U.S. Census Bureau; see <http://www.census.gov/popest/data/index.html>.

<sup>38</sup> We use data on patient care physicians and hospital residents from the 2009–2010 ARF[0] Access release for 1990–2008 and the 2011–2012 ARF ASCII release for 2010, <http://datawarehouse.hrsa.gov/ARF.aspx>. Data is missing for 1991 and 2009; we interpolate for these years from the adjacent years. ARF physician counts are originally from AMA Physician Master Files.

<sup>39</sup> ARF physician counts by specialty are available for 1995–2010, and 2009 data are interpolated from 2008 and 2010.

<sup>40</sup> The change was prompted by a modification in TMB's classification system, which made it clear that some physicians were engaged in both research and direct patient care. Prior to 2008, TDSHS did not count these physicians as DPC physicians. It began to count them in 2009, in response to a request by the Texas Medical Association to do so. Emails from Brian King, Program Director, Health Professions Resource Center, Center for Health Statistics, TDSHS, to Charles Silver, Sept. 23 and 26, 2011.

lines to indicate physician counts had the definition of DPC physician remained unchanged. Although the difference is not large, it demonstrates the importance of scrutinizing the data to ensure time-consistency.

The first lesson from Fig. 3 is that Texas was not hemorrhaging physicians before tort reform was enacted in 2003. The number of DPC physicians steadily increased. There was no interruption in the upward trend during the med mal insurance crisis period (1999–2003). Insurance premia, which more than doubled during this period, do not appear to have discouraged doctors from coming to Texas. We obtain similar results controlling for population. After a flat period in the early 1990s, the number of DPC physicians per capita rose steadily from 1993 to 2003.

The second lesson is that the physician population did not grow faster after reform than before. As Fig. 3 shows, the absolute number of DPC physicians grew at roughly the same rate during the pre- and post-reform periods. If anything, the increase was slower, on average, during the eight post-reform years (2004–2011) than in the preceding eight years (1996–2003). Thus, the assertion by tort reform proponents that Texas experienced an "amazing turnaround" after suffering an "exodus of doctors from 2001 through 2003" is doubly false. There was neither an exodus before reform nor a dramatic increase after reform.

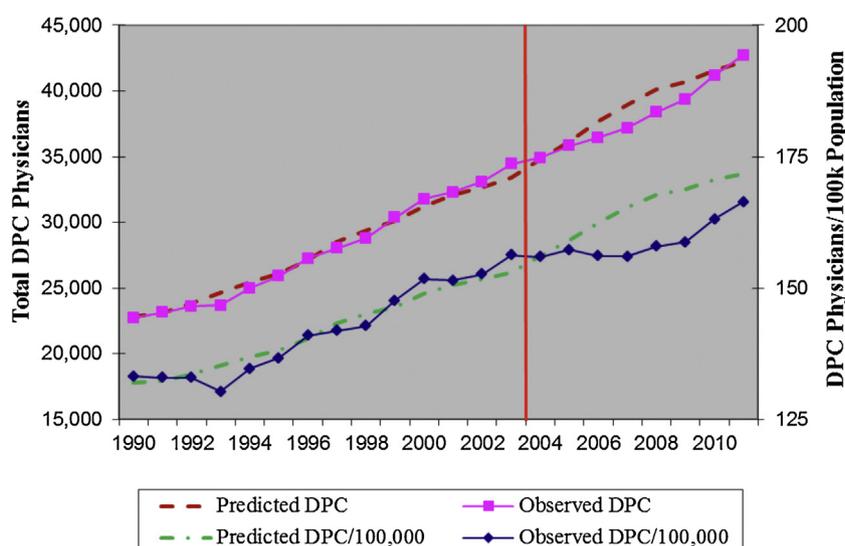
To assess the impact of tort reform, we must estimate a counterfactual: how many direct patient care physicians would have been practicing in Texas had tort reform not been enacted? To do so we estimated the following regression model over the pre-reform years (1981–2002) and used it to predict DPC physicians over 2003–2011<sup>41</sup>:

$$\text{No. of TX physicians} = \alpha + \beta * (\text{year} - 1981) + \gamma * (\text{TX real GDP}) + \varepsilon \quad (1)$$

Fig. 4 compares the actual trend (solid lines) to the predicted trend (dashed lines).<sup>42</sup>

<sup>41</sup> We exclude 2003 from the "pre" period because some doctors may have moved to Texas in anticipation of the tort reform statute taking effect. This model, while simple, has an  $R^2$  of 0.9812. A similar model with active DPC physicians/100,000 population as the dependent variable has an  $R^2$  of 0.9041.

<sup>42</sup> The "actual" lines would be modestly lower if adjusted for the 2009 change in how TDSHS counts DPC physicians, noted above.



**Fig. 4.** Predicted & Observed DPC Physicians, 2000–2011. Actual and predicted Texas DPC physicians (left scale) and DPC physicians per 100,000 people (right scale). Predicted lines are based on regression equation (1) in text, estimated over 1981–2002. Source: TDSHS. Texas tort reform in 2003 is depicted by vertical line.

The top line in Fig. 4 shows that Texas attracted DPC physicians over 2004–2011 at roughly the same rate as during 1981–2002—somewhat slower from 2005 to 2009, but caught up in 2010–2011. On a per capita basis, as of 2011, Texas was still somewhat below the pre-reform trend. In robustness checks, the shortfall in physicians per capita is larger when we (i) include 2003 in the estimation period, or (ii) allow physician supply to respond to Texas GSP with a one- or two-year lag.<sup>43</sup> Texas physician supply improves in 2010 and 2011, but one cannot reliably attribute this to a lagged effect of tort reform. An alternate explanation is that Texas attracted more physicians, with a 1–2 year lag, due to its relative economic strength during and after the financial crisis and recession of 2007–2009.

The conclusion: The number of DPC physicians grew, if anything, more slowly in the post-reform period than experience over the prior two decades would have led one to expect. It is possible that but for tort reform, the trends during 2004–2011 would have been worse, but that is a very different claim than the one made by reform proponents.

How is it possible for Texas to issue substantially more licenses post-reform (Fig. 2) without a similar increase in DPC physicians per capita? There are four main reasons. First, there was a lag between tort reform (2003) and the increase in issued licenses (2007). Second, as Table 1 shows, the number of DPC physicians leaving practice increased over 2000–2005 (we lack data from before 2000).

The rates of departure and arrival may be related. Departures peaked in 2005 (Table 1) and license applications did the same in 2006 (Fig. 1). This suggests that many of the physicians who entered practice in Texas were attracted by vacancies. If so, then the rise in applications was driven principally by employment opportunities, rather than other factors, such as tort reform.

The data on physician exit rates does not support a large role for malpractice liability. The exit rate rose in 2003, when reform was already on the political agenda, and rose further in 2004 and 2005, after the 2003 reforms were in place. The timing suggests

**Table 1**

TDSHS statistics on DPC physicians who left practice<sup>a</sup>.

Year	Active DPC physicians	Left active DPC practice	% of DPC physicians leaving practice (%)
2000	31,769	1010	3.2
2001	32,281	1416	4.4
2002	33,094	1614	4.9
2003	34,432	2029	5.9
2004	34,904	2020	5.8
2005	35,811	2463	6.9
2006	36,450	1762	4.8
2007	37,177	1687	4.5
2008	38,387	1999	5.2
2009	39,374	1720	4.4

Number of year-end active Texas DPC physicians, and number leaving practice each year, for 2000–2009. Source: TDSHS.

<sup>a</sup> TDSHS, Characteristics of Physicians who Left Practice in Texas: 2000–2009, p. 2 Table 1 (2010), available at <http://www.dshs.state.tx.us/chs/hprc/publicat.shtm>.

that other, unknown factors were the principal drivers of physician exit.

Third, the fraction of licensed Texas physicians who are in active patient care in Texas fell over 2002 to 2010, from about 41% to about 39%. This suggests that a smaller fraction of the newly licensed physicians reported by TMB are becoming DPC physicians.

Fourth, both Texas' population and the national ratio of active physicians per 100,000 population are rising. Both factors would predict an increase in the number of newly entering physicians. But population growth means that the number of physicians per capita will only rise if the number of physicians grows faster than the population.

#### 4.4. Comparing Texas to national trends: Graphical evidence

In section B, we compared post-reform Texas to pre-reform Texas. This approach implicitly assumes that, during the post-reform period, there were no changes in national trends that affected Texas. In this section, we consider how Texas did in attracting physicians relative to the rest of the U.S.

Fig. 5 draws on ARF data, and shows the number of active, patient care physicians per 100,000 persons, by state and for the United States as a whole, from 1990 to 2010. The top, upward sloping top line shows the national average, which rises steadily during both the pre- and post-reform periods. The lower, upward sloping line

<sup>43</sup> Compare Cooper, Getzen and Laud (2003) at 677 (“a growing body of literature demonstrat[es] that levels of health care spending could be predicted from GDP or national income with a high degree of accuracy, particularly if temporal lags were also considered”) (citing studies).

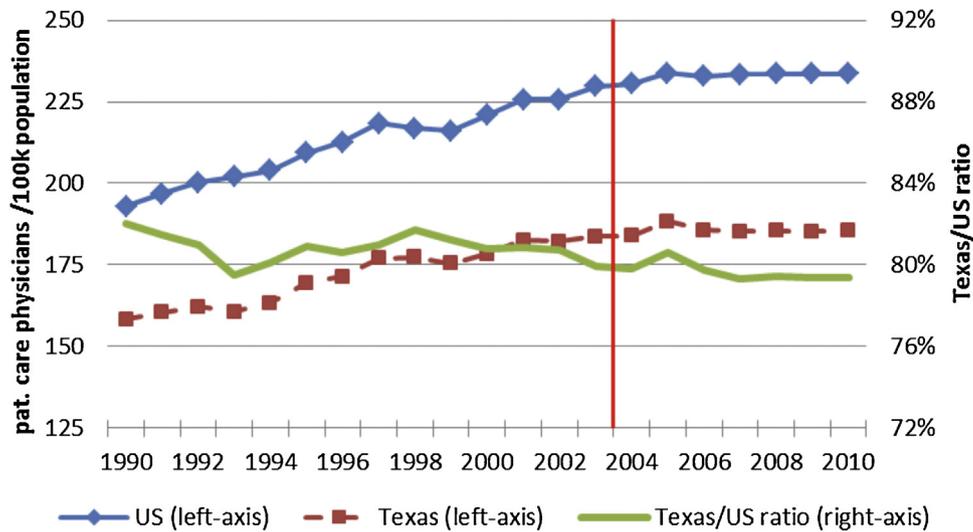


Fig. 5. US and Texas Trends in Patient Care Physicians/100,000 Population. Texas and U.S. patient care physicians per 100,000 population, 1990–2010, and ratio of Texas to U.S. physicians per 100,000 population. Source: ARF. Texas tort reform in 2003 is depicted by vertical line.

shows Texas, which rises roughly in parallel with the U.S. line during the pre-reform period, but somewhat more slowly after 2003. Finally, the slightly downward sloping line that begins between the other two lines shows the ratio between these two lines: Texas physicians/U.S. physicians, each per 100,000 people.

The third line provides a measure of whether tort reform improved Texas’s drawing power relative to the rest of the U.S. If so, the line should kink upward after tort reform. Putting aside short-term fluctuations, which likely reflect data collection issues rather than real changes in physician counts, this line is slightly downward sloping both before and after reform—consistent with tort reform not measurably affecting Texas’ appeal to physicians.

A second measure of how Texas is doing relative to other states comes from the AMA’s annual ranking of states based on active, patient care physicians per capita. If physicians were leaving Texas pre-reform, the state’s pre-reform rank should have fallen. Conversely, if tort reform made Texas more attractive, its post-reform AMA rank should have risen. Fig. 6 presents the AMA rankings from 1997 to 2009 of Texas and four states that consistently ranked in

the same neighborhood. The vertical axis is inverted so that a better (lower) rank appears higher than a worse (higher) one.

Texas’ ranking did slip pre-reform, from 38th in 1998 and 1999 to 44th in 2003, and improved modestly post-reform—to 42nd in 2007–2009. But Texas still ranked worse in 2009 than it did during most of the pre-reform period (1997–2002).

Texas, if anything, slightly lagged the rest of the U.S. in per-capita physician growth in the post-reform period (Fig. 5). How then can its AMA ranking have improved (Fig. 6)? The answer is that the AMA rank reflects Texas’ position relative to other states that also have low physician-to-population ratios. Modest changes in physicians per capita could affect Texas’s rank compared to these “nearby” states, yet have little impact on how Texas is doing relative to national averages. As Fig. 6 reflects, there was considerable volatility in the year-by-year rankings of these states during both the pre- and post-reform periods. During the post-reform period, Texas’s growth in physicians per capita was a bit below the average state, yet a bit better than other below-average states. Tort reform could have contributed to Texas’ gains relative to its peers, since

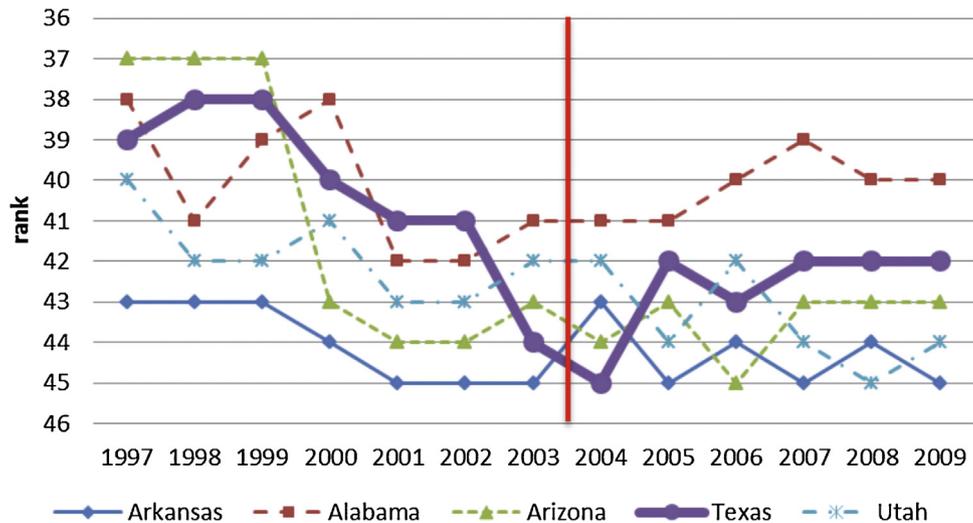


Fig. 6. AMA Ranking (Patient Care Physicians Per Capita) of Texas and Four Similarly Ranked States AMA annual ranking of Arkansas, Alabama, Arizona, Texas & Utah among 50 states based on active patient care physicians per capita, over 1997–2009. We chose these five states for comparison because they consistently ranked close to Texas during this period. Source: AMA, Physician Characteristics and Distribution in the US, various editions. Texas tort reform in 2003 is depicted by vertical line.

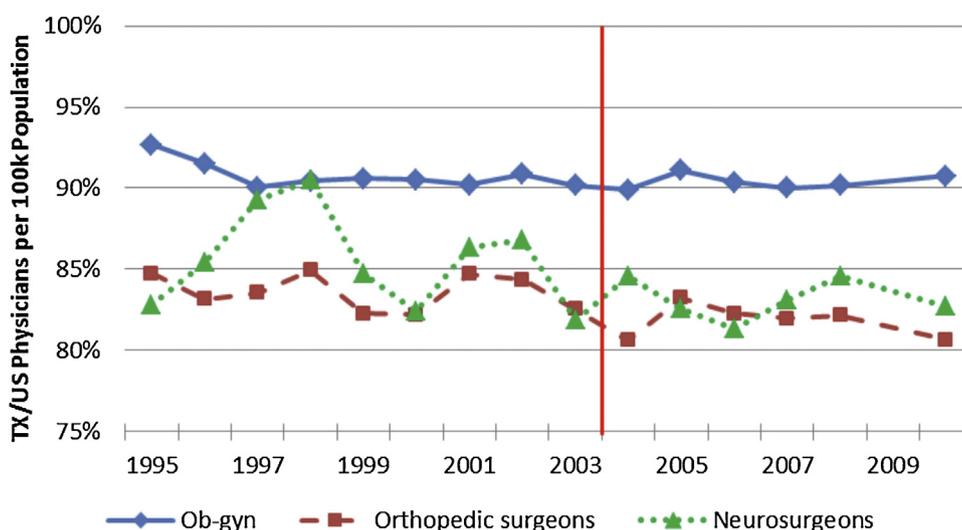


Fig. 7. Changes in Selected Specialties, 1995–2010. Ratio of Texas to US patient care physicians per 100,000 population in indicated specialties over 1995–2010. Ob-gyn includes both general and subspecialty physicians. Source: ARF. Texas tort reform in 2003 is depicted by vertical line.

Arkansas and Arizona have never had a damages cap, and Alabama's non-economic damages cap was struck down in 1991.

Qualitative evidence also indicates that tort reform did not solve Texas' physician supply issues. In 2009, the AMA listed Texas as a "hot spot" state where Medicare patients had difficulty obtaining treatment.<sup>44</sup> In 2011, the AMA declared that Texas seniors "face[d] a Medicare physician access crisis".<sup>45</sup> Similarly, in 2010, Dr. Gary Floyd, chief medical officer of JPS Health Network, told the Texas House of Representatives that Texas faced "a shortage of physicians of all types".<sup>46</sup>

#### 4.5. Trends for high-risk specialties, primary care, and rural areas

To this point, we have focused on Texas as a whole, rather than on particular geographic areas or practice specialties. Proponents have also used TMB data to argue that the number of physicians practicing in high-malpractice-risk specialties increased after the enactment of tort reform, and that more physicians are practicing in rural areas as well.<sup>47</sup> In this section, we assess the impact of tort reform on the number of physicians in three specialties that are generally seen as facing high med mal risk and which reform proponents focused on in their 2003 campaign for the reforms (ob-gyn, orthopedic surgery, and neurosurgery), primary care, and rural physicians.

##### 4.5.1. High-risk specialties

For specialists, as for physicians in general, one cannot learn much from counting only new entry, as tort reform proponents do. Moreover, some growth in specialist counts would be expected

due to population growth and national growth in the number of physicians per capita. The quantities of interest are the post-reform changes in DPC specialists per capita, taking into account both entry and exit, relative to both national trends and pre-reform Texas trends. Unfortunately, we do not have a good Texas-specific data source. As noted previously, TSDHS does not provide data by specialty except for primary care.

TMB does provide specialist data, but it is problematic. One concern is time consistency. In 2001, TMB switched from paper registration to online registration. This made it easier for physicians to report specialties, and induced some who had not identified specialties in prior years to do so. The percentage of physicians reporting no specialty dropped from 1.93% in 2003 to 0.32% in 2012. Thus, on average across specialties, about a 1.6% increase in specialist counts over this period likely reflects the change to online reporting.<sup>48</sup>

Second, as noted above, TMB's figures include non-DPC physicians, but there is no way to know how many. AMA data indicates that there is a general national trend, which includes Texas, toward a declining ratio of patient care to total physicians. In Texas, this ratio dropped from 82.2% in 2003 to 80.4% in 2009. Thus, on average across specialties, one would need about a 1.8% increase in specialists over this period to maintain the same number of DPC specialists, holding population constant.

Third, growth in the number of specialists should be compared to national trends, and should be assessed per capita. In Fig. 7, we provides such a comparison, using ARF data. The figure presents the ratio of Texas to U.S. DPC specialists per 100,000 population over 1995–2010 for ob-gyn, orthopedic surgeons, and neurosurgeons. The Texas/U.S. ratio for ob-gynecologists is basically flat, both before and after reform. The ratios for neurosurgeons and orthopedic surgeons are volatile (which might reflect data collection issues rather than real changes), but trend modestly downward with no apparent change in trend after reform. Thus, there is no evidence of dramatic post-reform inflows for these three specialties. New ob-gyns, orthopedic surgeons, and neurosurgeons indeed arrived in Texas after tort reform—but net of exits, at similar rates as in other states, once we control for population growth.

<sup>44</sup> <http://www.ama-assn.org/ama/pub/health-system-reform/patient-access-hot-spots.shtml>.

<sup>45</sup> <http://www.ama-assn.org/ama1/pub/upload/mm/399/sgr-states-tx.pdf>.

<sup>46</sup> Alex Branch, JPS official warns Texas legislators of doctor shortage, Star-Telegram.com, Oct. 19, 2010, <http://www.star-telegram.com/2010/10/18/2556711/jps-official-warns-texas-legislators.html#ixzz1TZqnR85F>. See also 24/7 Wall St., States Running Out Of Doctors, March 15, 2011, at <http://247wallst.com/2011/03/15/states-running-out-of-doctors/#ixzz1TZselsxW> (ranking Texas sixth on a list of ten states said to be short of physicians).

<sup>47</sup> Texas Medical Board, Physician Demographic Information, 1997–2011, at <http://www.tmb.state.tx.us/agency/statistics/demo/docs/docdemo.php>. TSDHS also provides an annual breakdown of DPC physicians by county, but it does not provide information on specialties.

<sup>48</sup> For additional details on specialist reporting, see Silver et al. (2008), at 28.

#### 4.5.2. Primary care physicians

Primary care physicians are an important factor in access to healthcare. In 2006 and 2011, TDSHS published reports analyzing the number of primary care physicians in Texas.<sup>49</sup> Fig. 8 summarizes TDSHS's analysis of changes in primary care physicians per 100,000 population in Texas and the U.S. The bottom line shows the Texas ratio of DPC primary care physicians per 100,000 population. The middle line shows the U.S. ratio. The top line, which uses the right-hand axis, shows the Texas/U.S. ratio of primary care physicians per 100,000 population.

As Fig. 8 indicates, in Texas the number of primary care Texas physicians per 100,000 population has been nearly constant since 2000, following a sustained rise over 1993–2000. Tort reform had no apparent impact on the number of primary care physicians per capita.

Turning to the top line, which shows the Texas/U.S. ratio, that ratio has fluctuated, falling in the early 1990s, rising in the late 1990s, and falling again from 1999 to 2004, then slightly rising since. Overall, the Texas/U.S. ratio has averaged 85% over the last 30 years, with no long-term trend. The modest rise in the Texas/U.S. ratio after 2004 is driven by a falling number of primary physicians per capita in the rest of the U.S., rather than a rising number in Texas.

The major takeaways from Fig. 8 are: (i) important factors other than tort reform affect the supply of primary care physicians, both in Texas and nationally; and (ii) there is no improvement in Texas's position after tort reform is enacted in absolute terms, and only a modest improvement in relative terms. Tort reform may have contributed to the change from a downward relative trend over 1999–2004, to a moderate upward trend since. But other factors (the large fluctuations in the pre-reform period and the fact that the change in the Texas/U.S. ratio is attributable to developments outside Texas), counsel against treating this change in relative trend as more than mild evidence on causation.

#### 4.5.3. Physicians in rural areas

The reform advocates quoted in Part III argued that rural Texas counties experienced a dramatic inflow of physicians after tort reform. Some prior research finds that tort reform modestly increases the availability of physicians in rural areas, so some increase is plausible, although the magnitude of the increase claimed to have occurred in Texas is surprising.

TDSHS also analyzed the distribution of DPC physicians in metropolitan (urban) and non-metropolitan (rural) counties over 1981–2011. Fig. 9 is adapted from their 2011 report, and shows separate lines for urban physicians per 100,000 population (top line) and rural physicians per 100,000 population (bottom line). Fig. 9 also includes a middle "ratio" line showing the ratio of rural/urban physicians in Texas per 100,000 population.

As Fig. 9 indicates, the ratio of rural/urban physicians per capita has not changed much in the last 30 years. There is no evidence of a post-reform upswing. If anything, there was a modest upward trend in this ratio in the pre-reform period, which reversed after reform.

#### 4.6. Comparing Texas to other states: Formal DiD analysis

We now turn from qualitative, graphical analysis to a formal DiD comparison of Texas to states that have not adopted

<sup>49</sup> TDSHS, Supply Trends among Licensed Health Professions Texas, 1980–2011 (Fifth Edition 2012), available at <http://www.dshs.state.tx.us/chs/hprc/publicat.shtm>. We are grateful to TDSHS for providing us with the data underlying the charts in their report.

damage caps ("no-cap" states).<sup>50</sup> In Table 2, Regressions (1)–(3), we compare Texas to nine southern and western no-cap states, which we expect to be more culturally and geographically similar to Texas.<sup>51</sup> In Regressions (4)–(6), we compare Texas to all 20 no-cap states. In both, we report classic DiD change-in-level estimates with  $\ln(\text{physicians}/100,000 \text{ population})$  as the dependent variable. We report use state level data (regressions (1) and (4)) and county-level data (regressions (2) and (5)), as well as negative binomial regressions at the county level (regressions (3) and (6)). The regression models are specified in Appendix B. In unreported regressions, we obtain similar results with a distributed lag model, which allows the treatment effect to vary during the post-reform period.<sup>52</sup>

Panel A covers all patient care physicians. In regressions (1)–(3), Texas tort reform predicts a statistically significant 2–5% decrease in patient care physicians per capita, relative to the 9-state control group. However, this effect weakens and becomes statistically insignificant in regressions (4)–(6), where we use the broader, 20-state control group.

We next focus on the three high-risk specialties considered above. For neurosurgeons (Panel B), we prefer the state-level DiD regressions ((1) and (4)) and the county-level negative binomial regressions ((3) and (6)).<sup>53</sup> The coefficients on post-reform dummy are negative in all of these regressions; in regression (3), the coefficient is significant and negative. Thus, there is no evidence of an increase in neurosurgeons, and mild evidence of a decline.

In Panels C and D, we consider orthopedic surgeons and obstetrician-gynecologists, respectively. Here, the county-level regressions ((2) and (5)) deserve more weight because a larger fraction of counties remains in the sample. For both specialties and both control groups, the coefficients are modest, never statistically significant, and mixed in sign.

In Panel E, we consider rural physicians. The coefficient of interest is the interaction between the post-reform dummy and the rural dummy. The coefficients on the interaction term are always negative and are significant, albeit barely so, with the broad control group.<sup>54</sup>

The specifications in Table 2 assume "parallel trends" in Texas and control states. But what if there was a pre-reform trend toward fewer physicians in Texas, relative to other no-reform states, that would have continued without tort reform? Then the coefficients in Table 2 would be biased downward, toward fewer

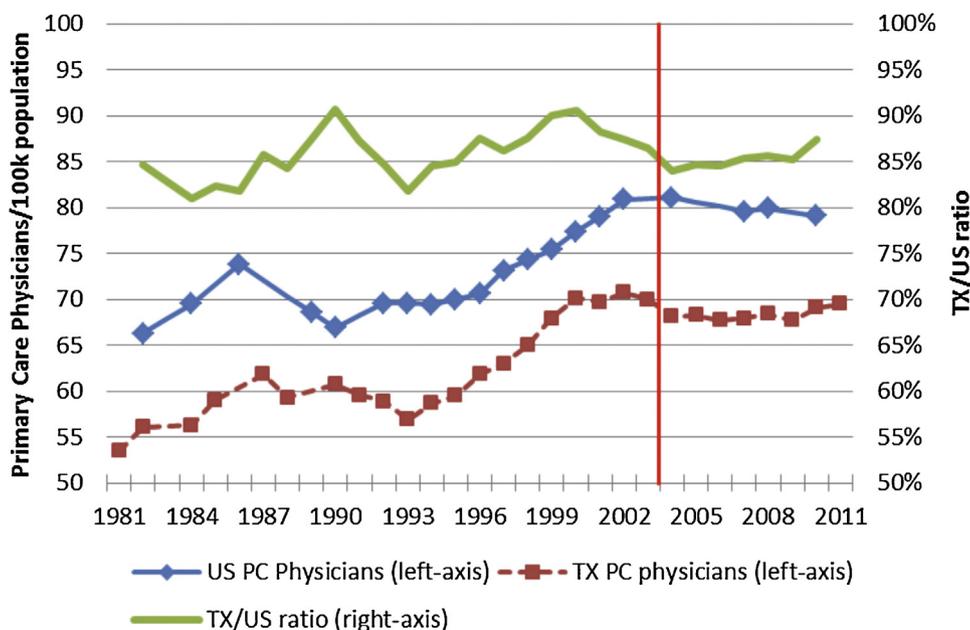
<sup>50</sup> Following Paik, Black, and Hyman, 2012a, we divide the 51 states into three groups, based on damage cap adoption. The 12 "new-cap" states, which adopted caps in the 1990s or 2000s, are Florida, Georgia, Illinois, Mississippi, Montana, Nevada, North Dakota, Ohio, Oklahoma, South Carolina, Texas and Wisconsin. The 19 "old cap" states, which adopted caps in the 1970s or 1980s, are Alaska, California, Colorado, Hawaii, Idaho, Indiana, Kansas, Louisiana, Maryland, Massachusetts, Michigan, Missouri, Nebraska, New Mexico, Oregon, South Dakota, Utah, Virginia, and West Virginia. The 20 "no-cap" states are Alabama, Arizona, Arkansas, Connecticut, Delaware, District of Columbia, Iowa, Kentucky, Maine, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Tennessee, Vermont, Washington, and Wyoming.

<sup>51</sup> The nine states are Alabama, Arizona, Arkansas, Iowa, Kentucky, Minnesota, Tennessee, Washington and Wyoming.

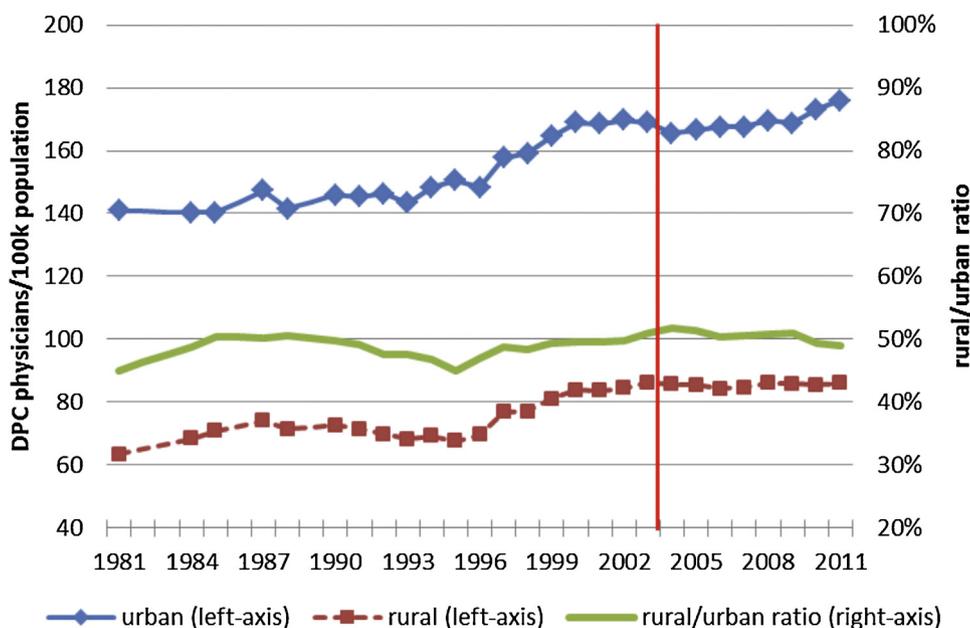
<sup>52</sup> A caution: Clustered standard errors can be biased downward if the number of clusters falls below about 30 (Cameron et al., 2008). The bias can be moderate with 10 clusters (regression (1)) and should be a limited concern with 21 clusters (regression (4)). Our rough judgment is that true significance at the 5% level is uncertain iffy for state-level regressions with  $t$ -statistics less than, say, 2.50.

<sup>53</sup> Regressions (2) and (5) are suspect because only 1,402 county-years (for larger counties) have a neurosurgeon in at least one year (out of 10,042 county-years with at least one physician). The coefficient estimate is based on counties with a neurosurgeon in at least one pre-reform and one post-reform year.

<sup>54</sup> A rural dummy is not meaningful at the state level.



**Fig. 8.** U.S. vs. Texas Primary Care (PC) Physicians Per 100,000 Population. Number of active primary care U.S. and Texas physicians per 100,000 population over 1981–2011. Source: TDSHS. Data for missing years (for TX: 1983, 1986, 1989; for US: 1981, 1983, 1985, 1987, 1988, 1991, 2003, 2005, 2006, 2009) are interpolated to compute Texas/US ratios. Texas/US ratio=(Texas/U.S. primary care physicians per 100,000 population). Texas tort reform in 2003 is depicted by vertical line.



**Fig. 9.** Texas DPC Physicians in Urban and Rural Counties: 1981 to 2011. Urban and rural DPC physicians per 100,000 population, and rural/urban ratio, over 1981–2011. Source: TDSHS. Data for 1982, 1983, 1986 and 1989 are interpolated from nearest adjacent years. Rural/urban ratio=(rural/urban DPC physicians per 100,000 population). Texas tort reform in 2003 is depicted by vertical line.

post-reform Texas physicians. We address this concern in unreported regressions which include state-specific time trends but are otherwise similar to Table 2. We again find no consistent evidence for a post-reform change in Texas physician supply.<sup>55</sup>

Taken as a whole, the regressions in Table 2 are consistent with the graphical evidence in Figs. 5 and 7. There is no evidence of a post-reform rise in Texas physicians, relative to no-cap states, whether for overall patient care physicians, the three high-risk specialties, or rural physicians.<sup>56</sup>

<sup>55</sup> In a state-level regression similar to regression (1), the coefficient for total patient care physicians is  $-0.005$  (insignificant). The coefficients for orthopedic surgeons are negative and significant in state-level regressions, but insignificant in county-level regressions.

<sup>56</sup> We evaluated a synthetic control strategy, following Abadie et al. (2010), but were unable to implement this approach. The synthetic control for Texas is Arizona (the state weights, using our covariates as predictors, are 100% for Arizona and zero for the other 19 non-cap states). We judged that comparing Texas to a single control state would not provide meaningful additional evidence.

**Table 2**  
Regression analysis: impact of Texas tort reform on physician supply.

Control group	9 Similar no-cap states			20 No-cap states		
	Ln(physicians/100,000 persons)		No. of physicians	Ln(physicians/100,000 persons)		No. of physicians
Dep. variable						
Data level	State	County	County	State	County	County
Regression type	<i>DiD</i>	<i>DiD</i>	Neg. binomial	<i>DiD</i>	<i>DiD</i>	Neg. binomial
Regression	[1]	[2]	[3]	[4]	[5]	[6]
<b>Panel A. Patient care physicians</b>						
Post-reform	<b>-0.024</b>	<b>-0.032</b>	<b>-0.053</b>	-0.006	-0.015	-0.016
	<b>[3.14]**</b>	<b>[2.51]**</b>	<b>[5.74]**</b>	[0.66]	[1.08]	[0.97]
Observations	120	10,042	10,488	252	13,700	14,172
<b>Panel B. Neurosurgeons</b>						
Post-reform	-0.042	0.005	<b>-0.114</b>	-0.039	0.104	-0.065
	[0.45]	[0.10]	<b>[4.32]**</b>	[0.94]	[1.63]	[1.35]
Observations	120	1402	10,488	252	2893	14,172
<b>Panel C. Orthopedic surgeons</b>						
Post-reform	0.031	-0.037	-0.007	0.016	-0.006	0.014
	[0.95]	[1.16]	[0.33]	[0.74]	[0.21]	[0.56]
Observations	120	4042	10,488	252	7000	14,172
<b>Panel D. Ob-gynecologists</b>						
Post-reform	-0.006	0.029	-0.010	0.034	0.033	-0.008
	[0.21]	[1.12]	[0.42]	[2.08]*	[1.28]	[0.28]
Observations	120	4783	10,488	252	7972	14,172
<b>Panel E. Rural patient care physicians</b>						
Post-reform		<b>-0.028</b>	<b>-0.053</b>		-0.007	-0.015
		<b>[1.99]**</b>	<b>[5.70]**</b>		[0.42]	[0.94]
Post-reform × rural dummy		-0.025	-0.021		<b>-0.055</b>	<b>-0.054</b>
		[0.98]	[0.92]		<b>[2.03]**</b>	<b>[2.00]**</b>
Observations		10,042	10,488		13,700	14,172

**All Panels:** Difference-in-differences and negative binomial regressions of changes in Texas physicians, relative to control states, with year and state (or county) fixed effects, over 1998–2011. We drop 2003 (cap adoption year), and 2009 (physician data not available). Control group in regressions (1)–(3) [(4)–(6)] is 9 no-cap states similar to Texas, specified in text [all 20 no-cap states]. Regressions (1) and (4) use state-level data and state fixed effects; other regressions use county level data and county fixed effects. All regressions include post-reform dummy (=1 in Texas for 2004 and after), covariates (ln(per capita income), unemployment rate (%), % black, % Hispanic, %age 0–4, % age 65+, ln(population)), and constant term. Coefficients on covariates and constant term are suppressed. Regressions are weighted by state (or county) average population over 1998–2011. Dependent variable for regressions (1)–(2) and (4)–(5) is ln(physicians/100,000 persons). Dependent variable for negative binomial regressions (3) and (6) is number of physicians; we use county population in each year as the exposure variable. Amounts in 2011\$. *t* statistics, with standard errors clustered on state (for state-level regressions) or county (for county-level regressions), in parentheses. \*, \*\*, \*\*\* indicate significance at the 10%, 5%, and 1% levels. Significant results (at 5% or better) are in **boldface**. **Panel A through D** report, respectively, estimates for patient care physicians, neurosurgeons, orthopedic surgeons, and ob-gyn physicians. **Panel E** includes interaction term between post-reform dummy and rural dummy (=1 for non-metro area counties). State-level regressions are omitted from Panel E because they are not meaningful.

## 5. Discussion

We consider in this section the implications of our findings for health, politics, policy and law. We then assess the claim made in an unpublished article by Professor Stephen Magee that lower malpractice risk increased effective physician supply by inducing doctors to work longer hours. Finally, we highlight the importance of reliable and transparent data for conducting research such as ours, and explore the differences between the TDSHS and ARF data series that we rely on, and the TMB data relied on by reform proponents and by [Stewart et al. \(2013\)](#).

### 5.1. Health

As noted previously, proponents framed the desirability of tort reform in terms of enhanced access to physicians—which would (at least implicitly) result in better health care and better health. The issue of access is more complicated than this framing would suggest. Past research indicates that enhanced access to primary care is far more likely to result in better health than enhanced access to specialists.<sup>57</sup> Thus, the post-reform decline in primary care physicians is troubling, whatever its cause. A post-reform increase in high-risk specialties might or might not be good news—this would

depend on how many specialists of each type are optimal. An increase in ob-gyns is more likely to be good news than an increase in cosmetic surgeons.

But the larger takeaway from our research is that there is no evidence that tort reform resulted in more Texas physicians, relative to the counterfactual of Texas-without-reform. This is true whether we look at all patient care physicians, at high-risk specialties, at primary care physicians, or at rural physicians. If Texas wants more physicians, it will have to find other ways to attract them.

### 5.2. Politics

The political logic of Republican enthusiasm for damage caps is straightforward: they are loved by physicians (a traditional Republican constituency) and hated by trial lawyers (a traditional Democratic constituency). Although we have focused on the statements of tort reform proponents, Republicans all, we do not mean to suggest that claims about health care going far beyond the facts are limited to one side of the political divide. The campaign for the Patient Protection and Affordable Care Act (“PPACA”) involved no shortage of whoppers—from the claim that seniors would be able to keep their “guaranteed” Medicare benefits (without clarifying that Medicare Advantage benefits were not “guaranteed,” and were slated to be cut dramatically),<sup>58</sup> to the phony accounting

<sup>57</sup> [Chang et al. \(2011\)](#) (“A higher level of primary care physician workforce, particularly . . . ambulatory primary care, was generally associated with favorable patient outcomes.”)

<sup>58</sup> Mayberry Misleads on Medicare, <http://www.factcheck.org/2010/07/mayberry-misleads-on-medicare/>.

that allowed the Obama Administration to double-count the almost \$500 billion “savings” from promised (but politically implausible) cuts in Medicare spending,<sup>59</sup> to President Obama’s repeated promises that “if you like your health care plan you can keep it”.<sup>60</sup> When it comes to health policy, exaggeration, distortion, and outright fabrication are too often the norm.

### 5.3. Policy & law: Factors affecting physician supply

Tort reform dramatically changed the malpractice environment in Texas. But, despite the claims of reform proponents, there is no evidence that tort reform materially affected the supply of DPC physicians. These findings are generally consistent with prior multi-state studies. Physician supply appears to be primarily driven by factors other than liability risk, including population trends, location of the physician’s residency, job opportunities within the physician’s specialty, lifestyle choices, and demand for medical services, including the extent to which the population is insured. For some physicians, malpractice insurance rates and the risk of being sued may be important factors. But for many physicians, other factors matter more. Tort reform is not a “magic bullet” for a state that wants to increase its physician supply relative to its peers. The same is true for the effect of text reform on health care costs: in another paper, we find no evidence that tort reform reduced the quantity of health care delivered in Texas, at least among the Medicare population.<sup>61</sup>

The core findings of these two papers are related: If demand for healthcare rises or falls, one might expect physician supply to respond. Perhaps causation goes both ways, with more (fewer) physicians inducing more (less) patient demand. But whatever the direction of causation, if little happens to the quantity of healthcare, we should expect little to happen to the supply of physicians to deliver that healthcare. The healthcare market is imperfect in many ways, but it is still a market in which supply and demand must balance in equilibrium.

### 5.4. Does reform induce physicians to work more hours?

Tort reform could affect the number of hours physicians work, instead of (or in addition to) the number of physicians in active practice. On theoretical grounds, one might expect two principal effects on hours worked. First, lower malpractice premia, which for physicians are largely a fixed cost, if not fully offset by lower prices, could increase physician incomes, and induce less effort. Second, while physicians rarely pay malpractice claims out-of-pocket, they

surely experience negative utility from being sued. Tort reform, by lowering the risk of suit, could reduce the malpractice-related disutility from seeing more patients. This, unless competed away through lower prices, would induce greater effort.

Theory thus provides no clear prediction for either the sign or the magnitude of any effect of tort reform on work intensity. Helland and Showalter, using 1980s data, provide evidence that doctors increase work effort following adoption of a damages cap.<sup>62</sup> Magee uses the elasticities estimated by Helland and Showalter to argue that the Texas reforms induced greater work hours.<sup>63</sup>

We know of no data that could be used to confirm or reject Magee’s speculation, but believe that caution is in order. One empirical study, using limited data from 25 years ago, when physicians worked in a very different environment than today, with more pricing power, is a fragile basis for estimating effects today. Moreover, the Helland and Showalter elasticity estimates, applied to the Texas reforms, produce implausibly large estimates of extra effort. Assume, for example, that negative utility is linearly related to the risk of being sued. That risk dropped by 60% following the Texas reforms. Helland and Showalter estimate an average elasticity of  $-0.285$  to perceived risk for all physicians and  $-1.224$  for older physicians, aged 55–64. These estimates, applied to Texas physicians, on average, imply that an (assumed) 50 hour week has become a 59 hour week and, for older physicians, a 77 hour week.<sup>64</sup> This is implausible.

In addition, if physicians are working significantly more hours, they are presumably seeing more patients and delivering more services. Yet we find no such effect for Medicare beneficiaries, who are the most intensive recipients of medical treatment.<sup>65</sup> We also know of no news reports, blog postings, or scholarly commentators suggesting that physicians are working substantially longer hours.

### 5.5. Market equilibrium: Is a small effect surprising?

Is it surprising for a large reduction in malpractice risk to have little measurable impact on physician supply? We think not. The healthcare market is beset with distorted pricing. Many patients are insured and pay a fraction – often none – of the marginal cost of services. Overtreatment is routine – a common estimate is that a third of the healthcare we collectively consume does not contribute to health. But healthcare is still a market, in which the quantity of services supplied must equal the quantity consumed. A downward shock to malpractice risk implies an upward shock to physicians’ willingness to supply their services. This change in the supply curve, if it leads to lower prices paid by patients, should induce higher demand, and thus a higher equilibrium quantity. But how much higher? Insurance companies can use reform to negotiate for lower prices, but insured patients will see only a fraction of the savings—perhaps none.<sup>66</sup> Moreover, the demand for many forms of healthcare is quite inelastic.<sup>67</sup> Both factors will mute any increase in the equilibrium quantity of healthcare and thus dampen any increase in the equilibrium supply of physicians, perhaps (as we find) to undetectable levels.

<sup>59</sup> The benefits are unlikely to be achieved, even once, because they assume some future Congress will do what the current and past Congresses have routinely refused to do, which is implement substantial cuts in Medicare. The annual scramble to defer the cuts that would otherwise be imposed by the “Sustainable Growth Rate” formula exemplifies Congressional unwillingness to cut Medicare. See Ginsburg (2011).

Double-counting is a separate issue, which results, in part, from different budgetary conventions with regard to Medicare Part A and other parts of the federal budget. See Donald Marron, *The Fight Over Medicare Double Counting*, May 9, 2012, at <http://dmarron.com/2012/05/09/the-fight-over-medicare-double-counting/>. This issue was identified by the Congressional Budget Office in a 2009 report. Effects of the Patient Protection and Affordable Care Act on the Federal Budget and the Balance in the Hospital Insurance Trust Fund, Dec. 23, 2009, at <http://www.cbo.gov/publication/25017>. Congress and the President nonetheless continued to double-count savings that are unlikely to be achieved even once. See, e.g., Amanda Carrey, *HHS Secretary Sebelius admits to double-counting in Obamacare budget*, Daily Caller, Mar. 4, 2011, at <http://dailycaller.com/2011/03/04/hhs-secretary-sebelius-admits-to-double-counting-in-obamacare-budget/>.

<sup>60</sup> On December 12, 2013, Politifact declared this claim to be the “lie of the year.” Angie Drobnic Holan, *Lie of the Year: “If you like your health care plan, you can keep it.”* <http://www.poliitifact.com/truth-o-meter/article/2013/dec/12/lie-year-if-you-like-your-health-care-plan-keep-it/>.

<sup>61</sup> Paik et al. (2012a).

<sup>62</sup> Helland and Showalter (2009).

<sup>63</sup> Magee (2010).

<sup>64</sup> Magee uses lower estimates for increased work hours, because he multiplies the Helland-Showalter elasticities by an assumed 29% drop in med mal insurance premia. The actual drop in real dollars was closer to 60%. Texas Medical Liability Trust, 2009 Annual Report, p. 4, reports a 50% drop in premia in nominal dollars; the decline in real dollars would be larger.

<sup>65</sup> Paik et al. (2012b).

<sup>66</sup> For evidence of a modest post-reform drop in the cost of health insurance, see Avraham et al. (2012).

<sup>67</sup> Data on the elasticity of demand is scarce; the best source is the 1970s RAND health insurance experiment of 1974–1977, which found an elasticity of roughly  $-0.2$  for out-of-pocket spending. Manning et al. (1987).

It also bears mentioning that physicians' salaries are not fixed. When tort reform makes it more profitable for doctors to practice in a particular state, hospitals and other employers of physicians in other states may offset the incentive to relocate by raising wages. Tort reform may thus enrich doctors in all states, by reducing costs in states that limit lawsuits and increasing compensation in states that do not. If the improvements are offsetting, as in labor market equilibrium one might expect them to be, tort reform should have at most a small impact on any given state's supply of physicians.

## 5.6. Data matters

### 5.6.1. Choice of dataset

As noted previously, we used data from TDSHS rather than TMB when comparing pre-reform Texas to post-reform Texas. We did not rely on this data. We explain that choice here in more detail.

TMB's counts are over-inclusive, for several reasons. First, prior to 2010, TMB did not publicly specify how it determined whether a physician was "active." In a 2010 report, TMB explained that licensed physicians are treated as active unless they state during license renewal that they were "not in practice" (in response to a question about type of practice) or stated on the same form that the number of hours they practiced was "N/A".<sup>68</sup> Thus, physicians had to affirmatively exclude themselves in one of two specified ways to be classified inactive. Anyone whose licensure status otherwise qualified and did not opt out in the specified manner would be classified as "active," whether engaged in patient care or not. In contrast, TDSHS goes through a series of careful steps intended to provide a good measure of physicians who are actually engaged in direct patient care.

Second, TMB counts administrators and researchers as active physicians. Proponents claimed that tort reform attracted physicians who would provide treatment to ordinary Texans. Attracting more administrators or researchers might be a good (or bad) thing, but it is not what tort reform proponents claimed, and not what we seek to measure.

Third, TMB's count includes physicians who provide direct patient care, but do not readily fit the "tort reform attracts physicians" model—residents, fellows, and medical school faculty. The number of residents and fellows depends on the number of funded residencies and fellowships, not on med mal risk. The number of residency and fellowship positions involves a complex interaction between accrediting agencies, residency and fellowship program directors, and federal funding for graduate medical education, and is not likely to be directly affected by tort reform. Similar dynamics apply to medical school faculty. These groups also normally do not pay for their own med mal liability insurance, which will further mute any impact of reform on location decisions.

Fourth, the TMB count includes military physicians and physicians employed by the federal government, through the Veterans Administration and the Public Health Service. As with residents and fellows, it seems unlikely that tort reform affects the number of military or federal physicians assigned to Texas.

In contrast, TDSHS begins with the TMB figures, and systematically excludes physicians who are not engaged in direct patient care.<sup>69</sup> The AMA definition of patient care physicians, reflected in the ARF data series, is similar to the TDSHS definition, except that it

includes residents and fellows.<sup>70</sup> Does it matter which figures one uses? The choice between TDSHS and ARF does not matter—the ARF counts are higher because they include residents and fellows, but the ratio of the two is reasonably constant over time, so time trends will be similar.

The choice between the TMB and TDSHS data series does matter. Fig. 10 shows the impact of this choice. TMB's data shows a steady post-reform increase in the number of active physicians per capita—albeit at a growth rate similar to the pre-reform period. TDSHS's data indicates the number of DPC physicians per capita is flat during 2004–2008, and then trends upward. The top line in Fig. 10 shows the ratio of the two lines: TDSHS DPC physicians per capita/TMB active physicians per capita. The ratio declines over 2000–2009, and then trends modestly upward in 2010–2011. Thus, an assessment of physician counts using TMB data will show Texas doing somewhat better during the post-reform period than the TDSHS or ARF data series. In our view, researchers who study physician supply should assess all available data series, explain their reasons for selecting one dataset and mode of analysis rather than another, and assess the consequences that flow from these choices. We have done so, and explained our reasons. Stewart et al. also explain their choice. Readers can decide which dataset one should rely more on.<sup>71</sup>

### 5.6.2. Importance of publicly available time-consistent data

We close by emphasizing the importance of publicly available, reliable, longitudinal data, collected on a time-consistent basis. It would not have been possible to perform this study (or the other studies we have done using Texas' closed claims data) without this data. Texas should be commended for creating a closed claims database in 1988, and maintaining it over the intervening decades. Other states should emulate Texas. Scholars should not take the availability of such data for granted. Indeed, when the National Association of Insurance Commissioners (NAIC) recently adopted a model law for states interested in setting up closed claims databases, insurance companies fought hard to limit public access. The model law leaves the decision on access to individual states.<sup>72</sup>

<sup>70</sup> ARF patient care physicians include office-based and hospital-based active non-federal MDs in patient care, and exclude MDs conducting other professional activities such as administration, teaching, and research. Hospital-based MDs include hospital staff, residents, and fellows.

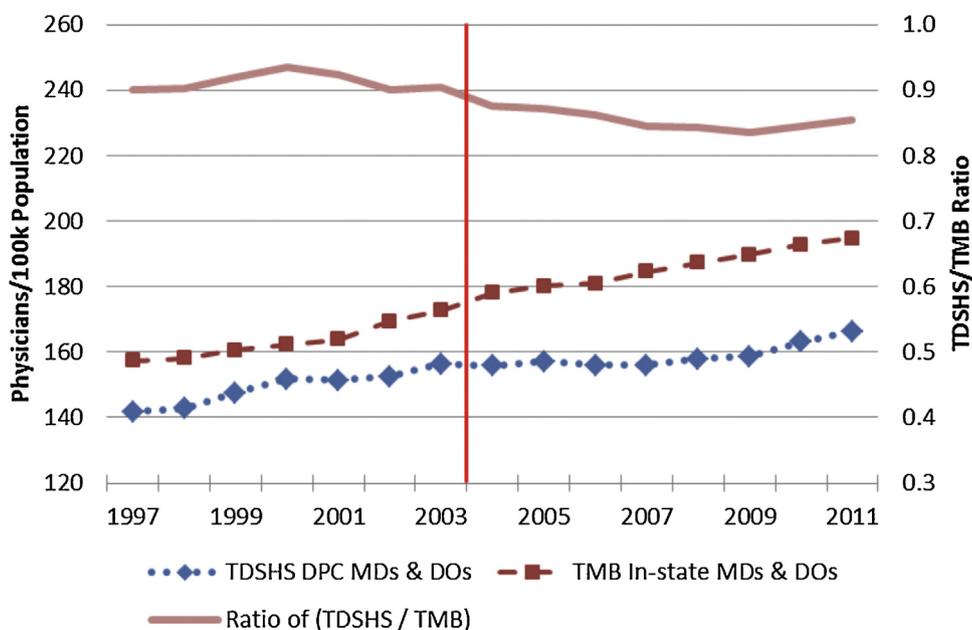
<sup>71</sup> Stewart et al. (2013) argue that TDSHS' measure of direct patient care physicians is "an antiquated notion that excludes very large numbers of practicing physicians." We agree that TDSHS excludes some physicians who provide some patient care—although how many is unclear. But, we disagree that TMB is a better data source for evaluating the impact of tort reform on physician supply. Some of the physicians excluded by TDSHS but included in TMB provide no patient care. The ones who do provide some patient care are principally medical school faculty, fellows, and residents—not the type of physicians promised by tort reform proponents.

We note also that Texas has long had a cap on total damages for claims against governmental entities of \$250,000. This cap covers the University of Texas Health System, so its faculty, fellows, and residents were not affected by the general 2003 cap. Plus, as noted previously, the number of fellows and residents depends on the number of funded positions—not on med mal risk. Thus, any increases in medical school faculty, fellows, and residents were unlikely to be attributable to the 2003 reforms. Stewart et al. note that "over the time period of the study, medical school class sizes did grow. There was also growth of academic medical centers in Temple, Round Rock, El Paso, and Austin. These changes may also have contributed to the increased number of physicians in Texas, potentially independent of tort reform." These dynamics could explain much of the differences in the TMB and TDSHS physician counts, as well as their otherwise puzzling finding of a large post-reform increase in metropolitan areas (since prior research indicates that tort reform is more likely to affect physician supply in rural areas).

<sup>72</sup> NAIC, Medical Professional Liability Closed Claim Reporting Model Law (2008), at [www.naic.org/documents/committees.c.med.closed.claim.law.pdf](http://www.naic.org/documents/committees.c.med.closed.claim.law.pdf).

<sup>68</sup> Texas Medical Board, Physician Demographic Information, available at <http://www.tmb.state.tx.us/agency/statistics/demo/docs/d2010/0910/inout.php>. We do not know if TMB's criteria have changed over time.

<sup>69</sup> See <http://www.dshs.state.tx.us/chs/hprc/PHYS-Ink.shtm> for a detailed description of how TDSHS determines which active, licensed Texas physicians are DPC physicians.



**Fig. 10.** TDSHS vs TMB Data: Physicians per 100,000 Population. TDSHS DPC and TMB in-state active practicing physicians per 100,000 population, and TDSHS to TMB ratio, over 1997–2011. Physician counts include MDs and DOs. TDSHS source: Fig. 3. TMB source: <http://www.tmb.state.tx.us/agency/statistics/demo/docs/docdemo.php>. Texas tort reform in 2003 is depicted by vertical line.

Similar dynamics apply to data on physician counts. The analysis we present above is possible only because TMB and TDSHS collect and publicly disclose data on physician supply; and because TDSHS discloses the specific adjustments it makes to TMB data to derive its DPC counts.

Our study also points to the importance of close scrutiny of the data, to ensure time consistency. We noted above two data collection and definitional changes that affect time trends: (i) TDSHS modestly expanded the definition of “DPC physician” in 2008, which increased DPC physician counts by about 1.8%; and (ii) TMB switched in the early 2000’s from paper to online reporting, which increased the number of physicians reporting a specialty by about 1.5%. These changes are not large enough to materially affect our conclusions, but each underscores the value of close scrutiny of the underlying data.

## 6. Conclusion

The tort reform debate has featured extravagant claims about the merits and demerits of damages caps. There is no doubt that damages caps can affect the frequency and cost of malpractice claims, and, in the long run, malpractice premiums. These impacts can be dramatic, as Texas’ experience shows. But their broader effects are less clear.

In Texas, tort reform proponents blamed the absence of a damages cap for Texas’s failure to attract physicians and credited adoption of a cap for an extraordinary increase in the number of physicians. We find no evidence to support either claim. Physician supply was not stunted prior to reform, and it did not measurably improve after reform. This is true whether one looks at the number of patient care physicians in Texas, the number of Texas physicians in high-malpractice-risk specialties and in rural areas, or the number of physicians per capita in Texas relative to other states.

Limiting med mal lawsuits might be a good idea or a bad one. But the core message from this study is that tort reform is a *small* idea, when it comes to the larger, questions of health care access. Our

broader study of the effects of all nine third-wave damage caps also finds no effect of cap adoption on physician supply, and reinforces that message.<sup>73</sup>

## Appendix A. Appendix A: Multistate studies of physician supply and tort reform

We discuss here the literature on physician supply as it stood when we wrote our article, which was substantially complete by 2012. We do not discuss two more recent studies of third-wave cap adoptions, one of them our own.<sup>74</sup>

Prior research suggests that damage caps can have a small positive impact on physician supply in particular areas, with mixed evidence of post-reform increases in statewide physician counts. In this appendix, we discuss a representative set of recent papers with DiD research designs. Encinosa and Hellinger studied the 1980s wave of tort reforms, using county and year fixed effects, but not pre-reform state trends, over 1985–2000.<sup>75</sup> They reported that counties in states that adopted damage caps had 2.2% more physicians per capita. Rural counties had 3.2% more physicians. These are related measures because 72% of counties are rural, and the authors weight counties equally. Encinosa and Hellinger found no significant effect in the first two years after cap adoption. Instead, the effect appeared gradually (the study gives no details on the relevant time frame).

The full results from this study, in a web appendix, suggest that the evidence for higher rural supply is weak. A dummy variable for other tort reforms predicted *lower* rural supply, although with an insignificant coefficient. The positive coefficient on a damage cap dummy and the negative coefficient on the other cap dummy were similar in size. Since many states adopt reforms in packages, it is unclear whether a package that includes a

<sup>73</sup> Paik, Black, and Hyman (2015)

<sup>74</sup> Helland and Seabury (2015); Paik, Black, and Hyman (2015).

<sup>75</sup> Encinosa and Hellinger (2005).

damages cap plus other reforms predicts higher physician supply. The authors also did not assess whether there were parallel pre-reform trends in cap-adopting and control states. Encinosa and Hellinger's results suggest a near zero change in urban physician supply: the 3.2% increase in rural counties fully explains the 2.2% average increase across all counties. Since most physicians practice in urban counties, their results suggest no significant change in statewide physician counts.

Kessler, Sage, and Becker studied 1985–2001, thus capturing most of the second reform wave.<sup>76</sup> They reported that damage caps predict a 3.3% increase in physicians per capita three years after reform, with the effect coming from greater entry and slower retirements. They also do not assess whether there were parallel pre-reform trends.

Matsa used county fixed effects and state trends, and studied a longer sample period, 1970–2000. This let him study both the first and second reform waves.<sup>77</sup> He found no effect of damage caps on overall physician supply. His point estimates were insignificant but *negative*, ranging from [−0.014, −0.003] depending on specification. He found a positive and significant [0.031, 0.044] increase in physicians per capita in the quartile of counties with the lowest population density, but no significant change in rural family practitioners. The increase in rural physicians appeared slowly over time, and was significant only 6–10 years after reform.

Klick and Stratmann used data from 1981 to 2000, covering the second reform wave.<sup>78</sup> Their principal specification included state and specialty trends, and a triple difference design (before versus after reform, reform versus control states, and high-versus-low risk specialties). They found a 6–7% rise in per capita counts for the 5 highest-lawsuit-risk specialties, and a 3–4% effect for the 10 highest risk specialties, relative to the 5 (or 10) lowest risk specialties, with risk based on payout per paid claim. They did not report changes in overall physician counts, but did include this result in a working paper version, where, according to Matsa, they found that damage cap adoption predicted a statistically insignificant 0.84% increase in physicians/capita.

Thus, with regard to overall statewide physician supply, of four DiD studies, one has a negative coefficient on damage cap adoption, two have coefficients in the 0–1% range, and one (Kessler et al.) finds a 3% increase. There is more evidence of an effect on physician supply in rural counties and among specific specialties.

## Appendix B. Appendix B. DiD regression models

In Table 2, regressions (1) and (4) use a simple DiD model, which allows for a one-time post-reform change in spending, is:

$$\ln\left(\frac{\text{physicians}}{100k \text{ population}}\right)_{it} = I_s + T_t + \beta \times \text{Post}_{it} + \mathbf{X}_{st}\delta + \varepsilon_{st} \quad (1)$$

here,  $s$  indexes states and  $t$  indexes years;  $I_i$  and  $T_t$  are county and year fixed effects;  $\text{Post}_{it}$  is a post-reform dummy variable, which equals 1 for Texas in 2004 and after, 0 otherwise; and  $\mathbf{X}_{it}$  is a vector of covariates. Regressions (2) and (5) are similar but are at the county level.

Regressions (3) and (6) are negative binomial regressions, with number of physicians as the dependent variable and population as the exposure variable. The coefficients can be interpreted, similarly to the DiD regressions, as exponential changes in the number of physicians per capita. For small coefficients, these are approximately equal to fractional changes.

## References

- Abadie, Alberto, Diamond, Alexis, Hainmueller, Jens, 2010. Synthetic control methods for comparative case studies: estimating the effect of California's tobacco control program. *J. Am. Stat. Assoc.* 105, 493–505.
- Avraham, Ronen, Dafny, Leemore, Schanzenbach, Max, 2012. The impact of tort reform on employer-sponsored health insurance premiums. *J. Law Econ. Org.* 28, 657–686.
- Black, Bernard, Silver, Charles, Hyman, David, Sage, William, 2005. Stability not crisis: medical malpractice claim outcomes in Texas, 1988–2002. *J. Empirical Legal Stud.* 2, 207–259.
- Cameron, A. Colin, Gelbach, Jonah B., Miller, Douglas L., 2008. Bootstrap-based improvements for inference with clustered errors. *Rev. Econ. Stat.* 90, 414–427.
- Chang, Chiang-Hua, Stukel, Theresa A., Flood, Ann Berry, Goodman, David C., 2011. Primary care physician workforce and Medicare Beneficiaries Health Outcomes. *J. Am. Med. Assoc.* 305, 2096–2104.
- Cooper, Richard A., Getzen, Thomas E., Laud, Prakash, 2003. Economic expansion is a major determinant of physician supply and utilization. *Health Serv. Res.* 38, 676–696.
- Encinosa, William, Hellinger, Fred, 2005. Have state caps on malpractice awards increased the supply of physicians? *Health Affairs* 24, 250–258.
- Helland, Eric, Showalter, Mark H., 2009. The impact of liability on the physician labor market. *J. Law Econ.* 52, 635–663.
- Helland Eric, Seabury F Seth, 2015. Tort Reform and Physician Supply: A Review of the Evidence. In: *International Review of Law and Economics*. RAND. 42, 191–202.
- Ginsburg, Paul B., 2011. Rapidly evolving physician-payment policy—more than the SGR. *N. Engl. J. Med.* 364, 172–176.
- Kachalia, Allen, Mello, Michelle, 2011. New directions in medical liability reform. *N. Engl. J. Med.* 364, 1564–1572.
- Kessler, Daniel P., Sage, William M., Becker, David J., 2005. Impact of malpractice reforms on the supply of physician services. *J. Am. Med. Assoc.* 293, 2618–2625.
- Klick, Jonathan, Stratmann, Thomas, 2007. Medical malpractice reform and physicians in high-risk specialties. *J. Legal Stud.* 36, s121–s142.
- Manning, Willard G., Newhouse, Joseph P., Duan, Naihua, Keller, Emmett B., Leibowitz, Arleen, 1987. Health insurance and the demand for medical care: evidence from a randomized experiment. *Am. Econ. Rev.* 77, 251–277.
- Matsa, David, 2007. Does malpractice liability keep the doctor away? Evidence from tort reform damage caps. *J. Legal Stud.* 36, s143–s182.
- Magee, Steven, 2010. The Rapid Physician Supply Response to the 2003 Medical Malpractice Reforms in Texas. At (<http://www.mccombs.utexas.edu/Health-Care-Symposium/Schedule/Magee-Abstract.aspx>).
- Paik, Myungho, Black, Bernard, Hyman, David A., Silver, Charles, 2012a. Will tort reform bend the cost curve? Evidence from Texas. *J. Empirical Legal Stud.* 9, 173–216. Available at (<http://ssrn.com/abstract=1635882>).
- Paik, Myungho, Black, Bernard, Hyman, David A., Sage, William M., Silver, Charles, 2012b. How do the Elderly Fare in Medical Malpractice Litigation, Before and After Tort Reform? Evidence From Texas. *Amer. Law Econ. Rev.* 14, 561–600.
- Paik, Myungho, Black, Bernard, Hyman, David A., 2015. Damage Caps and the Labor Supply of Physicians: Evidence from the Third Reform Wave, working paper. Available at: <http://ssrn.com/abstract=2470370>
- Silver, Charles, Hyman, David A., Black, Bernard, 2008. The Impact of the 2003 Texas Medical Malpractice Damages Cap on Physician Supply and Insurer Payouts: Separating Facts From Rhetoric. *Texas Advocate* 44(Fall), 25–34. Available at <http://ssrn.com/abstract=1139190>
- Stewart, Ronald M., West, Molly, Schirmer, Richard, Sirinek, Kenneth R., 2013. Tort reform is associated with significant increases in Texas physicians relative to the Texas population. *J. Gastrointest. Surg.* 17, 168–178.
- Yang, Y. Tony, Studdert, David M., Subramanian, S.V., Mello, Michelle M., 2008. A longitudinal analysis of the impact of liability pressure on the supply of obstetrician-gynecologists. *J. Empirical Legal Stud.* 5, 21–53.

<sup>76</sup> Kessler et al. (2005).

<sup>77</sup> Matsa (2007).

<sup>78</sup> Klick and Stratmann (2007).