Self-Insuring against Liability Risk: Evidence from Physicians' Home Values in States with Unlimited Homestead Exemptions

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ABSTRACT

We study whether individuals self-insure against uninsured liability risk by exploiting variations in state laws that allow individuals to protect some portion of the value of their homes against creditors. We test whether physicians take advantage of these laws to invest more in their homes to protect assets from malpractice claims exceeding liability policy limits. In states with unlimited homestead exceptions—laws that protect home equity from recovery by creditors—physicians invest 13 percent more in home value than in the absence of an exemption. Effects are larger where liability risk is greater; no effect occurs for other professionals of similar family income, family size, demographics, and city of residence. Our evidence suggests that individuals manipulate their financial assets to self-insure against liability risk when insurance markets are incomplete.

1. INTRODUCTION

When faced with financial uncertainty, rational agents have incentives to take steps ex ante to reduce the probability (self-protection) or the size (self-insurance) of a potential loss. Most prior empirical analyses of behavioral responses to liability risk have focused on measuring the extent to which individuals engage in self-protection. For example, a number of studies estimate the impact of no-fault automobile insurance coverage on accident rates (see Landes 1982; Zador and Lund 1986; Heaton

and Helland 2008). Other work finds that limits to tort liability lead to reductions in personal injuries and accidents more generally (Rubin and Shepherd 2007; Helland and Tabarrok 2012). With regard to the risk of liability for medical malpractice, there is a large literature examining how physicians adjust their practice styles and spending on the basis of the threat of medical malpractice liability (recent examples include Frakes 2013; Frakes, Frank, and Seabury 2015; Frakes and Gruber 2018; also see Kessler and McClellan 1996, 2002; Sloan and Shadle 2009; Lakdawalla and Seabury 2012). All of these are examples of changes in ex ante behavior that influence the probability that one might be subject to tort liability but do not necessarily impact the potential size of a loss if liability occurs.

One likely reason that past work has focused more on measuring self-protection rather than self-insurance is the widespread insurance coverage that individuals in the United States possess against tort liability. Individuals are often required to purchase liability insurance for automobile accidents, injuries that occur in their home, or in some cases against professional malpractice or misconduct. The classic model of insurance demand theorized in Ehrlich and Becker (1972) shows that market insurance and self-insurance are substitutes, which suggests that the ubiquity of insurance coverage might crowd out the need for self-insurance.[1] However, the presence of deductibles, policy limits, insurers' profits, and other imperfections in insurance markets makes it likely that most policies offer incomplete coverage, which leaves room for rational agents to take steps to mitigate potential financial risks from excess liability. But the question remains whether they do so through self-protection, self-insurance, or both.

We examine whether individuals self-insure against liability risk by exploring how one group of individuals who face high liability risks—physicians—respond to policies allowing them to protect their financial

1. As an empirical example of this, Kantor and Fishback (1996) find that the adoption of mandatory workers' compensation coverage early in the 20th century crowded out private efforts to provide insurance against workplace accidents.

assets from seizure after a malpractice judgment. The threat of malpractice liability is a source of considerable anxiety for physicians, and a substantial majority of physicians carry medical professional liability insurance to cover the financial costs of malpractice claims. The conventional wisdom is that, because of insurance, the actual financial risk to physicians from malpractice liability is minuscule. However, while this may be true on average, it ignores the small possibility of a catastrophic verdict that could exceed policy limits and put a physician's personal finances at risk. If physicians perceive themselves to face financial risk from malpractice liability, then we expect that they would take steps to alleviate that risk (see Ly 2019); if they are fully insured, they should behave no differently than individuals who do not face malpractice risk.

In this paper, we assess whether physicians respond to policies that allow them to protect themselves from the financial implications of uninsured malpractice risk. We test whether physicians take advantage of state laws allowing them to shield some portion of the value of their homes from creditors and invest more in their homes as a form of self-insurance. Our hypothesis is that in states with unlimited homestead exceptions—provisions of state law that protect home equity from seizure by creditors—physicians will purchase comparatively more expensive homes than those in states without such exceptions.[2] This analysis represents a test of whether physicians actively attempt to reduce the financial threat from malpractice liability, because the additional home equity does nothing to protect physicians from the indirect or psychological costs associated with liability. Thus, absent personal financial risk there would be no reason to make costly adjustments to their home purchases.

We estimate the effects of unlimited homestead exemptions using data from the American Community Survey (ACS). Our identification strategy is based on a comparison of home values of physicians across geographic areas with differing values of the exemption while using nonphysician homeowners as a control group. Importantly, not only can we condition on individual income, but we can also account for a number of other factors that influence home investment (most notably family income but also factors such as family size and demographics). If physicians are differentially using unlimited homestead exemptions to protect themselves

2. We describe how homestead exemptions work in more detail below, but put simply, they prevent the creditor—in this case, a plaintiff in a malpractice case with a court judgment against a physician—from forcing the sale of a physician's home to pay off the debt. If a sale is forced, the physician can retain equity up to the amount of the exemption. As a practical matter, the greater the exemption, the more home equity is protected from seizure relative to other assets.

from liability risk, we would expect to see physicians in these areas investing more in their homes than nonphysicians with identical characteristics do. To verify that differences in home values are driven by fears of malpractice liability risk, as opposed to other idiosyncratic differences in preferences, we test whether the relationship between homestead exemptions and physicians' home values is stronger in states with higher expected malpractice liability. We also compare the effects of homestead exemptions in states with and without tort reforms, particularly patient-compensation funds, which are malpractice reforms designed to protect physicians from liability claims that exceed insurance policy limits.

Our findings suggest that unlimited homestead exemptions induce physicians to invest approximately 13 percent more in the value of their homes compared with what they would have invested in the absence of an exemption. This translates into approximately $65,000 of asset protection if physicians own their homes outright (or if they could transfer sufficient funds to pay off their mortgages in the event of a claim). In addition, we find that the response of physicians to unlimited homestead exemptions is larger in areas where they have greater incentives to self-insure because of higher expected malpractice liability risk. Similarly, we find that homestead exemptions increase physicians' home values by less—that is, the treatment effect is smaller—in states where no patient-compensation fund is present. That unlimited homestead exemptions increase physicians' home values compared with home values of nonphysicians with comparable income and that the effect is larger in areas with relatively high uninsured malpractice liability risk are evidence that individuals do self-insure against liability risk.

Several falsification and specification tests verify that the results are robust. For instance, there is an effect of unlimited homestead exemptions on the home values of dentists, who have elevated liability risks similar to those of physicians.[3] Outside of health care, there is no impact of unlimited homestead exemptions on the home values of other high-paying occupations—lawyers and engineers—with demographics, family income, family size, and city of residence similar to those of physicians.[4] We also estimate the impact of homestead exemptions on the equity that physicians maintain in their homes (though equity is not directly available in the ACS and

3. About 12 percent of medical malpractice claims in the National Practitioner Data Bank (NPDB) involve dentists, and 78 percent involve physicians, compared with just .5 percent involving pharmacists and 1.7 percent involving nurses.

4. Kritzer and Vidmar (2015) find that, although the size and frequency of malpractice lawsuits vary against lawyers on the basis of their area of practice, the amounts paid tend to be modest relative to medical malpractice claims.

so must be imputed) and find that exemptions increase the probability that physicians hold positive equity. We also show that unlimited homestead exemptions increase other measures of physicians' home value, such as the number of bedrooms. Since home loans are secured debt, one method of reducing nonexempt assets is simply to hold less equity.

The policy implications of these findings are nuanced. Unlimited homestead exemptions reduce liability exposure by allowing physicians to protect assets from judgments in excess of their policy limits. This improves efficiency to the extent that malpractice claims have limited deterrence value and that the typical above-policy-limit case is frivolous in some way, that is, the plaintiff is not truly injured or the injury is unrelated to the physician's conduct. By contrast, if the typical above-policy-limit case is meritorious and the deterrent value of litigation induces better care by physicians, then unlimited homestead exemptions could be problematic. A more concrete implication of these results reinforces the point in Baker, Helland, and Klick (2016): the finding that medical malpractice judgments in excess of the policy limits typically settle at the policy limit (Zeiler et al. 2007) is not enough to conclude that physicians face no uninsured financial risk for malpractice claims.

The paper proceeds as follows. Section 2 provides background on malpractice risk for physicians and gives a brief description of homestead exemptions and the implications for physicians in malpractice cases. Section 3 describes the data sources, and Section 4 describes the empirical framework and outlines the identification strategy. Section 5 describes the results, and Section 6 describes the implications of the findings and offers suggestions for future research.

2. BACKGROUND

Homestead protection laws offer homeowners the ability to shield some portion of the value of their homes from being used to pay off creditors. While the details vary by state, generally speaking the laws allow individuals to declare some or all of their property as homestead, which makes it exempt from creditors. The homestead exemption is the amount of equity in the home that is protected from creditors.[5] If the total dollar value of

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5. The term "homestead exemption" can be used more broadly to refer to a set of legal protections offered to homeowners against taxation and asset seizure. For the purposes of this paper, we are chiefly interested in the protections that homestead exemptions provide homeowners against creditors, although they can also refer to exemptions against property taxes and the death of a spouse.

equity in the home is below the exemption level, creditors cannot force the homeowner to sell the home to pay off the debts. If the debtor's home equity exceeds the value of the exemption, the creditor may be able to force a sale of the home, but the debtor gets to keep up to the value of the exemption.[6]

In this paper, we argue that the existence of homestead exemptions can create an incentive for a person with comparatively high liability risk—in our example, physicians facing medical malpractice liability risk—to invest more in their home relative to other assets. Suppose that a physician loses a medical malpractice case and faces a final judgment that exceeds the value of his or her malpractice insurance policy limit. After the final judgment is entered, the physician becomes a judgment debtor, and the plaintiff becomes the creditor, with the amount of the debt equal to the difference between the final judgment and the policy limit. At this point, and if the creditor and the physician are unable to agree on a voluntary payment plan, the creditor has different legal options to attempt to force the physician to pay off the debt. The mechanisms and processes vary by state, but these typically include wage garnishments, levies of bank accounts, and judgment liens on real property, including the home.

The value of homestead exemptions to the debtor is from limits on whether and to what extent the creditor can seize proceeds from the sale—voluntary or forced—to pay off the debt. The application of the homestead exemption varies according to both state laws and other circumstances, including the debtor's financial situation and the size of the judgment.[7] In a particularly contentious case, the creditor may attempt to seize and force a sale of the home. If the amount of equity that the debtor holds in the home is less than the value of the homestead exemption, then this option will not be available to the creditor, and the debtor is allowed to keep the home. However, if the value of the home equity exceeds the

6. Note that homestead exemptions apply only to unsecured, or involuntary, creditors. That is, a homestead exemption would not prevent a bank from foreclosing on a debtor's house if the debtor failed to meet his or her mortgage obligations.

7. In addition to the value of the exemption, states differ in terms of eligibility and process. For example, states have different requirements with respect to how long the homeowner had owned the property, what types of property are covered, and how marital status is treated. States also differ in whether the exemption applies automatically or whether a declaration is needed, and if so the timing of that declaration. It is possible that these differences could impact the generosity of the exemption in terms of the expected level of asset protection. However, we feel that the first-order differences in generosity will be driven by the size of the exemption, particularly whether it is limited or unlimited, so that is the focus of our empirical work.

exemption, the creditor may be able to force a sale, but the debtor is allowed to keep up to the amount of the exemption.

If the amount the physician owes is in excess of his or her ability to pay, he or she may seek to declare bankruptcy in federal court. In the United States, individuals declare bankruptcy through one of two primary options: Chapter 7 or Chapter 13.[8] Chapter 7 requires the debtor to liquidate all nonexempt assets, if any, to repay his or her debts, but once the assets are gone the defendant's future earnings cannot be touched. Chapter 13, on the other hand, is designed for debtors with regular income and establishes a court-approved repayment plan over 3 to 5 years (depending on income). In the case of unsecured claims,[9] a debtor filing for Chapter 13 bankruptcy must offer a repayment plan that includes all disposable income and at least as much as what the claimants would receive if the debtor had liquidated under Chapter 7 (11 U.S.C. sec. 1325). While Chapter 13 requires debtors to pay back at least some of their unsecured liabilities, they do not have to pay them back in full.

Bankruptcy can offer significant protection to a defendant facing a large court judgment in a tort case. Bankruptcy ends all efforts by the plaintiff to collect a debt related to personal injury torts, including physicians facing verdicts from medical malpractice cases (Baker, Helland, and Klick 2016; for a discussion, see Gilles 2006).[10] Important for our purposes is that a homestead exemption in a bankruptcy case operates in a manner similar to a collection action in state court, which means that the creditor(s) cannot recover any more of the home equity than allowed by the exemption. Thus, a physician could protect assets by increasing the value of the equity in a home, which would restrict a plaintiff's ability to recover beyond the malpractice insurance policy limit. This effect is direct in the case of Chapter 7 bankruptcy, in which the creditors recover from the liquidation of the debtors' nonexempt assets. In Chapter 13 bankruptcy, the value of the repayment plan is based in part on what

8. The third option is Chapter 11 bankruptcy. While Chapter 11 is an option for individuals, it is the most complicated form of bankruptcy and can be costly, which means it is most commonly used by businesses. However, because of eligibility limits in Chapter 7 and Chapter 13 (regarding income in the former and the amount of debt in the latter), some physicians may be forced to file a Chapter 11 bankruptcy.

9. Unsecured claims are those that do not include some form of collateral to secure the debt. In the case of physicians who file for bankruptcy while facing liability from a malpractice claim, the plaintiff is considered an unsecured claimant.

10. Under Chapter 7 the physician (debtor) must list all debts owed, and thus a pending claim would not necessarily be discharged (see *Waterson v. Hall*, 515 F.3d 852 [8th Cir. 2008]; *In re Parker*, 313 F.3d 1267 [10th Cir. 2002]).

the debtor would have had to pay under Chapter 7, so the homestead exemption lowers the minimum amount of the repayment plan.[11]

As an example of how a homestead exemption works, suppose a physician faces a $2 million malpractice verdict, only $1 million of which is covered by a malpractice policy. For the sake of the example, suppose all legal actions (for example, appeals) have played out, and after the insurer pays, the physician owes $1 million in residual liability. The plaintiff proceeds to obtain a court judgment on that debt, which allows the plaintiff to place a lien on the physician's home in an attempt to foreclose on the property and force a sale. Further, suppose the physician has $200,000 worth of equity in a home. If the physician lives in a state with a homestead exemption of $300,000, the equity is less than the value of the exemption and is fully protected. The plaintiff then cannot force the physician to sell the home.

Alternatively, suppose the physician lives in a state in which the value of the homeowner exemption is $100,000. In this case, the physician's equity would not be fully protected, and the plaintiff could force a sale of the home. If the house is sold for its market value, the mortgage holder(s) will be fully repaid, the physician will keep $100,000, with the remaining $100,000 going to the plaintiff (assuming that the remaining debt minus wage garnishments and other actions are at least $100,000). Thus, in states with particularly high homestead exemptions, the more equity the physician holds in his or her home, the more assets can be shielded against recovery from a malpractice judgment.

11. If a physician is concerned about losing assets because of a judgment in excess of his or her policy limit, he or she can file for bankruptcy under Chapters 7, 11, or 13. Because Chapter 7 is inaccessible to high-income debtors, many physicians likely file under Chapter 11 or 13. Both allow the physician to retain all assets, regardless of the exemption limit, if the physician confirms a repayment plan that pays disposable income to creditors for a certain period (which varies by chapter). If physicians can retain assets in bankruptcy, why do exemption laws matter? They matter because Chapters 11 and 13 require the physician to pay an amount to unsecured creditors that is at least as much as they would receive if the physician's nonexempt assets were liquidated. If, for example, a physician files a Chapter 13 case and proposes a 5-year repayment plan, but the payments under the plan will be insufficient to ensure that unsecured creditors receive as much as they would receive in a liquidation of nonexempt assets, the court will not confirm the repayment plan. To convince the court to confirm the plan, the physician must liquidate some of the nonexempt assets and thereby increase the total payments to unsecured creditors by enough to ensure that they receive as much from the payments under the plan as they would from a liquidation. The greater the range of assets protected by exemption laws, the less likely it is that a physician will need to liquidate nonexempt assets in bankruptcy. Thus, unlimited homestead exemptions matter to physicians in that even under Chapter 13 they are less likely to be forced to liquidate assets.

Note that in this example, we did not specify whether the physician chose to file for bankruptcy. The key for our purposes is that, regardless of whether the physician files for bankruptcy, the homestead exemption offers a similar ability to protect assets from the plaintiff. In fact, we expect that the mere presence of a more generous homestead exemption could lead to lower recovery by plaintiffs even if bankruptcy is never filed or no lien is ever pursued. This is because the presence of the homestead exemption impacts the plaintiff's leverage in negotiations over payment plans, similar to how the presence of a damages cap could impact settlement negotiations prior to a trial.

2.1. Physicians' Malpractice Risk

Note that while we used a physician as the debtor in the example above, there is nothing unique about the way a homestead applies to a physician compared with other individuals. Physicians have higher than average incomes, so they likely have higher home values on average, but conditional on income there is no particular reason that physicians should value a homestead exemption more than other individuals unless they are more likely to need one. We argue that physicians do have a greater demand for homestead exemptions than other high-income individuals because they face a greater than average risk of tort liability due to the threat of medical malpractice.

Medical malpractice arguably represents one of the greatest sources of professional anxiety for physicians. Approximately 7 percent of physicians face a malpractice claim in a year, and even in lower-risk specialties 75 percent of physicians can expect to face at least one claim over the course of a career (Jena et al. 2011). With such comparatively high expected liability costs, a substantial majority of physicians carry medical professional liability insurance to cover the financial costs of malpractice claims.[12] This insurance is generally not experience rated at the individual level, which means that when a physician experiences a claim, future premiums do not increase.

Given the ubiquity of malpractice insurance, the conventional wisdom is that the actual financial risk to physicians from malpractice liability is minuscule. But despite this, physicians regularly report practicing defen-

12. In addition to the financial incentives to purchase malpractice insurance, many states require physicians to carry coverage, and most hospitals require it for admitting privileges (Mello 2006).

sive medicine,[13] and there is an extensive literature on physicians' behavior that finds that changes in malpractice risk weakly change physicians' labor supply and practice patterns (for evidence on the physicians' labor supply, see Encinosa and Helliger 2005; Klick and Stratmann 2007; Matsa 2007; Baicker and Chandra 2005; Kessler, Sage, and Becker 2005; Helland and Showalter 2009; for evidence on liability's impact on practice patterns, see Kessler and McCellan 1996, 2002; Bovbjerg et al. 1996; Dubay, Kaestner, and Waidmann 2001; Currie and MacLeod 2008; Dranove, Ramanarayanan, and Watanabe 2012; Frakes 2012, 2013; Ly 2019). The prevailing view in the literature is that physicians' behavioral responses to malpractice risk are driven by the nonfinancial psychological costs of malpractice, such as the time and hassle of dealing with claims[14] and personal anxiety associated with one's professional ability being called into question.[15] An additional indirect cost that potentially has both financial and nonfinancial ramifications is if physicians suffer reputational damage among their peers or potential patients. For example, physicians increase their payments on malpractice claims to avoid disclosure on state web pages that list malpractice awards (Helland and Lee 2010). This finding is consistent with physicians being concerned about damage to their reputations from a successful malpractice claim beyond just the direct payments. The belief that physicians' behavior is driven more by nonfinancial costs of malpractice has helped motivate calls for reform efforts to shift away from more traditional damage caps and toward other reforms that could lower the frequency of claims or make resolving them faster and more efficient (Mello, Studdert, and Kachalia 2014).

However, despite widespread medical malpractice coverage among physicians, it is possible that physicians bear more financial risk from

13. For example, Studdert et al. (2005) report that 93 percent of physicians surveyed in Pennsylvania in 2003 reported that they practice defensive medicine. Similarly, in a national survey conducted in 2009 by Bishop, Federman, and Keyhani (2010), 91 percent of physicians agreed that defensive medicine was common. Carrier et al. (2010) find somewhat lower but still substantial (60–78 percent) rates of physicians reporting behavior consistent with defensive medicine.

14. A significant portion of physicians' careers (up to 25 percent in high-risk specialties) are conducted under the shadow of an outstanding lawsuit, which could impose costs due to time or hassle of dealing with the suit or uncertainty over its outcome (Seabury et al. 2013).

15. In principle, the presence of insurance does not eliminate the value of self-protection from defensive medicine, as Ehrlich and Becker (1972) point out that self-protection can be complementary to market insurance because it lowers the price. However, malpractice insurance is not individually experience rated, which mutes this complementarity.

malpractice than is currently appreciated or at least that they perceive themselves to bear more risk. The most common malpractice policies involve coverage that is capped at $1 million per occurrence and $3 million per year. The belief that, despite these limits, physicians are essentially fully insured against financial risk stems from the fact that payments infrequently exceed this limit. For example, studies using malpractice payout data from Texas suggest that 1.5 percent of liability payments exceed policy limits (see Zeiler et al. 2007).[16] Moreover, in cases in which jury verdicts exceed policy limits, the belief is that plaintiffs are usually willing to settle at the policy limit because attorneys are reluctant to pursue a defendant's personal assets (Baker 2001; Gilles 2006). This is consistent with a more general perception that bankruptcy courts make it prohibitively difficult or costly to recover judgments beyond the policy limits.[17]

Outside Texas, however, a larger percentage of suits appear to exceed standard malpractice policy limits.[18] In the National Practitioner Data Bank (NPDB), the largest publicly available repository of information about paid malpractice claims, about 5.2 percent of malpractice claims in 2014 involved a payment of more than $1 million.[19] The average of those payments was about $1.98 million. Some physicians seem particularly at risk of a payment exceeding policy caps; for cases involving obstetrics errors, about 11 percent of payments were more than $1 million, and the mean payment in those cases was $2.51 million. Given that the annual risk of a physician facing a malpractice claim that ultimately results in a payment is less than 2 percent (Jena et al. 2011), the annual risk to a physician of facing claims that exceed the policy limits is still small (for example, approximately .1 percent, or 5 percent of 2 percent). However, the career likelihood of facing a claim involving a payment is much higher, over 70 percent in high-risk surgical specialties (Jena et al. 2011). Thus, if physicians consider claims over a long enough time horizon, the

16. Zeiler et al. (2007) find a 98.5 percent chance of a medical malpractice claim settling at or below the policy limit. It should be noted that this evidence is based on closed-claim data from Texas, which has an unlimited homestead exemption. This appears to lead to lower settlements and policy limits in Texas relative to other states (see Baker, Helland, and Klick 2016).

17. LoPucki (1996) argues for the so-called death of liability, meaning that ordinary middle-class people are essentially judgment proof beyond any liability insurance they happen to hold.

18. One reason that Texas might have a smaller share of payments exceeding the policy limit is the state's comparatively strict $250,000 cap on noneconomic damages.

19. For a description, see National Practitioner Data Bank, Public Use Data File (http://www.npdb.hrsa.gov/resources/publicData.jsp).

risk of facing a claim exceeding the policy limits is still small but not negligible, especially given the potentially large dollar values at stake.[20] And this ignores the fact that in the face of rising malpractice premiums, an increasing number of physicians are self-insuring against malpractice risk (alone or as part of a practice group).

It is also worth noting that physicians have substantially higher litigation exposure than nonphysicians. The annual risk of a malpractice claim for the typical US physician is approximately 7 percent, with a lifetime risk nearing 100 percent for high-risk specialists and 75 percent for low-risk specialists (Jena et al. 2011). The best available estimates of liability risk in the general population would place the risk of a lawsuit at an order of magnitude lower than this.[21]

We do not have direct evidence that physicians take advantage of homestead exemptions more than those in other occupations do, but there is anecdotal evidence that physicians do indeed consider homestead exemptions as a means to respond to the financial risk of malpractice. Though no published survey data exist, homestead exemptions are frequently cited by financial planners who cater to physicians. Financial planners often recommend to physicians that additional asset protection is needed because liability insurance does not provide complete protection. The two most common suggestions are placing additional assets in protected classes such as a primary residence (homestead protection), retirement plans, and life insurance or placing assets in a spouse's name

20. These numbers could be enhanced when one considers the possibility of self-liquidating policies in which defense costs count against policy limits, which reduces the effective policy limit. Another possibility that could lower the effective policy limit is when multiple claims arise for the same event, which insurers usually count as a single occurrence and apply to them a single coverage limit.

21. While there is no comparable estimate of liability risk for the general population, in 2002 the Bureau of Justice Statistics (BJS) reported that 98,786 federal tort cases were concluded (Cohen 2005). In addition, the National Center for State Courts estimated that there were 193 tort cases per 100,000 in the state courts (based on data from 30 states) or about 555,068 cases per year based on the 2002 US population of 287.6 million (Ostrom, Kauder, and LaFountain 2003). If we assume that each of those cases involved only one defendant, the annual risk of being named in a resolved tort suit is about .23 percent (653,854 tort cases nationwide of which 555,068 are state cases and 98,786 are federal torts identified by BJS divided by the US population). The adult population in 2002 was 212.6 million. If we assume that children are rarely involved in litigation, the litigation risk rises to .31 percent, which is far below the physician risk. These BJS-based estimates are similar those of Posner (1997), who finds that there are 327.2 lawsuits per 100,000 in the United States, although his estimate includes contract cases. Posner's estimate would imply a litigation risk of .3 percent. In either estimate, the liability risk for the general population is far lower than that for physicians.

(see more on tenants by the entirety below; see also, for example, Lowes 2003).

Because these strategies cannot be used after a malpractice judgment, financial advisors often recommend that physicians establish advance protection through these means. Indeed, under the Consumer Protection Act of 2005 (Pub. L. No. 109-8, 119 Stat. 23), the inflation-adjusted limit for homestead exemptions is $125,000 regardless of the state exemption unless the home was purchased less than 1,215 days prior to the filing (see Rudzinski 2010), which suggests that physicians' decisions to mitigate financial risk through homestead-motivated investments must be performed well in advance of any malpractice judgment. A robust advisory market therefore exists in which advisors recommend that physicians shield assets anticipatorily from malpractice liability through the use of homestead exemptions.

2.2. Testable Hypotheses

We have argued that homestead exemptions offer potentially valuable asset protection to a defendant in a civil case facing a large court judgment; physicians are, or at least perceive themselves to be, at greater risk of civil liability than a person in another occupation with similar income because of the threat of malpractice liability; and taking full advantage of the homestead exemption requires having home equity prior to the judgment being rendered. Taken together, these three points motivate the following hypotheses that we test in our empirical work: conditional on income, unlimited homestead exemptions increase the value of a physician's home compared with homes of individuals in occupations that are less subject to liability risk, and the impact of unlimited homestead exemptions on physicians' home values compared with those of nonphysicians is greater when physicians are subject to larger potential uninsured malpractice liability.

3. DATA

The primary data source is the ACS, a nationally representative, cross-sectional survey of approximately 3 million households annually administered by the US Census Bureau (we use an extract from Ruggles et al. [2017]). The survey is mandatory and is conducted by mail, telephone, and personal visit interviews. The ACS includes respondents from the ci-

vilian population and from military households and collects information about respondents' demographics, housing, and employment. Of specific relevance for this study, the survey collects data on respondents' age, sex, race, marital status, family size, occupation, annual personal earned income, hours worked, and housing value. Response rates vary from year to year but historically have always exceeded 90 percent. While the ACS has always been a national survey, in its early years it was not fully geographically representative of the US population, with rural areas being underrepresented until 2005. However, given the relative scarcity of physicians in rural areas, we use the 2000–2010 waves for the primary results.[22] Using these data, we construct a series of stacked, annual cross sections of physician and nonphysician respondents from 2000 to 2010. We adjust all dollar values to 2012 dollars using the Consumer Price Index.

The key outcome variable from the ACS is the reported value of an individual's home. Because we are interested in how unlimited homestead exemptions impact the decisions of physicians to invest in their homes, we confine the sample to owner-occupied dwellings, which make up about 74 percent of the sample. The ACS asks homeowners for their assessment of the current market value of their homes: "About how much do you think this house and lot, apartment, or mobile home (and lot, if owned) would sell for if it were for sale?" Note that the underlying basis for respondents' beliefs about their homes' value is not captured by the survey, which raises the possibility of errors in the respondents' assessments of a property's value.

In addition to the potential for individual error, there are two limitations with the ACS data on home values. The first is that, while from 2008 onward the value is reported as a continuous variable, prior to that it was reported as the midpoint of an interval for values under $250,000 (the size of the interval varied from $4,999 to $49,999). The second limitation is that the home value is top coded at $1 million from 2000 to 2007, and in the data the values of all properties worth more than $1,000,000 (in nominal dollars) are replaced with $1,000,000. In 2008 the ACS began truncating the sample at the top 5 percent of the property values in the state-year. However, after 2007 the truncated values are replaced with means of the truncated values. For example, in Alaska in 2010 all val-

22. Note that we have subanalyses separating the 2000–2004 and 2005–10 data. Although these analyses are primarily intended to control for changes to federal bankruptcy policy, they also could inform as to whether the sampling changes matter.

ues above \$800,000 are replaced with \$1,504,000. For 2008–10 the ACS recodes truncated observations with the mean value of the top-coded sample, which is \$1,504,000 in 2010 Alaska. Both alterations potentially introduce further measurement error to the home value and effectively reduce the observed variation in home value across respondents.

Measurement error in the dependent variable should not necessarily bias the results if it does not vary systematically across physicians and nonphysicians or across states with limited or unlimited homestead exemptions. Nonetheless, we conduct several robustness and specification checks to ensure that the estimates are not driven by measurement error in home value. First, we limit the analysis to individuals with an income of \$250,000 or below and retest the results. Those individuals are significantly less likely to buy homes of \$1 million or more, so they are less likely to be affected by the top coding. Second, we estimate a censored regression (Tobit) model that allows for top coding of the outcome variable and verify that the estimates confirm those of the main specification. Finally, we estimate the expected value of top-coded home values in the pre-2008 sample. We use a version of the Pareto interpolation procedure suggested in Albouy and Zabek (2016), which also uses ACS home values.[23]

Finally, we also use additional data from the ACS on housing characteristics to assess whether physicians in states with unlimited homestead exemptions invest more in their homes. These variables include the size of the monthly mortgage payment, the number of rooms (total) in the house, the number of bedrooms in the house, and the annual premium for homeowners' insurance. While these are cruder measures of home value, if unlimited homestead exemptions induce physicians to invest

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23. Albouy and Zabek (2016) use Pareto interpolation to estimate the top-coded values of the American Community Survey (ACS). They assume that property values y are distributed according to a distribution $F(y)$ such that $\ln[1 - F(y)] = a_j[\ln(k_j) - \ln(y)]$, where $a_j > 1$ and k_j is the parameters for interval j. Thus, a_j can be estimated by $\hat{a}_j = [\ln(y_j + 1) - \ln(y_j)]/(p_{j+1} - p_j)$, where y_{j+1} is the home value for the bottom of the next bin, y_j is the bottom value for bin i, p_{j+1} is the portion of homes with values greater than y_{j+1}, and p_j is the portion with values greater than y_j. Albouy and Zabek (2016) find that for high values of y the values for a_j are fairly constant, as would be predicted if home values follow a Pareto distribution. For years in which they do not have the mean of the top-coded data, in our case years before 2008, they extrapolate a_j from the top 10 percent of the distribution of homes in a state-year that are not censored. We follow a similar procedure but use the top 20 percent for a year or two in California, the District of Columbia, and Hawaii when the top 10 percent is completely truncated (that is, y_j and y_{j+1} are the same value). We then replace the top-coded values for 2000–2007 with \$1,000,000 $\times$ $\hat{a}_j$. These values are used in Table 4.

more in the value of their homes, it should be weakly reflected in these measures as well.

We merge the ACS data with information about homestead exemptions at the state-year level. The information about state homestead policies are from the appendix of *How to File for Chapter 7 Bankruptcy* (Elias, Renauer, and Leonard 2000–2011; Elias, Renauer, and Bulkat 2013), which has been used in several other studies (see Greenhalgh-Stanley and Rohlin 2013; Corradin et al. 2013; Baker, Helland, and Klick 2016). For each state and year, we take the value of any homestead exemption, recording the dollar value for limited exemptions and an indicator for whether it is unlimited. As a quality check, we compared these data against the current homestead exemption values using online state bankruptcy statutes and verified their accuracy.[24]

Table 1 reports the values of the homestead exemptions by state and year from 2000 to 2010. There is wide variation in the amount of home equity a debtor is allowed to declare exempt. Certain states, such as Pennsylvania, have no exemption (which means that homeowners there use the federal exemption) during the study period, and other states, such as Texas, allow a debtor to protect all the equity in his or her home (an unlimited homestead exemption). Homestead exemptions in a given state change very little over time. This lack of change has costs and benefits for our analysis. On the one hand, our analysis cannot rely on within-state time-series variation in homestead values for identification. However, given that homes are a durable good, the general stability in exemptions suggests that most housing decisions were made well after states had determined the level of state exceptions. In other words, the respondents in our sample made their housing decisions given full knowledge, or at least a reasonable expectation, of how much income they could protect via the exemption.

Table 1 also reports the mean home values for physicians and nonphysicians in the ACS sample. Not surprisingly, the homes owned by physicians exceed the values for those of the general population. More important for our study, the value of physicians' houses typically exceeds the value of the homestead exemption by a significant fraction.[25] Suppose we assume that both physicians and nonphysicians have 38 percent equity

24. We exclude Washington, DC, and West Virginia from the sample because they changed their laws in the middle of the sample period.

25. This is true in all but five states, all of which have comparatively large exemptions that exceed $300,000: Massachusetts, Minnesota, Montana, Nevada, and Rhode Island.

in their homes.[26] On the basis of the values in Table 1, outside unlimited states, nonphysicians can protect about 59 percent of their equity via homestead exemptions, while physicians can protect only 36 percent. This means that investing in a more expensive home in unlimited-exemption states offers asset protection to homeowners facing a large liability judgment, while in other states the marginal value of a larger housing investment is essentially 0 in terms of protecting the asset from liability.

In addition to the ACS and homestead exemption data, we use two sources of information to control for state-level differences in malpractice risk. First, we use data on state-level malpractice reform measures from the Database of State Tort Law Reforms (DSTLR; Avraham 2014). These data, which have been widely used in previous work, provide the effective date of the 10 most prevalent kinds of tort reform measures for all 50 states and the District of Columbia during the sample period. The variables are indicators for whether in a state and year there is a noneconomic damage cap, a punitive damage cap, or a cap on total compensation; whether the state requires that judgments be paid as a lump sum or allows periodic payments; whether the state has modified its collateral source rule; whether the state has a higher evidence standard for punitive damages; whether the state limits lawyers' contingent fees; whether the state has modified the joint and several liability rule; whether the state has a fund that partially pays patients for medical malpractice judgments; and whether the state has modified the comparative fault rule (for a discussion and review, see Kachalia and Mello 2011). All of these are commonly used measures of the degree to which the state's civil justice system is proplaintiff or prodefendant and hence of liability risk.

Of these measures, the one arguably most relevant for our analysis is the special patient-compensation fund. Such a fund provides relief for physicians facing judgments that exceed malpractice insurance policy limits. This does not mean that physicians are necessarily fully shielded—some funds are voluntary or have limited recovery—but their presence suggests less of a need for physicians to protect themselves against uninsured malpractice risk. Thus, we conduct separate analyses of the impact of homestead exemptions on physicians' home values interacted with indicator variables for each tort reform, including having a patient-compensation fund in the state. If the homestead exemptions are truly being used by physicians to self-insure against liability risk, we would

26. This was the value that the Federal Reserve estimated to be the national average in 2010.

Table 1. Homestead Exemption Levels for Married Individuals, 2000–2010

	Exemption Level						Federal Exemption	Average Home Value		Patient Compensation Fund
	2000	2002	2004	2006	2008	2010		Nonphysician	Physician	
Alabama	10,000	10,000	10,000	10,000	10,000	10,000	No	170,310	562,060	No
Alaska	62,000	64,800	64,800	67,500	67,500	70,200	No	255,016	468,579	No
Arizona	100,000	100,000	100,000	150,000	150,000	150,000	No	287,276	731,383	No
Arkansas	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Yes	141,230	467,577	No
California	75,000	75,000	75,000	75,000	75,000	75,000	No	572,058	1,021,855	No
Colorado	90,000	90,000	90,000	90,000	90,000	90,000	No	332,693	717,458	No
Connecticut	150,000	150,000	150,000	150,000	150,000	150,000	Yes	434,348	755,729	No
Delaware	0	0	0	50,000	50,000	50,000	No	286,658	621,627	No
District of Columbia	0	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Yes	541,223	892,203	No
Florida	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	No	292,421	744,539	Yes
Georgia	20,000	20,000	20,000	20,000	20,000	20,000	No	231,270	590,568	No
Hawaii	20,000	20,000	20,000	20,000	20,000	20,200	Yes	562,162	933,622	No
Idaho	50,000	50,000	50,000	50,000	50,000	100,000	No	218,184	583,185	No
Illinois	15,000	15,000	15,000	30,000	30,000	30,000	No	265,541	698,512	No
Indiana	15,000	15,000	15,000	30,000	30,000	30,000	No	167,787	496,630	Yes
Iowa	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	No	145,834	398,887	No
Kansas	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	No	152,615	449,741	Yes
Kentucky	10,000	10,000	10,000	10,000	10,000	10,000	No	161,035	508,729	No
Louisiana	15,000	25,000	25,000	25,000	25,000	25,000	No	163,703	490,749	Yes
Maine	250,00	500,00	700,00	700,00	700,00	900,00	No	219,197	428,983	No
Maryland	0	0	0	0	0	0	No	402,894	752,763	No
Massachusetts	100,000	300,000	300,000	500,000	500,000	500,000	Yes	449,906	847,756	No
Michigan	7,000	7,000	7,000	31,900	31,900	34,450	Yes	205,115	537,219	No
Minnesota	200,000	200,000	200,000	200,000	300,000	300,000	Yes	257,795	583,815	No

Mississippi	75,000	75,000	150,000	150,000	150,000	No	138,597	468,153	No
Missouri	8,000	8,000	15,000	15,000	15,000	No	183,156	555,543	No
Montana	60,000	60,000	200,000	200,000	500,000	No	222,111	469,532	No
Nebraska	12,500	12,500	12,500	12,500	60,000	No	148,652	424,586	Yes
Nevada	125,000	125,000	200,000	350,000	550,000	No	328,626	790,393	No
New Hampshire	60,000	60,000	200,000	200,000	200,000	Yes	305,076	548,370	No
New Jersey	0	0	0	0	0	Yes	441,104	799,186	No
New Mexico	60,000	60,000	60,000	120,000	120,000	Yes	207,466	486,336	Yes
New York	20,000	20,000	20,000	100,000	100,000	No	380,489	829,239	Yes
North Carolina	20,000	20,000	37,000	37,000	37,000	No	216,587	564,160	No
North Dakota	80,000	80,000	80,000	80,000	100,000	No	125,763	355,249	Yes
Ohio	10,000	10,000	10,000	10,000	40,000	No	184,447	487,628	No
Oklahoma	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	No	140,564	439,669	No
Oregon	33,000	33,000	33,000	39,600	39,600	No	314,116	606,155	No
Pennsylvania	0	0	0	0	0	Yes	206,951	523,717	Yes
Rhode Island	0	150,000	150,000	200,000	300,000	Yes	343,704	675,128	No
South Carolina	10,000	10,000	10,000	10,000	10,000	No	211,919	633,082	Yes
South Dakota	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	No	148,950	400,876	No
Tennessee	7,500	7,500	7,500	7,500	25,000	No	191,339	557,882	No
Texas	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Yes	179,604	541,168	No
Utah	20,000	40,000	40,000	40,000	40,000	No	268,974	609,278	No
Vermont	150,000	150,000	150,000	150,000	150,000	Yes	242,978	466,454	No
Virginia	10,000	10,000	10,000	10,000	10,000	No	345,284	703,287	No
Washington	30,000	40,000	40,000	40,000	125,000	Yes	362,340	727,666	No
West Virginia	30,000	50,000	250,000	250,000	250,000	No	132,599	421,294	After 2004
Wisconsin	40,000	40,000	40,000	40,000	40,000	Yes	221,841	543,744	No
Wyoming	20,000	20,000	20,000	20,000	20,000	No	211,840	474,477	Yes

Note. The data are from Elias, Renauer, and Leonard (2000–2011), Elias, Renauer, and Bulkat (2013), and US Census Bureau (2000–2010). West Virginia raised the homestead exemption in 2003 for physicians facing medical malpractice judgments from the $50,000 available to all couples.

expect larger effects in states with no compensation fund. Table 1 shows the presence of patient-compensation funds by state.

In addition to the controls for tort laws, we use the NPDB to estimate liability risk as measured by the frequency of paid malpractice claims. Under the Health Care Quality Improvement Act of 1986 (Pub. L. No. 99-660, 100 Stat. 3,743), insurers must report all medical malpractice payments made on behalf of individual practitioners to the Department of Health and Human Services, which then publishes that information quarterly in the NPDB (for limitations of the NPDB, see Chandra, Nundy, and Seabury 2005; Helland and Lee 2010). We total these payments by state and year and divide by the number of physicians in the state. The physician counts data come from the Area Health Resource File, which is based on data from the American Medical Association Physician Masterfile.

Descriptive statistics for the full sample and by physicians and nonphysicians are in Table 2. Physicians are slightly younger, more likely to be male, and more likely to be married than nonphysicians. In addition, physicians have significantly higher income, work more hours, and purchase more expensive homes than the general population. However, in terms of the state-level variables, including homestead exemptions, liability risk, and malpractice reform, the sample is generally balanced. This suggests that while there are differences in income between physicians and nonphysicians, location choices are similar and at best only modestly influenced by perceived liability risk. See Table OA1 in the Online Appendix for a covariate balance test.

4. EMPIRICAL SPECIFICATION

The practical impact of a homestead exemption is to allow debtors to protect financial assets from creditors in the form of home equity. Equity is simply the fair market value of a home minus the value of any liens on the property, usually the remaining principal on a home mortgage. There are two ways equity can increase: either the home's value appreciates, or the homeowner pays off more mortgage debt. Note that, conditional on a court's judgment, a debtor has limited ability to move assets into a home, which means that the only way to guarantee that the equity would be protective is to hold the equity prior to an incident occurring. One way to generate more equity ex ante is to pay off more of your mortgage, say, by

Table 2. Summary Statistics

	Full Sample		Physicians		Nonphysicians	
	Mean	SD	Mean	SD	Mean	SD
Respondents' characteristics:						
Age	55.16	13.64	51.21	10.85	55.18	13.65
Female	.52	.50	.26	.44	.52	.50
Married	.71	.45	.85	.36	.71	.45
Household income	95,743	88,496	298,744	185,846	94,680	86,458
Family members in household	2.73	1.47	3.13	1.47	2.73	1.47
Self-employed	.10	.30	.39	.49	.10	.30
Hours worked per week	26.67	21.64	47.67	19.27	26.56	21.60
Unlimited homestead exemption	.18	.39	.16	.37	.18	.39
Housing characteristics:						
House value	280,247	288,385	647,401	486,961	278,325	285,746
Monthly mortgage payment (2012 $)	813.77	957.30	2,030.33	1,814.95	807.40	946.67
Annual property insurance cost	755.02	718.97	1,485.00	1,367.94	751.20	712.06
Bedrooms	4.16	.92	4.88	1.06	4.16	.92
Rooms	6.52	1.84	8.07	2.19	6.51	1.83
Malpractice risk: payments per physician (2012 $)	5,227	2,926	5,349	3,005	5,227	2,925
State tort reform:						
Noneconomic damage cap	.46	.50	.46	.50	.46	.50
Punitive damage cap	.61	.49	.57	.49	.61	.49
Cap on total recovery	.09	.29	.09	.28	.09	.29
Split recovery	.13	.33	.13	.33	.13	.33
Modified collateral source rule	.69	.46	.72	.45	.69	.46
Punitive damages evidence rule	.72	.45	.69	.46	.72	.45
Periodic payments	.69	.46	.71	.45	.69	.46
Contingent fee limit	.48	.50	.52	.50	.48	.50
Joint and several liability modification	.75	.43	.75	.43	.75	.43
Patient-compensation fund	.27	.44	.28	.45	.27	.44
Comparative fault modification	.91	.29	.91	.29	.91	.29
N	10,364,328		53,172		10,311,156	

Note. Values are from US Census Bureau (2000–2010). The sample includes respondents who are 18 or older, are employed, and reside in an owner-occupied dwelling. Washington, DC, and West Virginia are omitted. The data on state liability laws are from Avraham (2014). Data on malpractice payments per physician combine data on paid malpractice liability aggregated to the state-year level from the National Practitioner Data Bank linked to state-year physician counts from the Area Health Resource File.

making a higher down payment or paying off principal. The other is to buy a more valuable home, which will tend to appreciate more in dollar terms and generate greater expected equity for a given level of mortgage debt.

In principle, an unlimited homestead exemption could incentivize either of these behaviors. However, we focus the bulk of our empirical analysis on the relationship between homestead exemptions and physicians' home values. The first reason we do this is because of the favorable tax treatment that mortgage interest receives in the United States. Mortgage interest is tax deductible, which means that for the homestead exemption to induce a physician to pay off a mortgage, the reduction in expected liability costs would have to outweigh the tax benefit. The other reason is data limitations—a home's value is recorded directly in the ACS, while equity (or even the remaining mortgage balance) is not. Thus, we focus on the relationship between homestead exemptions and housing value and include robustness checks using imputed equity and some alternative measures (such as whether the individual holds a mortgage).

In principle, homestead exemptions should give all people, not just physicians, the incentive to invest more in their homes. However, we rely on the fact that physicians have comparatively high liability risk compared with those in other occupations. Other occupations like corporate executives may also have higher expected liability, but there are relatively few of them. Thus, comparing physicians with nonphysicians allows us to estimate whether physicians in states with unlimited homestead exemptions engage in more asset protection than individuals with comparable income in those states.

Table 3 compares the average home values for physicians and nonphysicians stratified by 10 income categories (corresponding to the deciles of the income distribution). Home values are consistently higher in states with limited homestead exemptions for both physicians and nonphysicians, largely because states with the highest housing costs, including California and New York, have limited homestead exemptions. Home values consistently increase with income, and the between-state differences in home values are depressed for the highest income categories (though this could be related to the top coding).[27]

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27. Note that the average home value for physicians with incomes of $500,000 or more exceeds $1 million, despite the top coding, which reflects the census's interpolation of the data after 2007, the inflation adjustment we applied to the top code, and the fact that a majority of physicians in this bracket are top coded.

Our hypothesis that unlimited homestead exemptions give physicians the incentive to invest more in the value of their homes is borne out by Table 3. The difference in levels is the unadjusted difference-in-differences (DiD) estimate between physicians and nonphysicians in unlimited and limited states. Other than the lowest income category,[28] the DiD is positive for every income category. This suggests that within each income category, physicians invest relatively more (compared with nonphysicians) in the value of their homes in states with unlimited homestead exemptions. At the highest income categories, physicians in states with limited exemptions have very similar (or even lower) average home values compared with nonphysicians, but those in the states with unlimited exemptions have significantly higher average home values. Estimates using the natural log of home value are positive and highly significant in all categories. While this analysis fails to adjust for potentially important factors besides income, it is consistent with physicians using unlimited homestead exemptions to purchase additional protection against malpractice liability.

For the primary analysis we estimate the following regression specification:

$$\ln(\text{Home Value}_{ist}) = \alpha + \beta_1 \text{Doctor}_{ist} \times \text{Unlimited}_s + \beta_2 \text{Unlimited}_s \\ + \beta_3 \text{Doctor}_{ist} + \gamma \boldsymbol{X}_{ist} + \delta \boldsymbol{Z}_{st} + \eta_s + \lambda_t + \varepsilon_{ist},$$

where i denotes the individual, s denotes the state, and t denotes the year. The dependent variable Home Value$_{ist}$ is the natural log of the value of observation i's home as reported in the ACS. The variable Doctor$_{ist}$ is an indicator equal to one if individual i's occupation is listed as a physician in the ACS. The variable Unlimited$_s$ is an indicator equal to one if the individual's state of residence s has an unlimited homestead exemption.[29] The coefficient β_1 on the interaction term represents the DiD estimate, the difference between physicians' home values in states with a homestead exemption relative to the difference for nonphysicians.

The vector $\boldsymbol{X}_{ist}$ includes the individual's demographic characteristics that influence the value of the person's home. In addition to household

28. This category is somewhat odd, as it represents a disproportionately small share of physicians (13 percent compared with 65 percent of the general population). These physicians likely work part-time or possibly are close to retirement and might have different housing needs or less malpractice risk.

29. Given the inclusion of state fixed effects, the coefficient on Unlimited is in effect the coefficient on the omitted state. As such, the coefficient does not have a meaningful interpretation in our analysis.

Table 3. Home Values in States with Limited and Unlimited Homestead Exemptions

Income and Exemption	Mean	SD	N	Difference in Levels		Difference in Logs	
				Coefficient	SE	Coefficient	SE
Less than $100,000				−22,797**	6,124.60	.09**	.03
Physicians, limited	435,138	437,481	6,185				
Physicians, unlimited	351,450	337,949	1,578				
Nonphysicians, limited	223,919	228,308	8,537,906				
Nonphysicians, unlimited	163,028	169,535	2,374,561				
$100,000–$149,999				14,015**	7,794.90	.12**	.02
Physicians, limited	501,633	423,764	6,094				
Physicians, unlimited	421,433	368,891	1,342				
Nonphysicians, limited	349,699	268,251	2,663,631				
Nonphysicians, unlimited	255,484	203,175	585,370				
$150,000–$199,999				29,377**	9,158.33	.13**	.02
Physicians, limited	536,426	364,143	6,605				
Physicians, unlimited	437,515	313,919	1,408				
Nonphysicians, limited	462,009	320,339	1,046,670				
Nonphysicians, unlimited	333,721	253,942	200,557				
$200,000–$249,999				56,807**	12,137.32	.17**	.02
Physicians, limited	607,860	441,513	6,047				
Physicians, unlimited	512,972	394,883	1,204				
Nonphysicians, limited	564,830	391,446	444,553				
Nonphysicians, unlimited	413,135	318,800	81,825				
$250,000–$299,999				49,830**	18,333.15	.16**	.03
Physicians, limited	681,762	491,628	4,279				
Physicians, unlimited	554,322	419,015	794				
Nonphysicians, limited	654,925	477,575	206,124				
Nonphysicians, unlimited	477,655	422,496	38,334				

$300,000–$349,999				93,499**	20,476.09	.21**	.03
Physicians, limited	693,652	484,401	3,918				
Physicians, unlimited	611,323	496,502	744				
Nonphysicians, limited	691,191	511,594	115,586				
Nonphysicians, unlimited	515,363	468,838	23,571				
$350,000–$399,999				78,544**	20,646.69	.14**	.03
Physicians, limited	723,361	482,488	4,290				
Physicians, unlimited	653,184	521,153	803				
Nonphysicians, limited	719,256	535,520	91,079				
Nonphysicians, unlimited	570,535	483,784	18,456				
$400,000–$449,999				55,011**	22,727.93	.08**	.03
Physicians, limited	782,298	564,264	3,326				
Physicians, unlimited	711,345	540,213	1,009				
Nonphysicians, limited	805,976	636,988	65,903				
Nonphysicians, unlimited	680,012	557,780	19,731				
$450,000–$499,999				85,487**	27,585.14	.14**	.03
Physicians, limited	862,144	580,080	2,617				
Physicians, unlimited	748,881	504,353	722				
Nonphysicians, limited	886,046	670,872	50,880				
Nonphysicians, unlimited	687,296	517,649	13,013				
$500,000 or greater				71,006**	26,019.44	.1**	.02
Physicians, limited	1,020,825	707,275	6,295				
Physicians, unlimited	858,525	635,063	1,318				
Nonphysicians, limited	1,083,161	857,391	113,662				
Nonphysicians, unlimited	849,855	690,386	17,597				

Note. Differences in levels are coefficients for the difference-in-differences regression of physicians in states with unlimited and limited homestead exemptions relative to nonphysicians in the same states. Differences in logs are the coefficients from the same difference regression using the natural log of home values. Washington, DC, and West Virginia are omitted. SE = standard error.

** Statistical significance at the 1 percent level.

income, as described above, they include the individual's age and age squared, whether the person is female, whether the person is married, the person's family size, and whether they are self-employed. The vector Z_{st} includes a series of indicator variables designed to capture the state's litigation environment. It is based on the fifth edition of the DSTLR (Avraham 2014) and includes controls for the tort reform variables summarized in Table 2. Finally, we include state (η_s) and year (λ_t) fixed effects. The term ε_{ist} represents the robust standard errors, which are calculated to allow clustering by state. We also estimate the model including metropolitan statistical area (MSA) or city fixed effects and replacing the state and year fixed effects with state-year fixed effects.

To identify the effects of homestead exemptions on physicians' housing values, we estimate a DiD model that compares housing values of physicians with housing values of nonphysicians in states with and without an unlimited homestead exemption. In principle, we could estimate a triple-differences model to look at within-state changes in the level of the homestead exemption and compare differences between physicians and nonphysicians as the homestead exemption value changed over time. However, two difficulties present themselves with this strategy. The first is that there is minimal variation in unlimited homestead exemptions in states over time; only Washington, DC, changes to an unlimited exemption in the sample period, and almost no states have altered an unlimited exemption in the last 40 years.[30] The second issue is that the data do not indicate when the individual purchased his or her home. The ACS does contain a variable for tenure in a home by six broad categories.[31] Given the infrequency of home purchases, the paucity of changes in law, and the broad categories identifying tenure in the home, it would be very difficult to pick up time-series effects from a change.

One common concern with DiD strategies based on state laws is that the timing of laws could be endogenous. This is clearly less of an issue with unlimited homestead exemptions since the laws have essentially not changed. Moreover, it appears that homestead exemptions are rarely designed specifically for physicians, perhaps because there are politically more direct methods of tort reform, such as damage caps, that protect physicians from liability. The sole exception appears to be West Virginia,

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30. As noted above, we exclude Washington, DC, and West Virginia, which altered the homestead exemption and increased the exemption for physicians, respectively.

31. The categories are 12 months or less, 13–23 months, 2–4 years, 5–9 years, 10–19 years, 20–29 years, and over 30 years since the occupant moved into the residence.

which raised the exemption for physicians facing a medical malpractice claim to $250,000.[32]

One further complication is that the existence of unlimited homestead exemptions changes the willingness of lenders to lend and the demand for housing by potential buyers. For example, Lin and White (2001) and Berkowitz and White (2004) find that loan applications are more likely to be turned down in states with unlimited homestead exemptions, and Corradin et al. (2016) find that unlimited exemptions generally increase the demand for housing. This may be a concern if credit rationing due to the existence of the unlimited homestead exemption differentially impacts physicians, who may be less likely to go bankrupt than the general public simply because they have higher average incomes. However, this concern should be substantially mitigated by adjusting for household income.

For these reasons, our primary identification strategy relies on a DiD model using differences in unlimited homestead exemptions across states, with nonphysicians serving as a control group. To demonstrate the validity of this strategy, we conduct a large number of robustness and specification checks and test for other confounding sources of variation. We include estimates with MSA and city fixed effects and replace the state and year fixed effects with a fixed effect for each state-year. We estimate models using other measures of home value and imputed equity as dependent variables. And, importantly, we test for similar effects of unlimited homestead exemptions on the home values of nonphysicians who work in other high-income or health care occupations, for example, engineers and attorneys. This provides us with a useful falsification test because these are professionals who may be situated similarly to physicians in terms of their income and home preferences but have much lower liability risks.

32. See West Virginia Code sec. 38-10-4, which states, "(a) The debtor's interest, not to exceed $35,000 in value, in real property or personal property that the debtor or a dependent of the debtor uses as a residence, in a cooperative that owns property that the debtor or a dependent of the debtor uses as a residence, or in a burial plot for the debtor or a dependent of the debtor: *Provided,* That when the debtor is a physician licensed to practice medicine in this state §30-3-1 *et seq.* or §30-14-1 *et seq.* of this code, and has commenced a bankruptcy proceeding in part due to a verdict or judgment entered in a medical professional liability action, if the physician has a current medical malpractice insurance in the amount of at least $1 million for each occurrence, the debtor physician's interest that is exempt under this subsection may exceed $35,000 in value but may not exceed $250,000." Note that in 2014 New Jersey had a bill pending (Senate Bill 1018) that would have raised the exemption for physicians facing a medical malpractice judgment.

5. RESULTS

5.1. Main Results

The results of the DiD analysis with different combinations of covariates and fixed effects are in Table 4. For the full sample without individual-level control variables and law controls, physicians in states with unlimited homestead exemptions have homes worth 20.4 percent more relative to the difference for nonphysicians. When we add control variables, there is a similar increase of 19.5 percent. Both estimates are consistent with the hypothesis that physicians take advantage of unlimited homestead exemptions to protect their assets by purchasing more valuable homes.

The qualitative results do not change substantially as the specification is varied to include more controls. The baseline model excludes income and hours worked because of the possibility that they could be determined endogenously with home value. In the case of household income, it is possible that the existence of a homestead exemption allows physicians to choose lower policy limits and hence less expensive medical malpractice insurance, and this may show up as higher income. Physicians may also modify their practice in ways that increase liability but also increase income (for example, managing high-risk deliveries or working in the emergency department). In terms of hours worked, previous studies find an impact of liability risk on hours worked (see Helland and Showalter 2009). The model in column 3 includes income and hours worked and shows a smaller but still significant and positive effect, which suggests an increase in home value of 13.5 percent. The models in columns 4 and 5 include MSA and city fixed effects, respectively, for which identifiers are available only after 2004. Again, the results are consistent with a 14–16 percent increase in home values for physicians in unlimited states. Finally, in the model with state-year fixed effects, the effect of an unlimited exemption is 14 percent, which indicates that the results are not sensitive to even the most flexible state time trend.

Given that the data on home values are top coded at $1 million from 2000 to 2007 and at the top 5 percent in each state-year thereafter, including only households with family incomes under $250,000 effectively eliminates all of the top-coded observations, although at the expense of a large portion of the sample of physicians. Although the estimated impacts are somewhat smaller with this restriction, they are not substantively different from the results for the full sample.

Given the change in personal bankruptcy laws in 2005, it is possible that an unlimited homestead exemption could have become less effective as an asset-protection strategy.[33] We cannot directly test the laws' impact in that the US Census estimates the median residential tenure at 5 years for all residences and 11 years for homeowners, which means that most homeowners purchased homes before the change in law even in the last cross section in the sample. Nevertheless, it is useful to see if we can detect any differences in the postreform period. In addition, the ACS underwent several changes prior to 2005 and is geographically representative only after 2004. The estimated coefficients using only data for 2005–10 are similar in magnitude to the results for the full sample and are also significant and positive.[34] Thus, changes in bankruptcy laws or to ACS sampling procedures do not appear to substantially influence our findings.

In a model using a censored regression to account for the truncation of home values at $1,000,000 nominal dollars or the top 5 percent of state-year home values after 2008, the results are substantively similar to those for the full sample (and somewhat larger than when families with household incomes over $250,000 are eliminated). Again, this suggests that top-coded housing values (or income) do not appear to be influencing the findings in a meaningful way.

In another model we replace the 2000–2007 top-coded values with the Pareto interpolation suggested in Albouy and Zabek (2016). The point estimates are slightly larger than the estimates from the censored regression model but not statistically significantly so. The impacts are all statistically significant.

Another model uses only homes purchased in the previous 12 months. One concern with our estimation strategy of including state and year or

33. Historically, debtors had the option to choose whether to file for bankruptcy under Chapter 7 or Chapter 13. However, this changed in 2005 with the Bankruptcy Abuse Prevention and Consumer Protection Act (Pub. L. No. 109-8, 119 Stat. 23), which was designed to make bankruptcy more costly for debtors. Prior to 2005, there was no income test for Chapter 7, which meant that anyone was eligible to file for Chapter 7, although the lender could argue that the Chapter 7 filing was abusive if a debtor had sufficient income to pay off a reasonably restructured debt. After 2005, Chapter 7 became means tested (White 2007) at the state's median income, adjusted for expenses. The act also increased the cost of filing by 50 percent (White 2007). The impact of this change was to dramatically increase the number of filings in 2005 (prior to the change in law) and reduce subsequent Chapter 7 filings (see White and Zhu 2010; Cornwell and Xu 2014). Evidence suggests that the rise in filing fees contributed significantly to the decrease (Gross, Notowidigdo, and Wang 2014).

34. The results are also similar for 2000–2005.

Table 4. Effect of Homestead Exemptions on Physicians' Home Values, 2000–2010

	(1)	(2)	(3)	(4)	(5)	(6)
Full sample:						
Physician × Unlimited	.204**	.195**	.135*	.163**	.145*	.136*
	(.061)	(.062)	(.055)	(.058)	(.057)	(.056)
N	10,363,985	10,363,985	6,678,484	5,210,284	5,210,284	6,678,484
Income under $250,000:						
Physician × Unlimited	.173**	.165**	.130**	.155**	.146**	.137**
	(.047)	(.047)	(.041)	(.050)	(.047)	(.049)
N	9,975,489	9,975,489	6,378,840	4,956,056	4,956,056	4,956,056
After 2005:						
Physician × Unlimited	.200**	.193**	.140*	.163**	.145*	.140*
	(.066)	(.065)	(.058)	(.058)	(.057)	(.058)
N	8,112,843	8,112,843	5,210,284	5,210,284	5,210,284	5,210,284
Censored regression:						
Physician × Unlimited	.203**	.194**	.134*	.161**	.142*	.138*
	(.061)	(.071)	(.056)	(.059)	(.057)	(.058)
N	10,363,985	10,363,985	6,678,484	5,210,284	5,210,284	5,210,284
Replace top-coded homes with expected value:						
Physician × Unlimited	.218**	.211**	.156**	.180**	.162**	.156**
	(.064)	(.060)	(.053)	(.053)	(.053)	(.052)
N	8,112,843	8,112,843	5,210,284	5,210,284	5,210,284	5,210,284

Owned home 12 months or less:						
Physician × Unlimited	.210**	.100**	.141**	.117*	.096+	.144**
	(.053)	(.036)	(.047)	(.046)	(.054)	(.047)
N	251,203	92,281	192,734	155,882	144,584	192,734
Matched sample:						
Physician × Unlimited	.107**	.100**	.074**	.085**	.074**	.077**
	(.037)	(.036)	(.025)	(.020)	(.021)	(.026)
N	92,281	92,281	92,281	77,797	73,044	92,281
Interaction:						
Physician × Unlimited × ln(Income)	N.A.	N.A.	.011**	.011**	.014**	.015**
			(.003)	(.003)	(.002)	(.003)
N	N.A.	N.A.	6,678,484	5,210,284	5,210,284	6,678,484
Controls	No	Yes	Yes	Yes	Yes	Yes
Income	No	No	Yes	Yes	Yes	Yes
Hours worked	No	No	Yes	Yes	Yes	Yes
Metropolitan statistical area fixed effects	No	No	No	No	No	No
City fixed effects	No	No	No	No	Yes	No
State-year fixed effects	No	No	No	No	No	Yes

Note. Controls include the respondent's age, age squared, gender, marital status, and family size and whether the respondent is self-employed. Washington, DC, and West Virginia are excluded. All regressions include state and year fixed effects. Metropolitan statistical area and city identifiers are available only after 2005. Robust standard errors adjusted to allow clustering at the state level are in parentheses. N.A. = not applicable.

+ Statistical significance at the 10 percent level.
* Statistical significance at the 5 percent level.
** Statistical significance at the 1 percent level.

state-year fixed effects is that we might be identifying the effect of faster appreciation of home prices among physicians in unlimited-exemption states relative to other states. Restricting the sample to recently purchased homes removes the appreciation effect and captures something closer to the difference at the time of purchase. This greatly restricts the sample, but nonetheless the impact is significant. Although the impact is slightly smaller in some specifications, this suggests that differential appreciation across physicians is not driving the results.

The final model uses a matched sample. The concern is that we do not have covariate balance across the four groups (physicians in unlimited states, physicians in limited states, nonphysicians in unlimited states, and nonphysicians in limited states). In Table OA1 in the Online Appendix we present a balance test that shows the extent of the differences. To control for this, we estimate a logit model of the probability that an observation is a physician and then use propensity-score matching to generate a control group of nonphysicians who are similar to physicians on observable characteristics. We then use this control group and physicians to estimate the DiD model. The coefficients are smaller than those in the other models. This suggests that the lack of covariate balance may be inflating the estimates, but the impact is not large enough to meet conventional significance levels.

We also estimate a model that includes interactions of Physician, Unlimited, and ln(Income). Because at high incomes a doctor can protect all assets, regardless of exemption laws, using Chapter 13, we would expect the coefficient on Physician $\times$ Unlimited $\times$ ln(Income) to be positive; that is, physicians with higher incomes purchase comparatively more expensive homes for asset protection. The specifications that exclude income do not include the interactions, but the results that include income are consistent with small but statistically significant positive effects. Since income is logged, the coefficient can be interpreted as an elasticity: a 1 percent rise in income increases a doctor's home value in unlimited-exemption states by .1 percent more than in limited-exemption states.

These findings suggest that physicians in states with unlimited homestead exemptions purchase homes that are about 13 percent more expensive than what they otherwise would purchase. Interpreting the magnitude of this effect depends on how much equity physicians hold in their homes. If physicians own their homes outright or could transfer enough money into their homes prior to judgment to pay off their mortgages,

then this estimate suggests that physicians in unlimited-exemption states are protecting about \$73,320.[35] However, the Federal Reserve reports that in 2010 the average homeowner in the United States had equity equal to 38 percent of the market value of his or her home (Kravitz and Rugaber 2011). If we apply this to our data, then the estimated amount of financial assets being protected falls to approximately \$27,862.

How does this compare with the expected excess liability risk? As noted above, about 5.2 percent of claims in the NPDB exceed \$1 million, and the average payment in those cases is \$1.98 million. Even though the annual risk to physicians of facing a malpractice claim resulting in a payment is low, over the course of a career the threat of liability is high (Jena et al. 2011). By age 65, 19 percent of physicians in low-risk specialties and 71 percent in high-risk specialties will face a claim that results in an indemnity payment (Jena et al. 2011). With the numbers from the NPDB, back-of-the-envelope estimates of the career risk of excess malpractice liability could range from about \$9,700 to \$36,000, depending on specialty. Given the favorable tax treatment that mortgage debt receives in the United States, our estimate of about \$28,000 in asset protection does not seem to imply an unreasonable level of risk aversion by physicians.

For comparison, Table 5 shows the estimates from our analysis of unlimited homestead exemptions on the relative home values of individuals in other occupations. We focus on three high-earning occupations with different levels of liability risk: dentists, lawyers, and engineers. Like physicians, dentists have higher liability exposure than the general population and carry liability insurance. For example, Milgrom et al. (1994) find that almost a quarter of dentists surveyed had experienced a malpractice claim.[36] In contrast, lawyers and engineers serve as falsification groups, as they have higher incomes and own more expensive homes than the average homeowner in the ACS but face considerably lower liability risk than physicians and dentists.

These results confirm that, like physicians, dentists appear to invest more in their homes in states with unlimited homestead exemptions. The interaction term for dentists and unlimited homestead exemptions is positive and significant, whether estimated alone or in a pooled model. On

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35. The average home value for physicians in unlimited-exemption states is about \$564,000 in 2012 dollars.

36. According to Lydiatt (2002), 60 percent of the lawsuits against dentists are for failure to perform a biopsy when the patient had cancer of the oral cavity.

Table 5. Effect of Homestead Exemptions on Home Values of Other Professionals

	Professionals	All	Dentists	Lawyers	Engineers
Physician	.304**	.307**			
	(.024)	(.024)			
Physician × Unlimited	.136*	.137*			
	(.056)	(.056)			
Professional × Unlimited	.078				
	(.050)				
Professional	.201**				
	(.009)				
Dentist × Unlimited		.174**	.173**		
		(.033)	(.032)		
Dentist		.166**	.145**		
		(.019)	(.019)		
Lawyer × Unlimited		.091		.090	
		(.058)		(.057)	
Lawyer		.270**		.259**	
		(.013)		(.012)	
Engineer × Unlimited		.046			.044
		(.054)			(.053)
Engineer		.121**			.114**
		(.014)			(.014)

Note. The variable Professional excludes physicians. All regressions include the respondent's age, age squared, gender, marital status, family size, and income; whether the respondent is self-employed; and state tort law controls. Washington, DC, and West Virginia are excluded. Robust standard errors adjusted to allow clustering at the state level are in parentheses. $N = 6,678,484$.

  * Statistical significance at the 5 percent level.
  ** Statistical significance at the 1 percent level.

the other hand, unlimited homestead exemptions appear to have no effect on the relative home value for lawyers or engineers, either for all professionals or when each is given its own intercept and interaction. While the coefficient is positive, in most cases it is considerably smaller (ranging from $\frac{1}{20}$ to $\frac{1}{4}$ the magnitude of the coefficient for physicians) and is not statistically significant.[37]

5.2. The Impact of Unlimited Homestead Exemptions according to Malpractice Liability Risk

Overall, the results in Tables 4 and 5 support our first hypothesis: physicians respond to unlimited homestead exemptions by investing more

  37. We ran alternative specifications with additional occupations, including nurses and executives, and found similar results in the sense that homestead exemptions appear to significantly increase home values only for physicians or dentists.

in their homes to protect their assets from liability risk.[38] Taken at face value, this does not necessarily imply that the threat of excess malpractice liability is the reason that physicians respond in this manner, as they could have perceived financial risk for some other, unobserved reason. Per our second hypothesis, if the response to unlimited homestead exemptions is a response due to concerns about excess malpractice liability, we should be able to observe physicians responding to the exemptions more when their expected malpractice risk is higher (or at least when they perceive it to be higher).

To test this, we modify our empirical model using a direct measure of liability from the NPDB. We interact the unlimited homestead exemptions and physician-level interactions with our measure of liability risk and estimate the following regression model:

$$
\begin{aligned}
\ln(\text{Home Value}_{ist}) = {} & \alpha + \beta_1 \text{Liability Risk}_{st} \times \text{Doctor}_{ist} \times \text{Unlimited}_s \\
& + \beta_2 \text{Liability Risk}_{st} \times \text{Unlimited}_s \\
& + \beta_3 \text{Liability Risk}_{st} \times \text{Doctor}_{ist} \\
& + \beta_4 \text{Liability Risk}_{st} + \beta_5 \text{Doctor}_{ist} \times \text{Unlimited}_s \\
& + \beta_6 \text{Unlimited}_s + \beta_7 \text{Doctor}_{ist} \\
& + \gamma \boldsymbol{X}_{ist} + \delta \boldsymbol{Z}_{st} + \eta_s + \lambda_t + \varepsilon_{ist},
\end{aligned}
$$

where Liability Risk$_{st}$ is the total of the payments in the NPDB divided by the number of physicians in state s in year t.[39] The results of this estimation are reported in Table 6.

When we estimate the full set of interacted variables, many of them are highly correlated and none are individually significant, but they are jointly significant. In Table 6 we divide the effect of homestead exemptions into the top three quartiles of liability risk relative to the bottom

38. Note that greater investment in homes by physicians in states with unlimited homestead exemptions can explain the differences in settlements and premiums observed elsewhere (Baker, Helland, and Klick 2016). Rational plaintiffs' attorneys will expect that they will recover personal assets and thus will accept lower settlements or larger reductions (that is, haircuts) in judgments in states with unlimited homestead exemptions.

39. Note that if unlimited homestead exemptions successfully reduce the liability exposure of physicians conditional on a lawsuit, then they also could reduce the incentive to sue. Note that homestead exemptions impact liability only above a high threshold, so the effect should be muted, but to the extent that this is true, then the total payments per physician in the state could be endogenous. We tested whether the payments per physician were lower in states with unlimited homestead exemptions and found no evidence that this was the case (coefficient of Unlimited against log payments in a claim of −.088, with a standard error of .154), which suggests that this is not a serious concern.

Table 6. Effect of Homestead Exemptions on Physicians' Home Values by the State's Liability Risk

	(1)	(2)
Liability Risk × Unlimited	−.010	−.003
	(.013)	(.007)
Liability Risk × Unlimited × Physician	.014	.007
	(.016)	(.013)
Physician × Liability Risk	−.010	−.006
	(.011)	(.008)
Liability Risk	.004	−.008[+]
	(.008)	(.004)
Physician × Unlimited	.130	.116
	(.127)	(.102)
Physician	.960**	.378**
	(.087)	(.064)
Relative to states in the bottom quartile:		
Top quartile	.22**	.16*
	(.06)	(.07)
Third quartile	.19**	.15**
	(.07)	(.05)
Second quartile	.172[+]	.136[+]
	(.0862)	(.0566)
N	10,363,985	10,322,707

Note. Liability risk is measured by the total medical malpractice payments in the resident's state in the year divided by the number of physicians in the state that year. All regressions include the respondent's age, age squared, gender, marital status, family size, and income; whether the respondent is self-employed; state tort law controls; and state and year fixed effects. Washington, DC, and West Virginia are excluded. Robust standard errors adjusted to allow clustering at the state level are in parentheses.

  [+] Statistical significance at the 10 percent level.

  * Statistical significance at the 5 percent level.

  ** Statistical significance at the 1 percent level.

quartile. In states at the top quartile, physicians in unlimited-homestead exemption states increase the values of their home purchases by over 22 percent, compared with the effect of exemptions in states in the bottom quartile. This increase falls for the second and third quartiles. The results are similar if controls for state laws are included.

In addition, we estimate the effect of unlimited homestead exemptions on physicians' home values interacted with several common tort reforms: noneconomic damage caps, punitive damage caps, modifications to the collateral source rule, an evidence standard for punitive damages,

periodic payments of tort awards, limits on contingent fees charged by plaintiffs' attorneys, and the presence of a patient-compensation fund. As noted above, we expect the presence of these funds to mitigate the need for physicians to take advantage of homestead exemptions because they should reduce malpractice-related financial risk. The results are reported in Table 7. When the model is estimated using the full sample, noneconomic damage caps are associated with higher home values in unlimited-exemption states, although the impact is very weakly significant. Both the higher evidence standard for punitive damages and patient-compensation funds appear to mitigate the impact of unlimited homestead exemptions on physicians' home values. One problem with these reforms is that, unlike unlimited homestead exemptions, there have been changes in law relatively recently, and thus a physician may have purchased a home before the state adopted the reform. When we restrict to homes purchased in the last year, several coefficients switch signs and change significance. The sole consistent impact is presence of a patient-compensation fund, which again reduces the effect of an unlimited homestead exemption on the value of homes purchased by physicians.

5.3. Equity and Other Measures of Home Value

In truth, the value of a physician's home represents an upper bound on the amount of money he or she can protect. The actual amount a physician can protect is driven by how much equity he or she holds in a home. In principle, our predictions on the relationship between home values and homestead exemptions should hold for the level of equity. However, a complication is that the predictions do not hold for negative equity. Because a homeowner can default on a mortgage and lose the home, which serves as collateral for the loan, one who owes more on the loan than the value of the home would be better off defaulting rather than paying down the mortgage as a form of asset protection. In effect, a person with negative equity loses money either way; he or she could pay the plaintiff or the lender and be no better off financially.

As a practical matter, we are limited in our ability to test for the effect of homestead exemptions on physicians' equity because the ACS does not record the loan amount. It does identify the homeowner's monthly payment, but this does not allow us to observe equity without some additional assumptions. Some of these assumptions are based on the amount

Table 7. Effect of Homestead Exemptions and Tort Reform on Physicians' Home Values

	Full Sample	Owned <12 Months
Doctor × Unlimited	.416**	−.226*
	(.050)	(.092)
Doctor × Unlimited × Noneconomic Damage Cap	.062+	−.041
	(.034)	(.063)
Doctor × Unlimited × Punitive Damage Cap	.140	.632
	(.125)	(.386)
Doctor × Unlimited × Modified Collateral Source Rule	−.032	.247**
	(.035)	(.057)
Doctor × Unlimited × Punitive Damages Evidence Rule	−.324**	−.297
	(.119)	(.397)
Doctor × Unlimited × Periodic Payments	−.033	.162**
	(.036)	(.052)
Doctor × Unlimited × Contingent Fee Limit	−.002	−.093**
	(.023)	(.032)
Doctor × Unlimited × Patient Fund	−.119**	−.269**
	(.036)	(.045)
N	10,363,985	251,203
Total effect	.109	.114
	(.0413)	(.0383)

Note. Covariates include the respondent's age, age squared, gender, marital status, family size, and income; whether the respondent is self-employed; and state and year fixed effects. Washington, DC, and West Virginia are excluded. Robust standard errors adjusted to allow clustering at the state level are in parentheses.

+ Statistical significance at the 10 percent level.
* Statistical significance at the 5 percent level.
** Statistical significance at the 1 percent level.

of time the homeowner has held the property, which, as noted above, is recorded not as a particular year but rather a range that expands the longer the home is owned. Because of this, the exact amount of equity cannot be reconstructed, but it can be imputed. A high value and a low value of equity can be identified if we assume that all owners have a 30-year fixed mortgage, that they all paid the prevailing interest rate at the time they purchased a home (the 30-year fixed mortgage rate from the Federal Reserve Bank of St. Louis's Federal Reserve Economic Data database),

and that none of them have refinanced.[40] These assumptions may not hold in practice, but violations should not systematically bias the results.

The results are shown in Table 8. The specifications follow the same format as regressions for the home value in Table 4. For logged positive values of equity, physicians hold more equity in their homes in states with unlimited homestead exemptions. The impacts range from about 19 percent to 27 percent depending on the specification. When we estimate the model in levels using all values of equity, the impact is never significant and switches sign depending on the specification. In a model using levels and only positive values, the results are positive but not significant. With a model that estimates the probability that a homeowner has a mortgage, the results are consistently negative (although not significant at conventional levels), showing about a 1 percent decrease in the likelihood that a physician owns his or her home outright. Finally, we estimate whether the home has a second mortgage. The results are not statistically significant but are consistently negative. Overall, the results based on imputed home equity are mixed, consistently displaying the expected signs but failing to attain statistical significance.

5.4. Other Measures of Home Value

Table 9 reports estimates of the model using as outcomes three measures of home value. The first is the monthly mortgage payment. Physicians in states with unlimited home exemptions have mortgage payments about 10 percent higher in the DiD analysis. There is also a positive impact on the annual cost of property insurance among physicians in states with homestead exemptions. Finally, unlimited homestead exemptions also increase the number of bedrooms in physicians' homes. These results are

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40. Imposing these assumptions, we construct the average loan amount over the window for which the homeowner could have purchased a home, $t = 1 \ldots n$, as

$$\overline{\text{Loan}} = \left(\sum_{t-1}^{n} \text{Monthly Payment} \right.$$

$$\times \left\{ \frac{[1 + (\text{Annual 30-Year Rate}_t/12)]^{(360-12\times\text{Years in Home}_t)-1}}{(\text{Annual 30-Year Rate}_t/12) \times [1 + (\text{Annual 30-Year Rate}_t/12)]^{(360-12\times\text{Years in Home}_t)}} \right\} \right)/n,$$

where Monthly Payment is the amount the respondent identified as the first plus the second monthly payment in the ACS, Annual 30-Year Rate is the prevailing rate for a 30-year mortgage in year t of the purchase window, and Years in Home represents the number of years the owner has occupied the home if the home was purchased in year t of the purchase window. We then compute equity by subtracting the average loan amount from the value of the home.

Table 8. The Effect of Unlimited Homestead Exemptions on Measures of Physicians' Home Equity

	(1)	(2)	(3)	(4)	(5)	(6)
Log(Equity > 0):						
Doctor × Unlimited	.215**	.207**	.192**	.272**	.252**	.243**
	(.076)	(.061)	(.064)	(.077)	(.072)	(.072)
N	4,622,683	4,622,683	4,622,683	3,519,916	3,519,916	3,519,916
Equity in levels:						
Doctor × Unlimited	−7,357.821	−7,186.971	−10,312.547	9,657.047	4,199.934	613.666
	(17,366.851)	(16,672.426)	(14,304.501)	(20,968.504)	(22,016.516)	(22,396.681)
N	5,586,521	5,586,521	5,586,521	4,362,804	4,362,804	4,362,804
Equity > 0:						
Doctor × Unlimited	20,490.430	19,116.829	14,388.944	42,223.923	37,275.368	33,718.459
	(18,791.075)	(17,740.676)	(15,219.780)	(26,382.538)	(27,908.239)	(28,095.554)
N	4,622,683	4,622,683	4,622,683	3,519,916	3,519,916	3,519,916
Pr(Mortgage):						
Doctor × Unlimited	−.018[+]	−.020	−.018	−.018[+]	−.014	−.012
	(.010)	(.016)	(.014)	(.009)	(.011)	(.011)
N	10,360,204	10,360,204	10,360,204	8,109,977	8,109,977	8,109,977
Pr(Second Mortgage):						
Doctor × Unlimited	−.004	−.004	−.004	−.013	−.013	−.013[+]
	(.006)	(.006)	(.006)	(.008)	(.008)	(.008)
N	10,360,204	10,360,204	10,360,204	8,109,977	8,109,977	8,109,977
Controls	No	Yes	Yes	Yes	Yes	Yes
Income	No	No	Yes	Yes	Yes	Yes
Hours worked	No	No	Yes	Yes	Yes	Yes
Metropolitan statistical area fixed effects	No	No	No	Yes	No	No
City fixed effects	No	No	No	No	Yes	No
State-year fixed effects	No	No	No	No	No	Yes

Note. Coefficients are from a linear probability model with a dependent variable equal to one if the respondent has any mortgage or a second mortgage. Equity value is computed as the remaining loan value assuming the respondent has a 30-year fixed mortgage at the average prevailing interest rate during the home purchase window. Columns 2–6 include the respondent's age, age squared, gender, marital status, and family size and whether the respondent is self-employed. All regressions include state and year fixed effects. Metropolitan statistical area and city identifiers are available after 2005. Washington, DC, and West Virginia are excluded. Robust standard errors adjusted to allow clustering at the state level are in parentheses.

[+] Statistical significance at the 10 percent level.
** Statistical significance at the 1 percent level.

Table 9. The Effect of Homestead Exemptions on Other Measures of Physicians' Home Value

	ln(Mortgage Payment)	ln(Property Insurance)	Bedrooms
Physician × Unlimited	.103**	.231**	.155**
	(.028)	(.075)	(.053)
N	5,096,795	6,678,132	6,678,484

Note. The coefficients for bedrooms are estimated with a Poisson model. All regressions include the respondent's age, age squared, gender, marital status, family size, and income; whether the respondent is self-employed; and state tort law controls. Washington, DC, and West Virginia are excluded. Robust standard errors adjusted to allow clustering at the state level are in parentheses.
  ** Statistical significance at the 1 percent level.

consistent with the hypothesis that physicians buy relatively larger homes as an asset-protection method in states with unlimited homestead exemptions.

5.5. Other Robustness and Specification Checks

The Online Appendix reports the results of additional robustness and specification checks. Section OA1 reports the results of a covariate balance test, discussed above. In Section OA2 we test how the impact of homestead exemptions on physicians' home values changes in response to conditions in malpractice insurance markets. While we are limited by the lack of data in the ACS on the date on which physicians purchased their homes, we do find that unlimited homestead exemptions appear to have increased home values more for physicians who purchased their homes in periods of malpractice crisis, although the result is not significant, and that physicians appear to have been slightly more likely to purchase a home during a malpractice crisis.

In Section OA3, we test for undue influence for a single state—which is potentially a concern, as we have only eight states with unlimited homestead exemptions—by sequentially removing each one from the model. Overall, the results are consistent and not driven by any one state.

Section OA4 reports the results of models using the actual value of all state homestead exemptions as opposed to those in only the unlimited-exemption states. The only significant effects seem to come from unlimited-exemption states, probably because the value of the limited exemptions is too small to offer much financial protection.

Section OA5 examines whether homestead exemptions affect physicians' labor supply decisions. Previous studies have found that an increase in liability exposure leads to a reduction in physicians' labor supply (see, for example, Kessler, Sage, and Becker 2005; Baicker and Chandra 2005; Klick and Stratmann 2007; Masta 2007; Helland and Showalter 2009; for a more complete review of the literature, see Helland and Seabury 2015), so it is possible that the ability to protect assets through unlimited homestead exemptions also causes physicians to change their practices in ways that may increase litigation risk but also increase income, such as working more hours or treating higher-risk patients. The results are mixed, showing a positive effect on physicians' income but no effect on hours worked.

In Section OA6, we test whether state variation in ownership rules for married couples has any implications for our results. We test whether our findings differ in states where married couples are allowed to jointly own property as tenancy in the entirety, which means that the property is owned jointly by the married couple as a single legal entity. This option offers married physicians the ability to protect their home assets in a manner similar to an unlimited homestead exemption, so it is possible that confounding variation in tenancy rules could influence the estimated effects of unlimited homestead exemptions. However, Section OA6 shows that the results are largely unchanged by the inclusion of tenancy-by-the-entirety laws.

In Section OA7, we estimate the impact of states that allow non-recourse versus recourse loans. With a recourse loan, the lender can recover more than the value of the home if the foreclosed home sells for less than the value of the loan. Given the overlap between unlimited-exemption states and recourse loan states, we are concerned that physicians may purchase larger houses because they are better credit risks (more stable incomes or higher Fair Isaac Corporation scores) even after controlling for income, and this credit worthiness manifests itself in recourse states. The specifications include an indicator for which states have recourse loans and that indicator interacted with Physician. The results are similar to those in Table 4.

Finally, Section OA8 examines the impact of exemptions on loan-to-income ratios as a proxy for leverage. A physician worried about losing assets because of a malpractice judgment or settlement in excess of a policy limit can file for bankruptcy, which allows the physician to keep all assets as long as he or she pays disposable income for some period of

time pursuant to a repayment plan. One method of reducing the value of nonexempt assets is to hold higher levels of secured debt, such as a home with little equity. Thus, physicians in low-exemption states should have higher leverage than those in higher-exemption states. Although we lack the data to estimate leverage in the ACS, we do find that physicians in low-exemption states have higher debt-to-income ratios.

6. CONCLUSION

The majority of physicians maintain substantial insurance coverage against malpractice liability risk, and in only a small fraction of paid malpractice claims is the typical policy limit of a physician exceeded. This fact, combined with annual rates of paid malpractice claims of approximately 2 per 100 physician-years (Jena et al. 2011), has been used to suggest that the cost of malpractice to physicians is primarily indirect or nonfinancial, such as time and hassle, reputational costs, or anxiety. Over a career, however, the risk of losing at least one malpractice suit is substantial: 71 percent in high-risk specialties and 19 percent in low-risk specialties (Jena et al. 2011). The lifetime risk to physicians of being involved in a suit that would be large enough to place personal financial assets at risk is therefore nonnegligible.

Given this, we tested whether physicians take steps to self-insure against uninsured malpractice risk by manipulating their asset allocation. We compared the home valuations of physicians with nonphysicians in states with unlimited and limited homestead exemptions, holding income, age, marital status, family size, and other variables that would be expected to influence home investment constant. With this model, we find that physicians who reside in states with unlimited homestead exemptions invest approximately 13 percent more in the value of their homes. The effects are largest in states where uninsured malpractice liability risk is the highest, which confirms that physicians' response to unlimited homestead exemptions is driven by perceived malpractice liability risk. There is no effect of homestead exemptions on other high-earning professionals such as lawyers and engineers, but there are effects among dentists, who also face substantial malpractice liability risk.

These findings suggest that physicians make financially costly decisions to protect themselves against the threat of uninsured malpractice losses. According to our estimates, physicians in unlimited-exemption states pur-

chase about $28,000 worth of expected asset protection, while their expected career risk of excess malpractice liability ranges from $10,000 to $40,000, depending on specialty and other factors. This implies elasticities of .67 to 2.8 in terms of asset protection relative to expected risk. With this wide range we cannot rule out a highly elastic response on the part of physicians. A number of factors could explain this strong response, including comparatively high levels of risk aversion, the possibility that investing in a larger house offers a protective effect that induces settlement in malpractice cases (because the plaintiff has lower potential recovery), or the idea that malpractice fears represent a "dread risk" to which physicians (over)react strongly (Carrier et al. 2010, p. 1585). Regardless, our findings indicate that physicians take costly steps to self-insure and lower the potential financial costs associated with malpractice liability risk. Because self-protection and self-insurance are substitutes, in the sense that engaging in one behavior reduces the incentives to engage in the other, the ability to self-insure could weaken the deterrent effect of liability. Future examinations of the behavioral effects of liability risk should consider whether self-insurance mechanisms exist and if so how they might impact the observed relationships.

As noted above, the policy implications of our findings for both bankruptcy and medical malpractice law depend on what one thinks of the underlying merits and deterrence value of medical malpractice cases. If these cases are largely frivolous and have little deterrent value, then reducing physicians' liability through the ability to protect assets is likely to be efficiency improving. The bankruptcy code often serves as a de facto check on the tort system when large judgments are restructured because they exceed the defendant's ability to pay. All of this suggests that policy makers should consider the role of asset-protection strategies when considering the potential impact of tort reforms.

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