# Defensive Medicine and Physician Asset Protection*

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**Abstract**

Malpractice insurance provides for payments to patients so that a physician need not compensate harmed patients from personal assets. The bankruptcy system also protects a debtor's assets from seizure by creditors. In this paper, we estimate the effect of personal asset protection on physician practice decisions. Variation in bankruptcy law provides exogenous variation in risk to physician personal assets. In preliminary results, we find that malpractice premiums and total charges to patients decrease when bankruptcy exemptions increase with no corresponding change in mortality risk, indicating that increases in exemptions decrease malpractice pressure and the practice of defensive medicine. Our results suggest an imperfect substitutability between malpractice insurance, bankruptcy exemptions, and the insurance against lawsuits provided by defensive medicine.

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# 1 Introduction

In a seminal contribution, Kessler and McClellan (1996) show that the medical malpractice liability system impacts physician practice decisions. Defensive medicine, or medical decisions made to protect physicians from lawsuits rather than to benefit patients, increases medical costs without improving health outcomes. Kessler and McClellan (1996) estimate the effect of tort reforms on practice decisions, finding that reductions in liability costs for physicians lead to less defensive medicine and lower costs. Currie and MacLeod (2008) consider a variety of other legal liability reforms, finding a decrease in defensive medicine from joint and several liability reforms that result in doctors being more likely to be sued directly by injured patients and an increase in procedure use from tort reforms that limit damages payable to patients.

Papers examining defensive medicine and physician malpractice liability have generally argued that physicians "face little financial risk from malpractice claims" (Currie and MacLeod, 2008, p. 799). Silver et al. (2008) show that many malpractice judgments are for amounts just under the limit of a physician's insurance for a single claim. There is also agreement that the indirect costs to a physician of defending against malpractice suits, including lost time and energy, can be significant (OTA, 1993). Seabury et al. (2013) show that physicians can spend up to 11% of their careers with an open, unresolved malpractice claim, while Jena et al. (2011) show that 55% of physicians in internal medicine, 80% of general surgeons, and 74% of obstetricians/gynecologists face a malpractice claim at least once by age 45. Involvement in a malpractice case can produce lasting harm to a physician's career through the National Practitioners' Data Bank, a searchable database that includes records of any payments made in response to malpractice suits.[1]

[1]The National Practitioners' Data Bank (NPDB) maintains records of any payments made by or on behalf of a physician settling a malpractice claim and can be referenced by future employers, state licensing boards, or lawyers for plaintiffs. See `http://www.npdb-hipdb.hrsa.gov/topNavigation/aboutUs.jsp` for more details. The harm of being listed in the NPDB is evidenced by employers of physicians offering to pay malpractice settlements under the condition that the physician be dropped from the lawsuit. This "corporate shield" results in approximately 20% of all malpractice payments going unreported in the NPDB (Chandra et al., 2005).

However, there is empirical evidence that physicians' personal assets are not always protected from malpractice claims. The Harvard Medical Practice Study shows that approximately 6-9% of physicians facing a malpractice claim pay out of pocket costs, including judgment and legal defense costs, while over 85% report lost income from time spent contributing to legal defense. The study concludes that "monetary sanctions are real" for physicians (Lawthers et al., 1992, p. 476). Lawthers et al. (1992) also show that physicians' subjective estimates of the probability of being sued are three times greater than the actual probability of being sued across all cases and more than *thirty* times greater in cases involving injury due to physician negligence, a disparity also found in Jena et al. (2011).[2] The low probability of an injured patient filing a lawsuit implies that there may be many injured patients who have not yet filed suit against a physician but might at any time, resulting in a highly unpredictable number of claims in a given year that could exhaust a physician's malpractice insurance. Studdert et al. (2004, p. 285) discuss how a "huge reservoir of injuries" has led to yearly variance in the number of malpractice lawsuits since the 1960s. Thus, physicians may perceive a large threat to their personal assets from malpractice litigation, leading to a behavioral response when this threat is increased or reduced.

We analyze the effects of changes in the level of personal asset protection for physicians on medical practice. To determine the extent to which a physician's personal assets are beyond the reach of plaintiff's lawyers, we consider the asset protections available through the bankruptcy system. A primary benefit of filing for bankruptcy is receiving a discharge of debts, a legal ruling that prevents creditors from collecting on those debts so that the debtor need not pay them back. The Supreme Court's ruling in the 1998 case of *Kawaauhau v. Geiger* established that physician debts from malpractice cases are eligible for a discharge in bankruptcy. Both Chapter 7 and Chapter 13 personal bankruptcy offer debtors the opportunity to discharge debts while retaining some assets. These assets must have value lower than predetermined exemption levels. The value of property that may be held exempt

[2]Physicians estimated the probability of a lawsuit being filed at 60%, while the actual likelihood is under 2% (Localio et al., 1991).

from creditors is determined by each state, and exemption levels vary both across states and over time. The purpose of exemptions is to assist a debtor's fresh start after bankruptcy, so exemption levels are a good measure of the amount of insurance the bankruptcy system offers against negative wealth shocks.

We first show that changes in bankruptcy exemptions affect the malpractice insurance market, establishing the first link between personal asset protection and malpractice concerns. We draw intuition from a simple model of demand and supply of malpractice insurance. Since both malpractice insurance and bankruptcy exemptions protect a physician's personal assets in case of a lawsuit, these goods are likely substitutes. We expect that when states increase bankruptcy exemption levels and thereby provide physicians with more insurance against lawsuits, physicians will have lower demand for malpractice insurance. This model has the testable implication that the price of malpractice insurance should fall when bankruptcy exemptions rise.

We then turn to whether changes in personal asset protection lead to changes in medical practice. A large bankruptcy exemption can reduce the probability of an injured patient filing a lawsuit by reducing the amount that the physician would pay after judgment. This is similar to the effect of a tort reform that limits the damages that may be collected, with the important difference that changes in bankruptcy exemptions immediately affect payouts in all possible malpractice cases against a physician, not only those where the injury occurs after the law change. Currie and MacLeod (2008) note that the time between an injury to a patient and the payment of a settlement is around six years, confounding empirical work on the effect of tort reforms on physician behavior due to uncertainty in the lag structure of the effects. The immediate effect of changes in bankruptcy laws allows us to be more confident in the causal interpretation of our findings. Similar to Kessler and McClellan (1996), we find that increased exemption levels lead to reductions in total charges for hospitalized patients with heart attacks with minimal impact on mortality. We interpret this result as evidence of a decrease in defensive medicine when physicians have more wealth insurance

from the bankruptcy system. However, we also find an increase in procedure utilization rates for Medicare patients, suggesting that physicians respond on several margins to changes in liability pressure. This paper is the first to show that changes in physician personal asset protections affect the practice of medicine through the malpractice system.

# 2 Background

## 2.1 Dischargeability of Malpractice Debts

Bankruptcy law prohibits the discharge of debts that are a result of "willful and malicious injury" by the debtor.[3] The first case to test the meaning of this phrase came shortly after the passage of the Bankruptcy Act of 1898. In 1904, the Supreme Court ruled in *Tinker v. Colwell* that a "willful disregard of what one knows to be his duty, an act . . . wrongful in and of itself, and which necessarily causes injury and is done intentionally" met the standard to be nondischargeable in bankruptcy.[4] Under the *Tinker* standard, a physician could not discharge malpractice debts if the resulting injury was considered a likely consequence of the physician's actions or caused by negligence.

*Tinker* was a key precedent in bankruptcy law until the Bankruptcy Reform Act of 1978 (BRA78), in which Congress declared that the word "willful" must mean "deliberate or intentional," overruling *Tinker* and making it easier for debts incurred for harms caused by negligence to be discharged.[5] After BRA78, federal Courts of Appeals divided over the proper interpretation of the new law. The First, Second, Fifth, Sixth, Ninth, and Tenth Circuits ruled debts arising from negligent behavior nondischargeable in bankruptcy. However, the Third and Eleventh Circuits adopted a stricter standard, requiring that in order for a

[3] 11 U.S.C. §523(a)(6), 2005

[4] *Tinker v. Colwell*, 193 U.S. 473 (1904), p. 487

[5] House Report 95-595 (1978): "Paragraph (6) excepts debts for willful and malicious injury by the debtor to another person. Under this paragraph, 'willful' means deliberate or intentional. To the extent that *Tinker v. Colwell* [citation deleted] held that a looser standard is intended, and to the extent that other cases have relied on *Tinker* to apply a 'reckless disregard' standard, they are overruled."

debt to be nondischargeable, a reasonable person should have been able to predict that the action would cause harm.[6] In 1998, the Supreme Court resolved the conflicting rulings in *Kawaauhau v. Geiger*, a case surrounding a physician using bankruptcy to discharge a medical malpractice debt. A unanimous Supreme Court upheld the Eighth Circuit's ruling that "debts arising from recklessly or negligently inflicted injuries" are dischargeable in bankruptcy and only "acts done with the actual intent to cause injury" are nondischargeable.[7] As such, any medical malpractice debt where the injured patient cannot show that the physician intended to cause harm is dischargeable in bankruptcy. We use the pre-*Geiger* differences in federal appeals court rulings to test the relationship between bankruptcy exemption levels and physician practice decisions.

## 2.2 Bankruptcy and Exemptions

Chapter 7 and Chapter 13 are the two primary types of personal bankruptcy. Chapter 7 offers debtors a complete discharge of debts, but all assets above the available exemption levels can be seized to pay off creditors. Chapter 13 allows debtors to keep more of their assets, but they must agree to a repayment plan to make partial payment of their debts from future income. Only after successfully completing this plan by making payments over several years is a debtor eligible for a discharge of the remaining debt.

Exemptions are available for a wide variety of assets. The homestead exemption, which allows debtors to retain housing equity, is the largest exemption in most states. Other exemptions shield cars, clothing, or tools of trade from creditors, as long as the value of the asset is below a specific dollar amount. Some states use personal property exemptions that allow debtors to choose any property of total value less than the exemption level, rather than offering individual exemptions for different types of assets.

In addition to the changes mentioned above, BRA78 established a national set of bankruptcy

[6] See Hayes (1997) for specific cases and analysis of rulings. Figure 1 shows the geographic boundaries of the federal Courts of Appeals.

[7] *Kawaauhau v. Geiger*, 523 U.S. 57 (1998), p. 61-64.

exemptions. BRA78 permitted states to set their own exemption levels and every state did so by 1987, though some states allow debtors to claim the federal exemptions in lieu of state exemptions. We address issues with the determinants of state exemption levels and the exogeneity of changes in exemption levels in our empirical work below.

In 2005, Congress passed the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA), changing the nature of personal bankruptcy by adding a means test designed to prevent individuals with high incomes from filing for Chapter 7 bankruptcy. However, the means test applies only to individuals "whose debts are primarily consumer debts," suggesting that a physician with malpractice debts that constituted the majority of the individual's overall debt would not be subject to the means test.[8] Thus, BAPCPA did not greatly affect the ability of physicians to use the bankruptcy system to discharge malpractice debts unless their consumer debts are larger in magnitude than their malpractice debts.

# 3 Empirical Model and Data

As a baseline, we estimate the statistical model

$$Y_{ist} = \alpha + \beta \cdot TotalExemption_{st} + \pi \cdot X_{ist} + \mu_t + \eta_s + \zeta_s \cdot Trend + \epsilon_{ist} \tag{1}$$

where $Y$ is our dependent variable of interest measured in county or individual $i$ in state $s$ and year $t$, $TotalExemption$ is the sum of all available exemptions measured in units of \$10,000, $X$ is other control variables, $\mu$ and $\eta$ are year and state fixed effects, and $Trend$ is a set of state specific linear trends.

Identification of the effect of the bankruptcy exemption levels comes from variation within states over time. For our research design to produce causal estimates of the effect of changes

[8] 11 U.S.C. §707(b)(1), 2005. For interpretation of the clause, see Wedoff (2005) and *In re Kinnee*, Case No. 06-21356 (Bankr. E.D. Wis, 2006) (unpublished decision available at `http://www.wieb.uscourts.gov/opinions/files/pdfs/In_Re_Kinnee,_06-21356.pdf`). *In re Kinnee* asserts that an individual has primarily consumer debt if more than 50% of the total debt amount is consumer debt.

in bankruptcy exemption levels on malpractice premiums or medical practice decisions, the variation over time in exemption levels must be exogenous. Hynes et al. (2004, p. 31) examine potential determinants of state exemption levels from 1975-96, including the number of doctors per resident and bankruptcy filing rate, and find that the "only robust predictor of exemption levels . . . was historic levels of exemptions." Mahoney (2012) finds that health policy variables, including the share of individuals with health insurance, also do not explain variation in bankruptcy exemptions. Fay et al. (2002, p. 709) argue that exemption levels should be treated as exogenous with respect to bankruptcy filing rates because "states change their exemption levels only rarely - mainly to correct nominal exemption levels for inflation." The claim that inflation adjustments are a factor in exemption changes is supported by historical work in Skeel (2001). This intuition also applies for why exemption levels can be considered exogenous with respect to malpractice premiums or medical practice decisions. Over 1989-2005, there were a total of 112 changes in the nominal total value of state exemption levels for an average of 6.6 changes per year. Since it does not appear that exemption levels are determined by factors related to malpractice premiums, health care provision, or state health care policy, nor jointly through a third factor such as bankruptcy filings per capita, we treat changes in exemption levels as exogenous.

Our data on exemptions comes from Traczynski (2011). We obtain data on state bankruptcy exemption levels from state statutes for the years 1989-2005 and report values in Table 1. The homestead exemption is the amount available in each year, ignoring any restrictions on lot size or location of the homestead. This amount is unlimited in some states. We construct the total nonhome exemption level by adding together all allowable exemptions for cars, personal possessions, tools of trade, bank deposits, and wildcard exemptions. We omit explicit exemption amounts for clothing or household goods, insurance payouts, burial plots, or pensions. These items are not subject to value limits in many states or have specific beneficiary requirements and therefore do not have easily quantifiable changes in their value over time. Gropp et al. (1997) and Berkowitz and Hynes (1999) use a similar definition of

nonhome exemptions. We adjust all exemptions into constant 2007 dollars using the CPI.

In states that allow debtors to choose between using state exemptions and federal exemptions, we assume that individuals choose the set of exemptions with the higher total value (homestead plus nonhome). For states with unlimited homestead exemptions, we assign a nominal value of $500,000 to the homestead exemption, consistent with Berkowitz and Hynes (1999). Our *TotalExemption* measure is the sum of the homestead and nonhome exemptions, which reflects the assumption that debtors can move assets between exemption categories to maximize the value of the exemptions. This pre-bankruptcy planning is generally permitted by bankruptcy judges, though after BAPCPA, such planning must take place earlier relative to the date of filing.[9] As shown in Table 1, the nominal and real values of bankruptcy exemptions are increasing in most states over this period.

We obtain data on malpractice insurance premiums from an annual survey conducted by the Medical Liability Monitor (MLM) from 1991-2012. The MLM conducts an annual state-by-state survey of medical liability insurance carriers comprising approximately 65-75% of the total medical malpractice market to obtain data on premiums for mature claims-made insurance policies with limits of $1 million per claim and $3 million in total coverage per year.[10] The insurance carriers surveyed by the MLM report that policies with these limits are the most commonly purchased policies. The premium data are reported for three physician specialties: internal medicine, general surgery and obstetrics-gynecology. Every company participating in the survey provides rates for each state and sub-state area in which it writes insurance policies. The most common sub-state areas are counties, though several companies report rates for MSAs or regions of the state. In cases where rates for MSAs or regions of

[9]For a discussion of changes made by BAPCPA in laws surrounding transfers, see Gallagher (2011).

[10]Under a claims-made policy, a physician is insured against any claims made during the term of the insurance policy, if the incident occurred anytime after the start of the policy. Tail coverage is needed to cover incidents that are reported after the policy lapses, even if the alleged malpractice occurs while the policy is in effect. In contrast, under a policy written on an occurrence basis, a physician is insured for any incidents that occur during the term of the insurance regardless of when those claims are reported. No tail coverage is needed because incidents that occurred during the policy period are covered no matter how much later they are reported.

the state were provided, we apply those rates to the appropriate counties.[11] We then create county average rates by taking the mean of the reported company rates for that county and convert all premiums into 2007 dollars using the CPI. In some cases, the data contain rates for policies with limits other than $1 million/$3 million or for policies written on an occurrence basis. We examine the sensitivity of our results to the inclusion of these alternative rates in the county averages in our empirical work below.

States with government-run patient compensation funds (PCFs) are also included in the survey. In these states, the required coverage limits usually differ from $1 million/$3 million limits. Physicians can buy a basic coverage with the required limits plus pay a surcharge that varies in size from a modest percentage of the basic coverage premium to more than the cost of the basic coverage. Since premium changes in states with PCFs can sometimes occur due to the legislative changes of required minimum coverage limits, we examine PCF states separately in our empirical work.

We have dropped some observations from the final dataset. First, we explore the sensitivity of our results to dropping observations for policies with limits other than $1 million/$3 million or policies for occurrence coverage because we believe the rates for these policies may be systematically different from the $1 million/$3 million claims-made policies. Second, we drop observations without enough geographic detail to assign the reported rate to a county. Third, we drop reports in which ranges of rates were provided, either territorial or for classes of doctors within a specialty. Finally, we drop premium data for fund non-participants in states with voluntary participation in the PCF, keeping only rates that fund participants face in the PCF state. Additionally, since each report provides data for the current year and for the previous year, we use data from future reports to populate missing values for companies that do not report rates in the current report. We weight our final premium data to account for geographic distribution of physicians in the state using data on the number of non-federal total patient care physicians by county from the 2012-2013 AHRF Access Database based

[11] In the few cases where a company provides two different rates for the same county, we average them.

on the AMA Master File data.[12]

To explore physician treatment choices, we use the Nationwide Inpatient Sample (NIS) from 1998 to 2005. The NIS tracks hospital inpatient stays across most of the U.S., and each year of data represents a 20% sample of U.S. hospitals.[13] NIS data is at a discharge level, reporting specific medical conditions and the total hospital charges along with demographic characteristics. We limit the data to hospital stays where the patient's primary diagnosis is either an acute myocardial infarction (AMI) or ischemic heart disease (IHD). AMI is a more severe heart illness than IHD, and both are caused by the narrowing of arteries and restriction of blood flow around the heart. AMI and IHD are the current leading cause of death worldwide and the leading cause of hospitalizations in the U.S.[14] Kessler and McClellan (1996) study defensive medicine in the treatment of these two diseases among Medicare patients, though our sample includes a wider variety of ages and insurance coverages. Focusing on AMI and IHD allows us to compare our results across diseases of different severity and facilities comparison between our estimated effects of personal asset protection on defensive medicine and the effects of tort reforms found in Kessler and McClellan (1996).

As measures of procedure utilization, we use rates of cesarean section births from Vital Statistics Natality Birth Data Files over the period 1989-2004. Following Yang et al. (2009), we calculate the number of all births that are vaginal births after the mother had a previous cesarean section (VBAC) and the total number of cesarean section births. We then determine the percentage of total births in a county that fit each of these definitions, treating "remainder of state" as a single additional county. We obtain data on rates of usage per 1000 Medicare enrollees for a number of procedures from the Dartmouth Atlas of Health Care at the hospital referral region level for the period 1992-2005. Hospital referral regions are geographic areas defined by where residents most often go for major procedures such as heart or brain surgery. The U.S. is divided into 306 hospital referral regions, making the areas smaller than a state

[12]A couple of years had physician data missing (1991 and 2009). We populate these years by linear interpolation.

[13]As of 2011, 46 states provide data to the NIS.

[14]See Finegold et al. (2013) and AHA (2012).

and larger than a county. In cases where the region runs over state boundaries, we assign the exemption level of the state in which the referred hospital is located. The procedures we use are coronary angiography, coronary artery bypass grafting (CABG), percutaneous coronary intervention, transurethral prostatectomy, radical prostatectomy, and all surgeries. These specific procedures offer physicians some latitude in deciding whether to use them on a given patient and were measures of defensive medicine in Baicker and Chandra (2005). Table 2 presents summary statistics for our data.

# 4 Preliminary Results

## 4.1 Malpractice Premiums

We first look for evidence that higher bankruptcy exemption levels are a substitute for the asset protection offered by malpractice insurance. We use county average malpractice premiums in states without patient compensation funds as the dependent variable in Equation (1) and present results in Table 3 for a panel of counties from 1991-2005. County level regressions are weighted by the number of physicians working in patient care in each county-year.

Our results show a consistently negative effect of exemptions on prices across specialties and across different definitions of the average rate in a county. When including all rates in the county average in column (1), we find that a $10,000 increase in bankruptcy exemption levels leads to a decrease of $101 in the average malpractice premium for physicians practicing internal medicine, a decrease of $407 for general surgeons, and a decrease of $576 for obstetrician-gynecologists. Using all rates may not be appropriate if policies with different limits or occurrence policies have different changes in their premiums in response to an increase in exemptions. We present results that include only prices of claims-made policies or only prices of policies with limits of $1 million/$3 million or both in columns (2), (3), and (4) respectively. None of the estimates under these alternative definitions of the average county rate lie outside the 95% confidence interval of the estimates from column (1), though for

internal medicine, some of the negative effects are statistically indistinguishable from 0 due to imprecise estimates. Overall, the effect of exemptions on malpractice premiums appears to be stable across different measures of the average premium.

Table 4 shows how the changes in exemption levels have impacted the malpractice premiums paid by each of the three physician types over the sample period. The mean total exemption is the physician-weighted average exemption level in each year, ranging from $122,838 in 1991 to $142,976 in 2005. We use the estimates in Table 3 to determine how the changes in exemption levels would affect malpractice premiums in each year. These results show that if a state increased its bankruptcy exemption levels from $122,838 to $142,976, malpractice premiums for physicians in internal medicine would decrease by $204, for general surgeons by $820, and for obstetrician-gynecologists by $1160. In 2005, the physician-weighted mean malpractice premium for these three groups of physicians was $20,317, $69,589, and $100,800, respectively, so the decreases in premiums associated with increases in exemption levels account for 1.01%, 1.18%, and 1.15% of the mean for each group.

To further establish the causal relationship between increases in exemption levels and decreases in malpractice premiums, we now turn to the question of that channel through which exemption levels affect malpractice premiums. The history of differing federal Court of Appeals rulings on the dischargeability of malpractice debts in bankruptcy provides a test of whether dischargeability is the channel through which exemptions affect malpractice premiums. Using the analysis of rulings in Hayes (1997), we categorize Courts of Appeals as having a "strict" reading of the "willful and malicious injury" clause, which would permit discharging medical malpractice debts due to negligence, or a "loose" reading, which does not permit discharging debts due to negligence. This categorization is based on rulings made prior to the 1998 Supreme Court ruling in the *Geiger* case. We consider the First, Second, Fifth, Sixth, Ninth, and Tenth Circuits to adopt a loose reading, while the Third, Eighth, and Eleventh Circuits adopt a strict reading.[15] Since the Supreme Court's ruling in

[15]We discard states in the Fourth, Seventh, and DC Circuits in this analysis as there are few changes in bankruptcy exemption levels in the states without patient compensation funds in these Circuits, leading to

*Geiger* forced all Circuits to use a strict interpretation of the clause after 1998, we expect that the relationship between exemption levels and malpractice premiums in Circuits with strict interpretations will change less after 1998 than in Circuits with a loose interpretation. We also expect that the relationship between exemptions and malpractice premiums will be weaker pre-*Geiger* in Circuits with loose interpretations than in Circuits with strict interpretations.

We modify Equation (1) to include interaction terms between the bankruptcy exemption level in a state, the strict or loose interpretation variable, and a dummy for the years after the 1998 *Geiger* decision.[16] We present results in Table 5 using all available rates in the county averages. We find that for all three types of physicians, malpractice premiums in counties that lie within strict Circuits decrease when exemption levels increase, while in loose Circuits the effect of bankruptcy exemptions on malpractice premiums has uniformly smaller point estimates that are not statistically significantly different from 0. For all three types of physicians, the difference between the effect of exemptions in strict Circuits and loose Circuits is statistically significant pre-*Geiger*. After 1998, both general surgeons and obstetrician-gynecologists have a significantly more negative relationship between exemption levels and malpractice premiums in loose Circuits, consistent with the *Geiger* ruling representing a change in the existing law in these areas. All three physician types show a larger effect of the Geiger ruling in loose Circuits than strict Circuits as the point estimates on the post-1998 interaction terms are larger, though the difference between loose and strict Circuits in the post-1998 change is only statistically significant for obstetrician-gynecologists. For obstetrician-gynecologists, there is also no statistically significant difference in the relationship between exemption levels and malpractice premiums in strict and loose Circuits after the *Geiger* ruling. We consider these findings to be evidence that the dischargeability of

very imprecise estimates of the effect of exemption levels on malpractice premiums in these Circuits. Inclusion of these Circuits does not move the point estimates of the effects of changes in bankruptcy exemption levels on malpractice premiums outside the 95% confidence intervals reported in Table 5.

[16]Note that we do not include a dummy for being in a strict or loose Circuit or a dummy for post-1998, as these effects are already accounted for with state and year fixed effects.

malpractice debts drives the observed negative relationship between bankruptcy exemptions and malpractice premiums.

## 4.2 Defensive Medicine: Hospitalization Charges

We now turn to the question of whether physicians change their medical practice in response to changes in bankruptcy exemption levels. We first look for impacts on the intensive margin of care by examining whether physicians change the way in which a hospitalized patient with heart disease is treated. We follow the approach of Kessler and McClellan (1996) by using the log of total charges incurred during a hospitalization and a dummy variable for whether the individual dies during the hospitalization as dependent variables in Equation (1) and we present results in Table 6. Regressions are weighted using the appropriate NIS sample weights for each variable.

Columns (1)-(4) show that the total charges incurred during each hospitalization for AMI or IHD falls when bankruptcy exemption levels increase. The estimates from columns (1) and (2) indicate that for every $10,000 increase in exemption levels, the charges for an AMI hospitalization fall by 0.64% and the charges for an IHD hospitalization fall by 0.74%. In our sample, the average cost for an AMI or IHD hospitalization is $34,745 or $28,984, respectively, so our estimates imply respective decreases of $222 or $214 in total charges per visit. We obtain similar results when we use the actual total charges instead of the log of total charges, as shown in columns (3) and (4). The larger percentage decrease in procedure costs for IHD is consistent with the notion of defensive medicine, as the lower severity of the condition allows physicians more leeway in how best to treat it. Patients with milder symptoms may leave physicians with more judgment calls to make about which treatments to administer, leading to a greater responsiveness of treatment choices to incentives. This finding is consistent with Kessler and McClellan (1996), who also find a greater percentage decrease in charges related to IHD than AMI patients in response to tort reforms that directly limit the amount of money recoverable by the patient.

Columns (5) and (6) show that the effects of this decreased spending on mortality are both statistically and economically insignificant. The average AMI patient experiences a decrease in the probability of death by 0.012 percentage points when bankruptcy exemptions increase, while IHD patients have a 0.0096 percentage point decline. We can rule out with 95% certainty increases in mortality larger than 0.020 percentage points for AMI patients and larger than 0.029 percentage points for IHD patients.

Combining the results on charges and probability of mortality allows us to estimate the marginal hospital expenditures to prevent a patient from dying while hospitalized. Using the upper end of the 95% confidence interval for the mortality estimates to generate conservative estimates, we find that over $1.1 million is spent to avert one AMI patient death while hospitalized.[17] As we do not have data on individual health outcomes after discharge from the hospital, we cannot estimate mortality rates for AMI patients at a longer horizon. Still, as the average age of an AMI patient is 68 in our sample, such expenditure is likely highly excessive relative to the statistical value of life and indicative of the practice of defensive medicine.

Since our results indicate that increases in bankruptcy exemptions have qualitatively similar effects on medical practice as tort reforms that lower payouts in malpractice cases, we can determine the size of the exemption increase necessary to equal the treatment effect of a tort reform. Using the estimate of a 5.3% decrease in expenditures for a damage cap tort reform from Kessler and McClellan (1996), we estimate that an increase in bankruptcy exemptions of approximately $83,000 would have a quantitatively similar impact on medical expenditures.[18] Table 1 shows that over 1989-2005, the states of Arizona, Connecticut, D.C., Massachusetts, Nevada, New Hampshire, and Rhode Island all increased their exemption levels by approximately this amount or more, while Minnesota decreased its exemption level

[17] Dividing the average reduction in total charges for an AMI patient in response to a $10,000 increase in exemption levels by the increased probability of mortality yields $^{(0.0064*34,745)}/_{0.0002} \approx 1,110,000$.

[18] Dividing the estimated treatment effect of the tort reform by the estimated treatment effect of a $10,000 increase in exemptions yields $^{0.053}/_{0.0064} \approx 8.3$, which represents an $83,000 exemption level increase. See Kessler and McClellan (1996) for more information on the coding and definition of such tort reforms.

a large amount. Changes in exemption levels that generate effects on medical practice that are on par with those created by tort reforms are thus not uncommon in practice.

### 4.3 Defensive Medicine: Procedure Utilization Rates

We now explore an alternative margin of defensive medicine, where physicians may choose to use more treatments on a patient because the probability of lawsuit from each treatment is lower and increasing the services consumed by the patient leads to greater revenue for the physician. Our previous results show that the costs of treating a particular condition fall when exemptions rise and malpractice pressure falls. However, physicians may perform more overall procedures by working on marginal patients. We look for evidence of this in the Natality Files and Dartmouth Health Atlas data.

We use county level rates of VBAC and total cesarean births as a share of total births as the dependent variable in Equations (1) and present results in columns (1) and (2) of Table 6. Regressions are weighted by the number of births in the county. Both of these regressions show no statistically or economically significant impact of changes in exemption levels on rates of cesarean births, as the point estimates and the standard errors are both small. The results from column (2) allow us to rule out effects larger than a 0.0787% change in the percentage of total births that occur via cesarean section with 95% confidence. Thus, it appears that cesarean section rates are not responsive to changes in bankruptcy exemption levels.

Columns (3)-(8) show regressions using procedure usage rates per 1000 Medicare enrollees. These results show a general increase in the use of these defensive procedures, as all point estimates are positive and a few are statistically significantly different from 0. Most notably, the total number of surgeries appears to rise when exemptions increase. The sign of these coefficients is theoretically ambiguous, depending on whether physicians decrease the use of defensive medicine as it is less necessary when there is more asset protection or whether physicians use the additional protection to incur more risk by performing more

procedures. The net effect we estimate is positive, suggesting that more marginal patients receive surgeries when physicians are less concerned about any resulting lawsuits.

# 5 Conclusion

This paper is the first to show that changes in the protection of a physician's personal assets against malpractice suits can change the malpractice environment and alter practice decisions, particularly by substituting for the use of defensive medicine. Our preliminary results indicate that increases in bankruptcy exemption levels result in decreases in malpractice premiums for physicians, suggesting that the asset protection offered by bankruptcy is a substitute for the asset protection offered by malpractice insurance. The fall in premiums is consistent with a decrease in the demand for malpractice insurance caused by the increase in exemptions. We find evidence of a decrease in total hospital charges for patients with heart conditions when asset protection rises without a proportional change in mortality rates. We also find that procedure utilization increases when exemptions rise, with physicians working on more marginal patients due to less fear of a potential lawsuit. This suggests that physicians reduce their use of defensive medicine procedures when the bankruptcy system offers additional wealth insurance. We show that the effects of increases in bankruptcy exemptions on the practice of defensive medicine are both qualitatively and quantitatively similar to those of tort reforms that limit payouts to patients.

Together, these results indicate an imperfect substitutability of risk protection from malpractice insurance, defensive medicine, and bankruptcy exemptions. If physicians were able to adjust the level of malpractice insurance they have continuously, then any increase in exemption levels could be exactly offset by a decrease in malpractice insurance to keep a physician at an optimal level of asset protection. In this case, we would not expect to see any impact of exemption levels on the practice of medicine. However, since malpractice policies are generally purchased at preset limits and the magnitude of changes in exemption levels

can vary greatly across states and over time, physicians will not be able to control precisely their level of asset protection, and exogenous changes such as those from rising bankruptcy exemptions may affect physician decision making. A similar argument applies to defensive medicine, as physicians order fewer tests with negligible health benefits for the patient to protect themselves against potential lawsuits when exemptions increase. Our preliminary results suggest this scenario has been occurring in the U.S. over the past 20 years.

In future work, we plan to refine and extend our current results. We will improve our measure of county average malpractice premiums by weighting the available premiums by the statewide malpractice market shares of the insurance companies. We are also expanding our data on defensive medicine to examine additional conditions. Currie and MacLeod (2008) argue that C-sections are a procedure often used defensively and affected by tort reforms, so this offers another natural area to test the effects of changes in bankruptcy exemptions on physician behavior and hospital charges. As argued above, our panel of bankruptcy exemption levels can also be expanded to cover the years after the 2005 BAPCPA reform, which will allow us to incorporate more recent data into our analysis. Using data past 2005 will also allow us to use information on the severity of heart attacks as a further test our defensive medicine results. Different types of AMIs have different treatment guidelines, and ICD-9 codes reflect these different types of AMIs after 2005. STEMI heart attacks have strict professional guidelines for treatment that leave little room for physicians to deviate from the recommended procedures, while guidelines for NSTEMI heart attacks explicitly allow for physician and patient preferences to guide treatment. The difference in latitude given to physicians in how to treat a patient with each type of heart attack provides a closer comparison for studying defensive medicine decisions than the comparison between AMI and IHD for severity.

We are examining ways to isolate any possible confounding effects from supplier-induced demand for services. Dhankhar et al. (2007) and Currie and MacLeod (2008) find evidence of physicians using different procedures in response to changes in the malpractice environment.

This could confound our results if some physicians respond to the lower risk of a lawsuit by trying to generate more income and ordering more procedures. We plan to use patients in capitated payment health plans to control for this effect, as physicians cannot make additional money through increased procedure use by such patients.

Finally, we would like to include state tort reform and joint and several liability reform measures from Currie and MacLeod (2008) to study the effects of bankruptcy exemptions in the context of different legal regimes. This will not only allow us to create a more direct comparison of the magnitudes of the two effects, but also allow us to determine if changes in bankruptcy exemptions have a differential impact on medical practice when the state does or does not offer physicians alternative protections in the form of restrictions on patient lawsuits.

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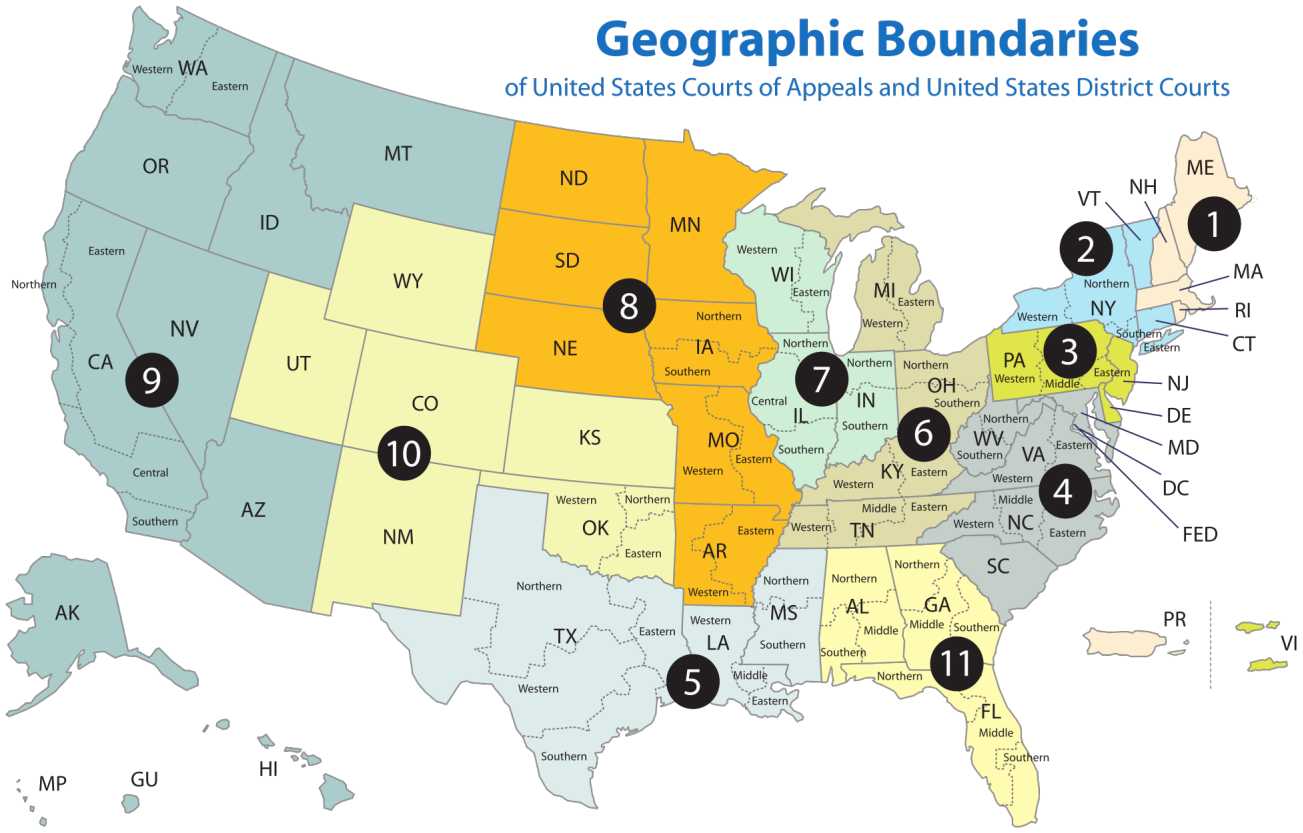
Figure 1: U.S. Courts of Appeals and District Courts




Note: Figure from Federal Bar Association, http://www.fedbar.org/Public-Messaging/About-US-Federal-Courts_1.aspx. Number of federal Court of Appeals given in black circle.

Table 1: Bankruptcy Exemptions by State

| | 1989 | | 2005 | | |
|---|---|---|---|---|---|
| State | Homestead | Nonhome | Homestead | Nonhome | Federal Exem. |
| Alabama | 5000 | 3000 | 5000 | 3000 | No |
| Alaska | 54000 | 5800 | 67500 | 9000 | No |
| Arizona | 50000 | 4150 | 150000 | 7650 | No |
| Arkansas | unlimited | 2150 | unlimited | 2150 | Yes |
| California | 30000 | 3700 | 50000 | 8375 | No |
| Colorado | 20000 | 2800 | 45000 | 13600 | No |
| Connecticut | 0 | 1500 | 75000 | 2500 | Yes |
| Delaware | 0 | 5000 | 0 | 5000 | No |
| District of Columbia | 0 | 1050 | unlimited | 5400 | Yes |
| Florida | unlimited | 1000 | unlimited | 2000 | No |
| Georgia | 5000 | 1900 | 10000 | 5600 | No |
| Hawaii | 20000 | 1000 | 20000 | 2575 | Yes |
| Idaho | 25000 | 1500 | 50000 | 5300 | No |
| Illinois | 7500 | 3950 | 7500 | 3950 | No |
| Indiana | 7500 | 2500 | 7500 | 2500 | No |
| Iowa | unlimited | 15100 | unlimited | 15600 | No |
| Kansas | unlimited | 27500 | unlimited | 27500 | No |
| Kentucky | 5000 | 3800 | 5000 | 3800 | No |
| Louisiana | 15000 | 0 | 25000 | 7500 | No |
| Maine | 7500 | 2600 | 35000 | 10400 | No |
| Maryland | 0 | 5500 | 0 | 16000 | No |
| Massachusetts | 100000 | 2800 | 500000 | 2300 | Yes |
| Michigan | 3500 | 1000 | 3500 | 1000 | Yes |
| Minnesota | unlimited | 7000 | 200000 | 13300 | Yes |
| Mississippi | 30000 | 10000 | 75000 | 10000 | No |
| Missouri | 8000 | 2900 | 15000 | 6600 | No |
| Montana | 40000 | 4700 | 100000 | 6000 | No |
| Nebraska | 10000 | 1500 | 12500 | 2400 | No |
| Nevada | 90000 | 5500 | 200000 | 19500 | No |
| New Hampshire | 5000 | 2600 | 100000 | 10400 | Yes |
| New Jersey | 0 | 1000 | 0 | 1000 | Yes |
| New Mexico | 20000 | 6000 | 30000 | 6000 | Yes |
| New York | 10000 | 3000 | 10000 | 3600 | No |
| North Carolina | 7500 | 1500 | 10000 | 2750 | No |
| North Dakota | 80000 | 3700 | 80000 | 3700 | No |
| Ohio | 5000 | 2550 | 5000 | 2550 | No |
| Oklahoma | unlimited | 8000 | unlimited | 8000 | No |
| Oregon | 15000 | 7350 | 25000 | 12600 | No |
| Pennsylvania | 0 | 300 | 0 | 300 | Yes |
| Rhode Island | 0 | 550 | 200000 | 11250 | Yes |
| South Carolina | 5000 | 1950 | 5000 | 1950 | No |
| South Dakota | unlimited | 2000 | unlimited | 4000 | No |
| Tennessee | 5000 | 4750 | 5000 | 5900 | No |
| Texas | unlimited | 15000 | unlimited | 30000 | Yes |
| Utah | 8000 | 3000 | 20000 | 6000 | No |
| Vermont | 30000 | 8600 | 75000 | 8600 | Yes |
| Virginia | 5000 | 0 | 5000 | 12000 | No |
| Washington | 30000 | 4700 | 40000 | 9500 | Yes |
| West Virginia | 7500 | 2350 | 25000 | 4700 | No |
| Wisconsin | 40000 | 1000 | 40000 | 9700 | Yes |
| Wyoming | 10000 | 2000 | 10000 | 4400 | No |
| Federal | 7500 | 2350 | 18450 | 5775 | — |

Exemption amounts from state statutes and Elias et al. (2005) and previous editions. Federal Exem. indicates whether a state allows its residents to choose to use the federal exemption levels in place of the state levels.

Table 2: Summary Statistics

| Variable | Obs. | Mean | Std. Dev. |
|---|---|---|---|
| **Premium Data (Medical Liability Monitor), 1991-2005** | | | |
| Premium: Internal Medicine | 35,396 | 14,197.32 | 8,743.28 |
| Premium: General Surgery | 35,492 | 47,469.19 | 27,698.21 |
| Premium: Obstetrician-Gynecologist | 35,492 | 76,832.43 | 39,163.38 |
| Total Exemptions ($10,000) | 36,330 | 12.63 | 18.32 |
| **Hospitalization Data (National Inpatient Sample), 1998-2005** | | | |
| Age | 3,266,763 | 66.50 | 13.18 |
| Female | 3,266,416 | 0.401 | 0.490 |
| Primary Diagnosis: AMI | 3,266,931 | 0.367 | 0.482 |
| Primary Diagnosis: IHD | 3,266,931 | 0.633 | 0.482 |
| Primary Payer: Medicare | 3,258,938 | 0.563 | 0.496 |
| Primary Payer: Medicaid | 3,258,938 | 0.052 | 0.222 |
| Primary Payer: Private insurance | 3,258,938 | 0.324 | 0.468 |
| Black | 3,266,931 | 0.060 | 0.237 |
| Hispanic | 3,266,931 | 0.049 | 0.215 |
| Asian | 3,266,931 | 0.012 | 0.111 |
| Hospital Bedsize: Medium | 3,266,931 | 0.238 | 0.426 |
| Hospital Bedsize: Large | 3,266,931 | 0.670 | 0.470 |
| Hospital Location: Urban | 3,265,712 | 0.874 | 0.331 |
| Teaching Hospital | 3,265,712 | 0.479 | 0.500 |
| Total Charges | 3,187,196 | 31,092.30 | 39,318.13 |
| Mortality | 2,871,392 | 0.038 | 0.192 |
| **Medicaid Utilization Rates (Natality Files and Dartmouth Health Atlas), 1989-2004 and 1992-2005** | | | |
| VBAC/Total Births | 8012 | 0.21 | 0.09 |
| Total Cesareans/Total Births | 8019 | 0.23 | 0.04 |
| Coronary Angiography | 4284 | 20.14 | 5.45 |
| CABG | 4284 | 5.67 | 1.30 |
| Percutaneous Coronary Intervention | 4284 | 8.49 | 3.48 |
| Transurethral Prostatectomy | 4284 | 7.75 | 3.18 |
| Radical Prostatectomy | 850 | 1.32 | 0.54 |
| All Surgeries | 4284 | 99.03 | 9.84 |

Data are real prices and exemptions from 1991-2005 measured in 2007 dollars. Premium and exemption statistics are from county averages weighted by number of physicians working in patient care in the county. Data on malpractice premiums from Medical Liability Monitor. Premiums include all policies reported in states without a patient compensation fund. Data on hospitalizations for AMI and IHD from National Inpatient Sample. Mortality variable excludes individuals who transfer between hosptials. Data on vaginal births after cesarean section and total cesarean section rates from Natality Files, 1989-2004. Summary statistics presented are for county averages, weighted by number of childbirths in a county. Data on medical procedure rates from Dartmouth Atlas of Health Care, 1992-2005. All procedure rates reflect the number of the given type of procedure performed per 1000 Medicare enrollees. Summary statistics are hospital referral region averages, weighted by the number of Medicare enrollees in each region.

Table 3: Effect of Exemptions on Malpractice Premiums

| Premium: | (1) All rates | (2) Claims-made only | (3) 1M/3M only | (4) Claims-made, 1M/3M only |
|---|---|---|---|---|
| Internal Medicine | -101.4** | -101.6 | -99.01** | -92.62 |
| | (39.53) | (61.17) | (45.67) | (69.69) |
| Obs. | 35,396 | 34,477 | 34,262 | 34,103 |
| $R^2$ | 0.782 | 0.779 | 0.777 | 0.776 |
| General Surgery | -407.2** | -518.8** | -374.2* | -486.0* |
| | (158.7) | (249.2) | (188.7) | (284.7) |
| Obs. | 35,492 | 34,573 | 34,358 | 34,199 |
| $R^2$ | 0.752 | 0.747 | 0.747 | 0.745 |
| Ob-Gyn | -576.0*** | -724.5** | -503.7** | -578.7* |
| | (200.4) | (336.8) | (204.4) | (325.2) |
| Obs. | 35,492 | 34,573 | 34,358 | 34,199 |
| $R^2$ | 0.748 | 0.744 | 0.741 | 0.739 |

*, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively. Observations are county-years. Standard errors in parentheses. All standard errors are Huber-White robust estimates, clustered at the state level. Each cell represents the coefficient on bankruptcy exemptions from the regression described in Equation (1) with dependent variable of the county average malpractice premium rate described by the row and column. Sample from 1991-2005. Regressions include state and year fixed effects and state linear time trends as controls. "Claims-made only" includes only rates reported for claims-made policies in the county average, "1M/3M only" includes only rates reported for policies with limits of $1 million per event / $3 million per year in the county average, and "Claims-made, 1M/3M only" includes only rates reported for claims-made policies with limits of $1 million per event / $3 million per year in the county average. All regressions weighted by the number of physicians in patient care in each county-year observation.

Table 4: Malpractice Premium Decreases

| | | Total Effect on Premiums | | |
|---|---|---|---|---|
| Year | Mean Total Exemption | Internal Medicine | General Surgery | Ob-Gyn |
| 1991 | $122,838 | — | — | — |
| 1992 | $122,066 | 7.83 | 31.44 | 44.47 |
| 1993 | $122,530 | 3.12 | 12.54 | 17.74 |
| 1994 | $122,320 | 5.25 | 21.09 | 29.84 |
| 1995 | $125,207 | -24.02 | -96.47 | -136.45 |
| 1996 | $121,161 | 17.00 | 68.29 | 96.60 |
| 1997 | $120,808 | 20.58 | 82.66 | 116.93 |
| 1998 | $121,314 | 15.45 | 62.06 | 87.78 |
| 1999 | $121,228 | 16.33 | 65.56 | 92.74 |
| 2000 | $120,118 | 27.58 | 110.76 | 156.67 |
| 2001 | $123,594 | -7.67 | -30.78 | -43.55 |
| 2002 | $133,689 | -110.03 | -441.85 | -625.02 |
| 2003 | $134,264 | -115.86 | -465.27 | -658.14 |
| 2004 | $133,956 | -112.74 | -452.72 | -640.40 |
| 2005 | $142,976 | -204.20 | -820.02 | -1159.95 |

Table 5: Effect of Exemptions on Malpractice Premiums by Prior Circuit Ruling

| | (1) | (2) | (3) |
|---|---|---|---|
| Premium: | Internal Medicine | General Surgery | Ob-Gyn |
| Total Exemption x Strict | -196.7*** | -791.4*** | -900.4*** |
| | (43.11) | (229.1) | (254.0) |
| Total Exemption x Strict x After 1998 | -9.518 | -123.1 | -73.05 |
| | (15.70) | (83.33) | (71.44) |
| Total Exemption x Loose | -63.76 | -187.9 | -300.6 |
| | (41.73) | (169.1) | (270.6) |
| Total Exemption x Loose x After 1998 | -13.98 | -226.8*** | -322.9*** |
| | (17.35) | (23.91) | (59.68) |
| Obs. | 29,409 | 29,505 | 29,505 |
| F-test, Equality of 1998 Effect | 0.816 | 0.196 | 0.000625 |
| F-test, Total Effect Post-1998 | 0.000148 | 0.00771 | 0.182 |
| $R^2$ | 0.767 | 0.742 | 0.745 |

*, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively. Observations are county-years. Standard errors in parentheses. All standard errors are Huber-White robust estimates, clustered at the state level. County average premiums include all reported rates. Sample from 1991-2005. Regressions include state and year fixed effects and state linear time trends as controls. Sample restricted to states in under federal Courts of Appeals that made a ruling affecting the dischargeability of debts under the "willful and malicious injury" clause prior to 1998. "Strict" denotes counties in the Third, Eighth, and Eleventh Circuits, while "Loose" denotes counties in the First, Second, Fifth, Sixth, Ninth, and Tenth Circuits. All regressions weighted by the number of physicians in patient care in each county-year observation. F-test rows report p-values of an F-test for equality of coefficients. "Equality of 1998 Effect" tests whether the coefficients on the Total Exemption x (Strict/Loose) x After 1998 are equal, while "Total Effect Post-1998" tests whether the sum of coefficients on the Total Exemption x Strict + Total Exemption x Strict x After 1998 terms is equal to the sum of the coefficients on the Total Exemption x Loose + Total Exemption x Loose x After 1998 terms.

Table 6: Exemption Levels and Defensive Medicine: Hospitalization Charges

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Dependent Variable: | ln(Charges) | ln(Charges) | Charges | Charges | Mortality | Mortality |
| Total Exemption | -0.00641*** | -0.00742*** | -487.77*** | -392.01*** | -0.000123 | -0.000096 |
| | (0.00169) | (0.00196) | (98.48) | (79.93) | (0.000166) | (0.000197) |
| Obs. | 836,587 | 1,440,743 | 836,587 | 1,440,743 | 718,258 | 1,350,613 |
| Disease | AMI | IHD | AMI | IHD | AMI | IHD |
| $R^2$ | 0.314 | 0.347 | 0.156 | 0.170 | 0.040 | 0.004 |

*, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively. Observations are hospital discharges from NIS data, 1998-2005. Standard errors in parentheses. All standard errors are Huber-White robust estimates, clustered at the state level. Regressions include state and year fixed effects, state linear time trends, and controls for age, gender, number of hospital beds, hospital urban/rural and teaching status, patient race, admission source, and insurance type. "Charges" denotes the log of total charges incurred before discharge, "Mortality" denotes the probability that the patient died while hospitalized. All regressions weighted using provided weights.

Table 7: Exemption Levels and Defensive Medicine: Procedure Utilization Rates

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Procedure: | VBAC | Total C-Sec. | Angiography | CABG | PCI | TP | RP | All Surgeries |
| Total Exemption | -0.000536 | 0.000107 | 0.0240 | 0.00835 | 0.0131** | 0.0129 | 0.00508* | 0.0672** |
| | (0.000858) | (0.000340) | (0.0189) | (0.00606) | (0.00556) | (0.00914) | (0.00302) | (0.0331) |
| Obs. | 8,012 | 8,019 | 4,284 | 4,284 | 4,284 | 4,284 | 850 | 4,284 |
| $R^2$ | 0.688 | 0.643 | 0.621 | 0.562 | 0.683 | 0.813 | 0.516 | 0.629 |

*, **, *** denote statistical significance at the 10%, 5%, and 1% levels respectively. Observations are county-years. Standard errors in parentheses. All standard errors are Huber-White robust estimates, clustered at the state level. Regressions include state and year fixed effects and state linear time trends as controls. Data for columns (1) and (2) from Natality Files 1989-2004. Data from columns (3)-(8) from Dartmouth Atlas of Health Care, 1992-2005. "VBAC" denotes vaginal births after cesarean section as a fraction of all births, "Total C-Sec." denotes all cesarean section births as a fraction of all births, "Angiography" denotes the rate of usage of coronary angiography, "CABG" denotes the rate of usage of coronary artery bypass grafting, "PCI" denotes the rate of usage of percutaneous coronary intervention, "TP" denotes the rate of usage of transurethral prostatectomy and "RP" denotes the usage of radical prostatectomy. Regressions in columns (1) and (2) weighted by number of births in county. Regressions in columns (3)-(8) weighted by number of Medicare enrollees in hospital referral region.