HOSPITALS AS INSURERS OF LAST RESORT*

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Abstract

American hospitals are required to provide emergency medical care to the uninsured. We use previously confidential hospital financial data to study the resulting uncompensated care, medical care for which no payment is received. Using both panel-data methods and case studies, we find that each additional uninsured person costs hospitals approximately $800 each year. Increases in the uninsured population also lower hospital profit margins, suggesting that hospitals do not pass along all uncompensated care costs to other parties such as hospital employees or privately insured patients. A hospital's uncompensated care costs also increase when a neighboring hospital closes.

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1. INTRODUCTION

Over the last decade, roughly 15 percent of Americans had no health insurance at any one time (US Census, 2013). Even after the full implementation of the Affordable Care Act (ACA), approximately 10 percent of the population will remain uninsured (CBO, 2013). Furthermore, many of those who gain coverage may be underinsured, facing large deductibles that exceed their available liquidity (Hamel et al., 2015). That lack of universal and complete coverage is partly the result of deliberate policy decisions. For example, the ACA excludes undocumented immigrants from many of its benefits and many state governments have, to date, not implemented the ACA's Medicaid expansion. In addition, the benchmark insurance plans used to determine the magnitude of the ACA subsidies are only expected to cover seventy percent of average medical expenditures, leaving even the newly insured exposed to costly medical bills.

Those policy decisions are often justified based on the estimated cost *to the government* of covering the uninsured (see, e.g., "Can We Afford It?" *New York Times* editorial). It is misleading, however, to consider only the cost to the government – doing so fails to capture the full cost of the uninsured. At a minimum, these costs include the fact that the uninsured still demand health care and, due to a variety of factors, hospitals are mandated to treat them regardless of their ability to pay. For example, the Emergency Medical Treatment and Active Labor Act (EMTALA) requires that hospitals provide emergency medical treatment to all patients. In addition, non-profit hospitals must provide a community benefit in order to maintain their tax exemptions. And even beyond those legal constraints, medical ethics require that physicians treat certain patients regardless of ability to pay (Annas, 1985).

In this paper, we argue that, as a result of these factors, hospitals serve as the "insurers of last resort" in the American health care sector.[1] When policymakers decide not to provide health insurance for a portion of the population that otherwise could not afford insurance, hospitals ultimately bear the cost of that decision. In 2012, hospital uncompensated care exceeded $46 billion. By comparison, this amounts to nearly 30 percent of

[1] Policymakers have long recognized the unique nature of the health care sector in that hospitals often provide services without compensation. As a result, policymakers have created funding streams to compensate hospitals for uncompensated care costs. Perhaps the most important of these funding streams are Disproportionate Share (DSH) payments. DSH payments are intended to compensate hospitals for providing care to low-income populations, and states are given broad latitude in how to spend the funds. In practice, though, DSH payments are much lower than the cost of uncompensated care provided by hospitals. For instance, in 2012, $17.1 billion was spent on Medicaid DSH payments. Hospitals also receive other forms of government assistance, but most of these are not directly tied to the amount of uncompensated care that the hospitals provide and instead provide general support for the variety of other services hospitals provide to the community. As a result, they do not directly compensate hospitals when the hospital faces more uninsured patients. For example, when states reduce the generosity of Medicaid benefits there is no corresponding increase in the value of these local tax benefits.

2012 Medicaid payments for inpatient and outpatient hospital spending.[2] Uncompensated care costs are also large relative to the industry's profits. Holding all else constant, if hospitals only served paying customers, their 2012 profits would have been approximately 70 percent larger (Herman, 2014). To describe this role of hospitals, we study the determinants of hospital uncompensated care costs. We then examine whether this burden is equally shared across hospitals of different ownership types. Finally, we estimate whether hospitals bear the full financial burden through decreased profits.

First, we examine how shifts in the *local demand* for uncompensated care – arising from changes in the uninsured population – affect hospital uncompensated care. We use 28 years of previously confidential, hospital-level financial data. Those data were compiled by the American Hospital Association and made available to us through a data-use agreement. We estimate that each newly uninsured person leads to nearly $800 in uncompensated care costs. That association is robust to state and year fixed effects, the inclusion of time-varying state economic controls, and region-by-year fixed effects.

One concern with those state-level panel estimates is that they may be subject to omitted-variables bias or reverse causality. To address that concern, we complement our results with two case studies of large-scale public health insurance disenrollments. The two disenrollments both occurred in 2005, in Missouri and Tennessee. Estimates from these reforms isolate the effect of sudden, plausibly exogenous increases in the uninsured population. Exploiting both within- and across-state sources of variation, we find that these disenrollments increased hospital uncompensated care costs. The magnitude of the change in costs following those disenrollments is similar to our state-year estimates.

We then study the *local supply* of uncompensated care. In particular, we test whether uncompensated care is tied to each specific hospital, or whether the costs can spillover across hospitals following changes in market structure. As an example of such a spillover, consider the case of Saint Elizabeth's Hospital in Belleville, Illinois. Hospital executives planned to move the main location out of the downtown area. This led executives at the remaining downtown hospital to fear that their hospital would "be overwhelmed and will get most of the area's uninsured and Medicaid patients" (Galewitz, 2015).

To study such dynamics, we measure the effects of a hospital closure on neighboring hospitals. Defining the local market as either the county or the hospital service area (HSA), we estimate a statistically significant decline in total uncompensated care provided in the market after a closure. However, this decline likely results from an

[2] This calculation assumes that the percentage of spending on inpatient and outpatient services is similar across the Medicaid Fee for Service and Managed Care programs.

overly strict geographic market definition. Supporting this argument, when we define the local market more broadly, using local commuting zones (Tolbert and Sizer, 1996; Autor and Dorn, 2013), we estimate a statistically significant increase in uncompensated care costs for the remaining hospitals in the market but no statistically significant change in the total uncompensated care provided. This nearly complete spillover of uncompensated care to the remaining hospitals suggests that the demand for uncompensated care is relatively inelastic and represents a market-level and relatively non-discretionary fixed cost for hospitals. The results also suggest that commuting zones may be a useful market definition when studying the health care consumption of non-elderly uninsured adults.[3]

Taken together, our results demonstrate the importance of hospital-provided uncompensated care in filling in the gaps of the social health insurance system in the United States. Importantly, the role of hospitals as informal insurers is not simply the unintended result of social insurance or the fact that the service provided is necessary for the survival of its customers. Both of these are characteristics of grocery stores, for example, which sell a vital product that is partially financed by social insurance in the form of food stamps. And yet, grocery stores that accept food stamps are not required to provide "uncompensated food" for individuals who are either ineligible for food stamps or have exhausted their monthly benefits. Similarly, this informal insurance does not mechanically occur because the government has chosen to use third parties in the provision of social insurance programs. Recently, the government has expanded the use of third parties as part of the Earned Income Tax Credit and the food stamps program without raising the costs of private firms (Kopczuk and Pop-Eleches, 2007; Saslow, 2013).

Instead, hospitals have become informal insurers as a result of deliberate policy decisions that (1) leave a portion of the low-income population without health insurance and (2) require hospitals to treat patients regardless of their ability to pay. As a result, Medicaid provides financial protection not only to its direct beneficiaries, but also to the hospitals that would have still been required to treat Medicaid recipients were they to be uninsured. That finding is consistent with the work of Finkelstein, Hendren, and Luttmer (2015), who estimate that Medicaid enrollees only value their insurance coverage at a fraction of the cost. Our results show that one reason for this undervaluation is that uninsured individuals often receive care at hospitals without providing direct

[3] These results also contribute to a broader understanding of the industrial organization of health care markets. Gaynor, Ho and Town (2014) summarize the research on the structure of these markets. They focus on the welfare effects of changes in firm concentration. However, they do not discuss the role of uncompensated care. Our results demonstrate that changes in the structure of the local market can have meaningful, negative effects on firms' patient margins. This can have several implications for research in this area. For example, a complete analysis of the benefits of increased concentration must account for the accompanying increased uncompensated care costs per hospital.

payment. Thus the results of both this paper and the work of Finkelstein, Hendren and Luttmer are consistent with a large fraction of Medicaid spending representing a transfer from the government to hospitals.

The existence of those transfers, however, does not speak to economic incidence. Many policymakers assume that hospitals simply pass on uncompensated care costs to privately insured patients by raising prices. For example, the text of the ACA states, "[t]o pay for [uncompensated care], health care providers pass on the cost to private insurers, which pass on the cost to families. This cost-shifting increases family premiums by on average over $1,000 a year. By significantly reducing the number of the uninsured, the requirement, together with the other provisions of this Act, will lower health insurance premiums." Cost shifting was also cited by Chief Justice Roberts in the Supreme Court decision upholding the ACA's constitutionality. Roberts wrote: "hospitals pass on the cost [of uncompensated care] to insurers through higher rates, and insurers, in turn, pass on the cost to policy holders in the form of higher premiums" (*National Federation of Independent Business v. Sebelius*).

Despite the frequent pronouncements of policymakers, there is little empirical evidence, and limited theoretical support, for the ability of hospitals to actually pass on uncompensated costs (Dranove, 1988; Morrisey, 1994; Timmins, 2014; Dranove, Garthwaite, and Ody, 2014).[4] We examine the potential for uncompensated-care cost shifting by studying how shocks to uncompensated care affect hospitals' patient-care profit margins and other financial outcomes. If hospitals pass along *all* uncompensated care onto private insurers, then an increase in the uninsured population should not affect profits. We find, however, that increases in the uninsured population lead to a decline in patient-care profit margins.

The results for hospital profits demonstrate that hospitals cannot fully shift uncompensated-care costs onto other parties such as hospital employees or insurers. The focus on profits also provides an additional benefit, an alternative to relying solely on the adjusted hospitals charges data used for our main estimates. As we describe below, uncompensated care charges may provide only partial information on actual costs, and as a result estimates based solely on charges may provide a biased measure of true uncompensated care costs. The profit estimates suggest that, in the case where hospitals are not able to pass any of their uncompensated care costs onto privately insured customers, each uninsured person costs hospitals approximately $600.[5] Therefore, the profit results provide an alternative estimate that does not require converting hospital charges to costs, and they also

[4] In theory, pass-through will only occur at hospitals that had not previously set profit-maximizing prices. If non-profit firms do not solely maximize profits, then they may pass on uncompensated care costs to private insurers. But existing research indicates that many non-profit hospitals behave in a manner consistent with profit maximization (Dranove, Garthwaite, and Ody, 2014).
[5] This lower bound is approximately two-thirds our estimate based on adjusted hospital charges, and we note that if hospitals are in fact able to pass along some of the cost to the privately insured (or adjust their costs in other ways) then this would suggest a higher actual cost per uninsured person.

represent a lower bound if hospitals can pass through a share of their uncompensated care costs to other parties.

We next explore differences by type of hospital. We find that non-profit hospitals predominantly bear the burden of serving as insurers of last resort. For example, we find that increases in the uninsured population primarily affect the costs of non-profit hospitals. By contrast, for-profit hospitals are largely unaffected. Similarly, when a hospital closes, nearby non-profit hospitals bear a greater share of the burden of the spillover of uncompensated care costs.

Those findings shed light on whether nonprofit hospitals are simply "for-profits in disguise" (Weisbrod, 1988). That view, for instance, was held by former chair of the Senate Finance committee, Charles Grassley, who said "[n]onprofit hospitals and for-profit hospitals have often been indistinguishable" (Pear, 2015). This paper's results generally contradict that view. We find a consistent pattern of evidence that non-profit hospitals are more exposed to changes in demand for uncompensated care. That pattern persists even when we limit the sample to for-profit and non-profit hospitals in the same market. That said, we cannot rule out that non-profit hospitals may choose to serve areas *within* these markets where they are more exposed to demand for uncompensated care resulting from changes in the market's uninsured population. However, we note that over the long term these decisions themselves are not fixed and therefore represent a choice made by non-profits. This finding contributes to work that examines differences between non-profit and for-profit firms (Weisbrod 1988; Sloan and Vraciu 1983; Norton and Staiger, 1994; Cutler and Horwitz, 1998; Duggan, 2002; Horwitz, 2005; Horwitz and Nichols, 2009; Capps, Carlton, and David 2010; Dranove, Garthwaite, and Ody 2014). Given the limitations of our data, we cannot conclude that this is the result of different intrinsic motivations of the firm, as opposed to differences in the selection of services that attract uninsured patients. However, we find that even when we limit the sample to similar geographies and hospital types, we continue to find evidence that non-profit firms bear a greater share of uncompensated care costs.

Finally, we conclude the paper by using our estimates to examine the broader set of constituents that are financially protected by Medicaid. We first estimate that insuring 25 million more Americans under the ACA would reduce the uncompensated care costs of hospitals by $20 billion, approximately 43 percent of the 2012 level. As a result, hospitals in states that do not implement the ACA's Medicaid expansion will face higher uncompensated care costs than those in states that implement the expansion. We calculate that the money states will "save" from not expanding Medicaid is less than the hospital uncompensated care costs generated by not expanding Medicaid. Our estimates thus suggest that the decision not to implement the ACA's Medicaid expansion achieves savings for the government at the expense of hospitals.

These results relate to the political economy of the Medicaid program. It is often argued that means-tested programs are not politically viable in the United States, that "a program for the poor is a poor program" (McElvaine, 1984). Indeed, traditional cash welfare did not survive the 1990s and the generosity of other safety-net programs, such as food stamps, has recently been pared back (Shear, 2014). But Medicaid has never disappeared from a state and – absent a few isolated disenrollments – the program has only grown in size over time. This paper suggests one explanation. A unique aspect of Medicaid is that it directly benefits not only the citizens it covers but also the hospitals they visit. Given that hospitals are an important political force at all levels of government, the factors requiring hospitals to provide uncompensated care may thus have unintentionally assured Medicaid's long-term political stability.

2. Why Do Hospitals Provide Uncompensated Care?

Typically, firms only serve customers that they expect will provide payment for services rendered. But in health care, hospitals routinely provide care to patients who are unable or unwilling to pay. In 2010, US hospitals provided approximately $40 billion of care, 5.8 percent of total expenses, without payment. From 1984 through 2010, the absolute amount of uncompensated care steadily increased and the relative amount varied between 5.4 and 6.4 percent of expenses. To place this number in some context, consider that from 1992 through 2010, average hospital operating margins ranged from a low of 2.0 percent to a high of 5.5 percent.

Few previous studies have focused on hospital uncompensated care. A small literature has described trends in uncompensated care over time (Mann et al., 1997; Cunningham and Tu, 1997). In addition, Mahoney (2015) finds that the bankruptcy system operates as a form of implicit insurance as hospitals are unable to collect full payment from indigent patients. To our knowledge, only two other studies have focused on the relationship between uncompensated care and the size of the uninsured population (LoSasso and Seamster, 2007; Davidoff et al., 2000). Both of these studies find a small association between public health insurance generosity and uncompensated care during the early 1990s. However, they focus on Medicaid expansions that were primarily aimed at children, which likely lowers their power to detect a relationship between public health insurance and uncompensated care. Two other studies conduct time-series analyses of changes to state Medicaid programs (Blewett et al., 2003; APS Healthcare, 2006). More recently, DeLeire et al. (2014) examined publicly released financial data from for-profit hospital chains since the implementation of the ACA and found large decreases in the share of admissions from uninsured patients. The paucity of other studies is likely driven by the lack of publicly available data on hospital finances.

Given that private hospitals are large and sophisticated firms, the inability to secure payment for services rendered cannot be rationalized as a simple operational inefficiency. The open question is: why do hospitals continue to provide billions of dollars in care without compensation? Some of these costs are the result of true bad debt that firms in all sectors face, services for which the hospital expected compensation but for which they were unable to collect payment. A large portion, however, stems from charity care, services that the hospital provided without expecting compensation.

There are a variety of reasons that hospitals provide uncompensated care.[6] In this paper, we consider two of the most-discussed reasons: (1) federal regulations and (2) preferential tax treatment for providing a community benefit. There are many regulations that govern how hospitals treat patients who do not pay. Perhaps the most important of these regulations is the Emergency Medical Treatment and Labor Act (EMTALA), which requires that hospitals treat all individuals requiring emergency care regardless of their insurance status. Passed in 1985, EMTALA was a federal statute that expanded on a number of state laws requiring hospitals to treat all patients regardless of their ability or willingness to pay. However, even after full implementation of EMTALA, analyses have shown that the uninsured still receive less intensive care for emergency treatments in hospitals (Doyle, 2005).

In addition to direct federal regulations, the health care sector is also unique in the large share of non-profit, private-sector firms. Over seventy percent of private hospitals are non-profit organizations. In exchange for being exempt from federal, state, and local taxes, these firms are expected to provide a community benefit. While there are many factors that contribute to a community benefit, such as medical research and teaching, perhaps the most discussed and easily quantified is uncompensated care (Nicholson et al., 2000). As a result, these hospitals may provide medical services to patients without compensation even if they do not enter the hospital through the ED.

3. DATA

Our primary data on hospital uncompensated care costs consist of proprietary financial data obtained through a research partnership with the American Hospital Association (AHA). The data are collected as part of the an-

[6] In this paper we focus primarily on the decision of private firms to provide uncompensated care. Medical services without payment are also directly provided by government hospitals. These public hospitals are part of the explicit social safety net system as they are supported directly by federal, state, and local governments. Although our precision is somewhat limited when we limit our analysis to public hospitals, we also find statistically significant increases in uncompensated care for public hospitals, with magnitudes broadly similar to what we find for non-profit hospitals (when normalized by expenditures, since these hospitals are typically smaller than non-profit hospitals).

nual AHA survey, which is the most complete measure of the structure and finances of American hospitals.[7] The AHA data provide the advantage of having hospital-level data for all hospitals on their exposure to uncompensated care linked to other data such as the hospital tax status. This allows us to examine both the supply and demand side of uncompensated care and implement our case studies examining sudden shocks to the share insured in both Missouri and Tennessee. Finally, because the uncompensated care and hospital financial data are linked in the data, we are able to estimate whether hospitals shift these costs onto private patients or whether they absorb these costs through decreased profits.

We obtained AHA survey data from 1984 through 2011. The survey asks hospitals the amount of medical care that they provide without any compensation. As described above, hospitals provide uncompensated care through two primary channels: charity care and bad debt.[8] Charity care are services for which a hospital never intended to collect payment, whereas bad debts are costs related to services for which a hospital attempted to collect payment but was not paid (American Hospital Association, 2010). The methods of classifying uncompensated medical costs across these two categories vary greatly by provider and over time. For example, Rundall et al. (1988) state that for-profit hospitals are more likely to report uncompensated care as bad debt rather than charity care. By contrast, non-profit hospitals might be more inclined to define these costs as charity care. Over time, these patterns can change. For instance, a non-profit hospital may become concerned about an impression that they are not aggressive enough (or they are being too aggressive) in tracking down non-payments. Given this unclear distinction, we consider solely the sum of bad debt and charity care, total uncompensated care costs.[9]

A second complication is that hospitals report the outcome as charges rather than costs. A well-known problem in the study of hospital finance is the growing spread between the list price that hospitals charge for a service and the actual payments these facilities receive from private payers. As a result, charge-based measures of uncompensated care provide an inaccurate description of actual costs. We therefore use a cost-to-charge ratio to approximate the actual costs of providing services, which we calculate using the revenue data in the AHA

[7] We caution that these results are based on self-reported uncompensated care numbers reported to the AHA, not based on administrative records. That said, note that hospitals face no incentive to report false numbers to the AHA; the survey is confidential and regulators never have access to the data. Nevertheless, we explore a corresponding dataset, Tennessee Joint Annual Report (JAR), with complementary data on uncompensated care costs, in order to validate our findings based on the AHA data. Appendix Figure A1 compares uncompensated care data from the AHA to reports for the JAR, a mandated reporting system in that state. These data are remarkably consistent, showing that reports to the AHA, at least in Tennessee, are quite similar to those to the state regulatory body.

[8] Importantly, our definition of uncompensated care does not include any portion of hospital costs that exceed reimbursements from government programs such as Medicare and Medicaid.

[9] Given these concerns, our data-use agreement with the AHA only allows us to study total uncompensated care in those data.

survey. Since our data cover a long time period, we adjust the resulting uncompensated care costs to 2011 dollars using the CPI-U series, and we make similar adjustments for all other dollar values in the survey, such as patient revenue and hospital expenditures.

A final concern with the AHA data is that it focuses on dollars, not visits. For that reason, we also digitized the Joint Annual Reports (JAR) of health care facilities in Tennessee each year. These data are collected by the Tennessee Department of Health from licensed health care facilities in Tennessee. While many of the data in these reports are duplicative of the data in the AHA survey, the JAR data also include other outcomes, such as the number of admissions or visits by payer type.

We identify spillovers of uncompensated care across hospitals with systematic data on hospital closures. We obtained such data for 1987 through 2000 from reports generated by the Office of the Inspector General (OIG) at the Department of Health and Human Services. The OIG data were originally compiled by the Center for Medicare and Medicaid Services and various state agencies and associations (OIG, 2000). We merge the OIG records to the AHA hospital data and consider a hospital closed when it is both listed in the OIG data and no longer appears in the AHA hospital data. In total we identify 359 closures from 1987 through 2000.

Finally, for the state-panel analysis, we use the March Supplement to the Current Population Survey (CPS). The CPS is an annual survey of employment, income, and health insurance outcomes. The March CPS asks about insurance coverage in the previous year and we use these data to determine the share of the state population between the ages of 21 and 64 that lacks insurance each year.

4. The Demand For Uncompensated Care

This paper's first goal is to study the demand for uncompensated care. In particular, we study how changes in the uninsured population affect hospital uncompensated care. Section 4.A. examines the relationship between the share of a state that is insured and the amount of uncompensated care provided by its hospitals. Section 4.B. complements those results with two case studies, the 2005 Missouri Medicaid disenrollment and the 2005 Tennessee Medicaid disenrollment. Section 4.C. studies how changes in uncompensated care costs reflect changes in hospital visits. And, relatedly, Section 4.D. examines how to adjust observed uncompensated care charges to reflect uncompensated care costs.

4.A. Health Insurance Penetration and Uncompensated Care

The size of the uninsured population should be a major factor in the provision of uncompensated care. After all, if individuals are insured, then they need little uncompensated care.[10] To explore this relationship, Figure 1 presents the share uninsured versus total uncompensated care costs per capita. Panel A suggests a strong cross-state relationship between these two variables, while Panel B shows a similar relationship using changes within states over time. Appendix Table A7 presents the estimates of these cross sectional regressions.

Of course, these cross-sectional relationships may simply reflect longstanding differences across states and over time. For that reason, we estimate the following panel-data regression:

$$y_{st} = \alpha_s + \delta_t + \beta \cdot PercentUninsured_{st} + X_{st}^T \Gamma + \varepsilon_{st}.$$

Here, α_s are state fixed effects, δ_t are year fixed effects, X_{st} is a vector of controls added to some specifications, and ε_{st} is an idiosyncratic error term that allows for arbitrary correlation between observations based on the same state. The coefficient of interest, β, represents the change in uncompensated care costs based on the percentage of the population uninsured in the CPS and is identified off of changes within states over time. We consider two measures of uncompensated care costs: (1) uncompensated care costs per capita based on CPS estimates of population, and (2) uncompensated care costs as a percentage of hospital expenditures. Note that when we consider uncompensated care costs per capita, β can also be interpreted as the change in uncompensated care costs for each newly uninsured person.[11]

Table 1 presents estimates of the regression equation above for a variety of hospital samples. Panel A presents estimates for the full sample of hospitals in the AHA. The estimates in column (1) suggest that each newly uninsured person is associated with $793 in hospital uncompensated care costs. That estimate remains similar when we include a set of time-varying state-level controls (column 2); region-by-year fixed effects (column 3); or both the region-by-year fixed effects and state-level economic controls (column 4).

To place this estimate in context, consider that 8 percent of the uninsured report an inpatient visit each year.[12] Thus an uncompensated-care cost per uninsured person of $800 translates into a cost of roughly $11,000

[10] The insured may consume uncompensated care if they do not pay their cost-sharing expenses, and this may have become more common in recent years. For example, in 2006, only 3 percent of workers with employer-provided insurance had deductibles greater than $2,000 and only 10 percent had deductibles greater than $1,000. By 2012, these numbers grew to 14 and 34 percent respectively (Rae, Panchal, and Claxton, 2012).

[11] That is, when per-capita uncompensated care is the outcome of interest, the state population is in the denominator in both the outcome and the independent variable of interest. Thus, β represents both the effect of a change in a percentage-point increase in the uninsured share and the effect of one additional uninsured state resident. This is one reason why we prefer this specification to one that specifies the dependent variable in logs. We find a similar pattern of results in a log-based specification.

[12] Authors' calculations based on the National Health Interview Survey.

per uninsured inpatient visit. By contrast, Pfuntner et al. (2013) estimate that each uninsured inpatient stay costs $8,300. We note, however, that the AHA uncompensated care costs are based on both inpatient and outpatient visits. Carper and Machlin (2013) estimate that inpatient services account for 71 percent of hospital spending relative to total inpatient, outpatient, and ED visits. This suggests a cost per uninsured person that utilizes medical services of approximately $11,690, which is very close to the scaled estimate above.

In interpreting these results, it is important to recognize the possibility that changes in share-uninsured have other effects. In particular, as a state's residents shift out of the uninsured pool, they may acquire health insurance that is, on average, more or less generous than the typical state resident's insurance. As a result, the newly insured may face more cost sharing, and so be more likely to generate uncompensated care than those already insured. Our analysis captures the reduced-form effect of the uninsured on hospital uncompensated care. That reduced-form effect includes these other potential channels. We believe that the reduced-form effect is what is most relevant to policymakers who can change DSH payments or other government transfers in response. But one should keep in mind that the underlying mechanism may be somewhat complex.

Columns (5) through (8) present a similar pattern for uncompensated care as a percentage of hospital expenditures. With the full set of controls, the point estimates suggest that a one percentage-point change in the share uninsured is associated with a 0.16 percentage-point change in uncompensated care as a percentage of costs. On average, uncompensated care accounts for 5.7 percent of expenditures, which means this is a 2.8 percent change in this outcome.

As described above, under EMTALA hospitals with an emergency department are required to treat emergent patients regardless of their ability to pay. Therefore, Panels B and C of Table 1 present regression estimates based on whether a hospital currently operates an ED. These estimates demonstrate that the increase in uncompensated care following an increase in share uninsured is entirely driven by hospitals with an ED. Facilities without an ED exhibit a small and statistically insignificant increase in uncompensated care when the share insured decreases. This is true regardless of the covariates included in the specification, the sample, or the definition of uncompensated care costs.

Finally, we note that not all hospitals should be expected to experience increased uncompensated care. The AHA data contains information on a wide variety of hospitals, from large, general acute-care facilities to ambulatory surgical centers and rehabilitation facilities. Panel D presents regression estimates for a sample limited to adult and child acute-care facilities with an ED. These estimates are similar to the estimates for all hospitals with an ED, suggesting that nearly all of the change in uncompensated care costs following an increase in the share

uninsured is borne by acute-care hospitals. This suggests that the observed relationship is not driven by a third, unobserved variable affecting the finances of the entire hospital sector.[13]

Overall, these estimates suggest a robust association between the demand for uncompensated care and actual uncompensated care costs. To further examine the magnitude of our estimates, we compare them to the results of the Oregon Health Insurance Experiment. Finkelstein et al. (2012) find that those who received new insurance as a result of the Oregon Health Insurance Experiment consumed an additional $1,000 in hospital charges and saw a decrease in medical collections of $390. Assuming that only bad-debt charges are sent to collection agencies, and applying both Oregon's 2009 cost-to-charge ratio and the distribution of charity care and bad debt in our AHA data, we estimate that each newly insured person reduced the uncompensated care costs for Oregon hospitals by approximately $550 in 2011 dollars with an upper bound of the confidence interval of nearly $1,021. This implied estimate is broadly similar to the main state-year estimate, above, of $830.51.

Although the state-panel estimates are robust to various control variables, we cannot rule out bias from unobserved, confounding trends. For example, a recession could increase the share uninsured in a state and also decrease the ability of previously uninsured individuals to pay for their hospitalization out of their own pockets. In addition, the results could be subject to bias due to reverse causality. Some researchers have hypothesized that it is the availability of charity care that induces consumers to become uninsured (Coate, 1995). Such a phenomenon would bias our results, however we note that existing evidence of such a phenomenon suggests that any effect is small (Rask and Rask, 2000; Herring, 2005; LoSasso and Meyer, 2006). To address this concern, we study large, sudden increases in the uninsured population. We focus on two such increases, which both arose from the two largest public health insurance disenrollments in Missouri and Tennessee. Overall, the results from these two case studies lead to similar conclusions as the state-level panel regressions above.

4.B Case Study Evidence from State Disenrollments

To provide suggestive evidence of the direction of causality in these results, we next exploit two large state-level disenrollments from the public health insurance systems in Missouri and Tennessee. The first disenrollment we examine occurred in Missouri. Following the 2001 recession, Missouri faced many years of revenue shortfalls. From 2001 through 2005, state revenues declined by 0.6 percent each year (Blouin et al., 2005). This resulted in

[13] Appendix Table A3 studies another potential difference across hospitals: whether they receive DSH funds. We divide hospitals into two groups based on whether they received DSH payments in 2005. (This is the first year we were able to obtain audited reports for the distribution of these funds at the hospital level.) The table suggests roughly similar effects of the uninsured on those two types of hospitals. This is consistent with DSH payments not fully compensating hospitals for the uncompensated care they provide.

budget cuts of over $2 billion over that time period, with nearly half of those reductions coming from social services, health, and mental-health services. Chief among these cuts was a sharp reduction in the generosity of the state's Medicaid program in 2005. In 2004, Missouri's Medicaid program provided insurance for over 900,000 low-income state residents. As a result of the 2005 policy changes, approximately 150,000 residents lost access to Medicaid and SCHIP (Zuckerman, Miller, and Pape, 2009).

Prior to the cuts in Missouri the state's Medicaid program was not notably generous and as a result those who lost coverage were similar to the traditional beneficiaries of public health insurance gaining and losing insurance in the panel-data estimates above. For example, approximately half of those losing insurance were parents with incomes between 17 and 75 percent of the Federal Poverty Line (Ku and Solomon, 2005). As a result, the magnitude of the effect of the Missouri disenrollment serves as a useful benchmark for the panel-data estimates above.

The reductions in the generosity of Missouri's Medicaid program provide a sudden shock to the state's uninsured population that should be unrelated to previous trends or other contemporaneous events in these markets. We begin by examining uncompensated care costs in Missouri versus neighboring states. Figure 2 presents uncompensated care costs in Missouri versus the other 6 states in the North-West Midwest over the same time period.[14] Following the disenrollment, there was a sudden increase in aggregate uncompensated care for Missouri's hospitals as compared to those in the comparison states. Importantly, prior to the disenrollment, hospital costs in Missouri and neighboring states followed roughly similar trends.

The second state we focus on is Tennessee, which in 2005 terminated its large Medicaid expansion program, a program that targeted a population not traditionally eligible for public health insurance. Specifically, the Tennessee expansion program targeted "uninsured" and "uninsurable" state residents regardless of income. As a result of the lack of an income requirement, the expansion enrollees had higher incomes than traditional Medicaid enrollees. In 1995, over 40 percent had incomes above 100 percent of the federal poverty line. In addition, relative to traditional TennCare enrollees, they were more likely to be white, between the ages of 21 and 64, and to not have children at home.

The expansion program made TennCare more expensive than anticipated, and, by 2001, the system faced a budget shortfall of over $300 million (Chang and Steinberg, 2009). As a result, beginning in late July of 2005, Tennessee disenrolled beneficiaries older than age 19 from the program. Approximately 4 percent of the non-

[14] In particular, we include North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, and Missouri in the sample. The two series are on different axes for readability, but the range in both axes is the same.

elderly adult population of Tennessee lost public insurance coverage.[15] Many disenrollees were able to secure private coverage, but in a previous paper we found that approximately 70,000 remained without insurance for many years after August 2005 (Garthwaite, Gross, and Notowidigdo, 2014). For them, the loss of insurance may have led to uncompensated care. It is that possibility that we assess here.

Figure 3 presents uncompensated care costs for hospitals in Tennessee and those in other Southern states.[16] Following the disenrollment, uncompensated care costs suddenly increased in Tennessee. Similar to Missouri, prior to the disenrollment, the costs for each set of states were similarly trending. However, in the years after the disenrollment there was a sharp change in uncompensated care costs for hospitals in Tennessee compared to hospitals in other Southern states.

The cross-state evidence of an increase in uncompensated care in both Tennessee and Missouri suggests a causal relationship between the size of the uninsured population and hospital uncompensated care. A remaining concern is that another, contemporaneous event within each state is driving the estimates. For this reason, we next exploit the substantial, within-state variation in exposure to the TennCare disenrollment to estimate the effect of the disenrollment on uncompensated care.

While the disenrollment was enacted simultaneously across Tennessee, the number of citizens who lost coverage varied a great deal across the state. We obtained county-level enrollment data from the Bureau of TennCare annual reports for 2004 and 2005. The percentage of a county's population losing health insurance in the year after the disenrollment ranges from a low of 0.8 to a high of 9.1. The median county experienced a drop in enrollment of 3.3 percentage points, and the interquartile range was 2.7 to 5.0 percentage points. We aggregate these disenrollment data into the 10 hospital referral regions (HRRs) containing Tennessee hospitals.

Figure 4 presents the uncompensated care by year for two groups of HRRs based on whether residents in those areas had above or below the median disenrollment. Similar to the cross-state evidence in Figure 3, hospitals in these HRRs had comparable trends in uncompensated care prior to the disenrollment. However, after the disenrollment there was an immediate increase in the uncompensated care costs for hospitals located in HRRs that were more affected by the disenrollment compared to hospitals in HRRs that were less affected by the disenrollment. This pattern of costs over time provides evidence that the cross-state patterns in Figure 3 are likely not the result of other factors or secular trends. In Appendix Table A4 we provide regression evidence documenting the magnitude of these changes using several different market definitions.

[15] For more institutional details on the TennCare disenrollment, see Garthwaite, Gross, and Notowidigdo (2014).

[16] As with Figure 2, the two series are on different axes for readability, but the range is the same in both cases.

4.C Analysis of the Utilization of Hospital Services

A final concern with the results above, and all of the estimates that rely on AHA data, is that uncompensated costs may be driven by accounting rules, and thus may provide an incomplete picture of the actual care provided without payment. For that reason, we next explore the effect of the disenrollment on tangible medical services, such as inpatient admissions and outpatient visits. We obtain data on such outcomes for Tennessee hospitals from the digitized JAR data described in Section 3.

Figures 5(a) through 5(d) plot the change in inpatient admissions and outpatient visits in Tennessee hospitals by insurance status. Figure 5(a) suggests a sudden decline in such visits after 2005. That decline is consistent with the disenrollment; there were fewer TennCare beneficiaries after 2005. Figure 5(b) suggests that some of those who became uninsured, became self-pay patients at Tennessee hospitals. By contrast, Figure 5(c) suggests a slight increase in privately insured patients.[17]

We compare the magnitude of this change in self-pay visits to the estimates based on the AHA data above. In 2007, there were approximately 980,000 self-pay visits. However, if the trend in self-pay visits had continued on its pre-disenrollment trend, we estimate there would have been only 740,000 self-pay visits. From 2002–2005 the average revenue from a TennCare patient was approximately $500 per visit. Accounting for the fact that Medicaid is known to pay below the cost of care, we estimate that the increase in self-pay visits cost hospitals approximately $138 million. Reassuringly, that number is broadly similar to the estimated change in uncompensated care per capita for Tennessee in Appendix Table A8, which suggests that the disenrollment increased uncompensated care costs by $158 million.

4.D Examining Alternate Cost-to-Charge Definitions

A remaining question relates to the underlying economics behind the cost-to-charge ratio. We only observe hospital charges in the AHA data, and so understanding the economic relationship between the demand for

[17] In our previous work (Garthwaite, Gross and Notowidigdo, 2014), we found that roughly half of those who lost TennCare coverage became uninsured, while the other half entered the labor market to procure private coverage. Figures 5(b) and 5(c) are consistent with that finding, in that we see an increase in both uninsured and private visits at Tennessee hospitals. The increase in private encounters in Figure 5(c) is small, but obscures a starker pattern for inpatient visits. Appendix Figure A4 presents the change in inpatient hospital visits for privately insured patients, and suggests a large, sudden increase after the disenrollment. The slight overall increase in privately insured hospital encounters is a combination of the large increase in inpatient admissions and a much smaller increase in ED visits. Such a pattern may result from the differential cost sharing for ED visits between Medicaid and most private insurance plans. There is debate in the literature about the effect of private insurance on the use of the ED (Kolstad and Kowalski, 2012; Miller, 2012; Anderson et al., 2012; Taubman et al. 2014). Appendix Figure A5 presents the number of ED visits by year in Tennessee. Prior to the disenrollment, the number of visits was smoothly increasing. However, beginning in 2005 there was a break from trend and the number of visits remains roughly level in the subsequent years. This decline provides suggestive evidence that insurance coverage increases rather than decrease the use of the ED.

uncompensated care and hospital costs requires that we translate charges into economic costs. For the main estimates presented above, we calculate each hospital's cost-to-charge ratio as its total expenses divided by the sum of gross patient revenue and other operating revenue, and we rely on the average of this measure across years for each hospital. This measure thus provides a way to translate hospital charges into an approximate measure of the average costs of the hospital.

That process, however, involves a number of assumptions that warrant further exploration. We consider four distinct questions. First, how sensitive are the estimates above to alternative cost-to-charge ratios? Second, how accurately does a hospital-specific cost-to-charge ratio capture the average costs of the services actually consumed by the uninsured as opposed to the insured? Third, how do the estimates change if we consider the marginal cost of uninsured hospital visits rather than the average cost? Finally, fourth, how do the estimates compare to ones that adjust charges using data on the average medical expenses of the uninsured. Below, we approach each of these questions in turn.

For the first question, Appendix Table A1 reports results using a number of alternative methods of calculating a cost-to-charge ratio. These include a state-by-year average cost-to-charge ratio, an annual average cost-to-charge ratio, a hospital-by-year cost-to-charge ratio, a hospital-specific lagged cost-to-charge ratio, and a "jackknife" measure which computes each hospital's average cost-to-charge ratio excluding the current year. One advantage of the jackknife measure is that if uncompensated care costs affect a hospital's profit margin (which would occur if hospitals cannot pass through the cost shock), then this will mechanically affect the hospital's cost-to-charge ratio and bias our results. We estimate a similar relationship between the share uninsured and the amount of hospital uncompensated care across all of these alternative cost-to-charge ratios. The estimated effect of the uninsured on uncompensated care across these measures is $616 to $855, suggesting that the qualitative implications of this paper's main results are not driven by the cost-to-charge ratio.

Second, we examine one weakness of any cost-to-charge ratio: it provides an estimate of the average costs based on the services used by all patients in the hospital. It is possible that the uninsured consume a mixture of services that is different from the average patient. If, in addition, the cost-to-charge ratio varied systemically across hospital services, then the cost-to-charge ratio on which we rely may be inappropriate in studying the uninsured. Unfortunately, the AHA data exist at the hospital-level rather than the patient-level and, as a result, cannot shed light on the cost-to-charge ratio for the services used by the uninsured.

To explore this issue further, we turn to the Medical Expenditure Panel Survey (MEPS), a dataset that captures the health care consumption of a nationally representative sample of Americans. For each hospitalization and emergency department visit in the MEPS, we observe the revenue received by the hospital and the

charges associated with the hospital encounter. Given the focus of the MEPS on medical expenditures it does not contain information on hospital costs. Therefore, we approximate the cost-to-charge ratio using the revenues received from the privately insured for each service. Using data from the 2000–2010 MEPS, we first document that there are differences in this revenue-to-charge ratio by service area. Appendix Table A12 presents this ratio for the most-common clinical codes in the MEPS data. The table suggests meaningful variation across services.

We next examine whether the services that are more commonly consumed by the uninsured have revenue-to-charge ratios that are systematically different from the services consumed by the privately insured. Appendix A19 depicts the relationships between the share uninsured and the revenue-to-charge ratio for privately insured patients. From this figure we learn two important facts. First, as is perhaps unsurprising, the uninsured consume a slightly different set of services. Second, the differences in the associated revenue-to-charge ratios are actually quite small and, if anything, the services consumed by the uninsured involve slightly higher revenue-to-charge ratios. This suggests that the main results above may underestimate the actual cost of the uninsured, but the difference is likely to be small. The regression in Figure A19 suggests that a 10 percentage point increase in the share uninsured for a clinical code is associated with a 0.7 percentage point increase in the revenue-to-charge ratio. As a result, if we adjust our primary estimates based on the differences suggested by the MEPS analysis, we would find that each newly uninsured person costs approximately $880 (compared to our preferred estimate of $800).[18] This suggests that differences in the consumption of services between uninsured and insured is unlikely to be a meaningful source of bias in our estimates.

A third question centers on the distinction between the marginal economic cost and the average accounting cost. Even the most precisely calculated cost-to-charge ratio translates charges into average accounting costs, not marginal costs. On the one hand, this measure includes a number of fixed costs that the hospital likely would make regardless of small changes in the number of uninsured patients. This would overstate the economic costs of the uninsured. On the other hand, it does not consider the opportunity costs of treating the uninsured, which would be quite high if hospitals are unable to treat the uninsured by delaying their care until there are slack resources. This would suggest that the average accounting costs might be an underestimate of the economic costs. In addition, some of the fixed costs may be the result of the hospital expecting a large amount of uninsured patients and therefore investing in facilities to ensure they can treat all emergency patients.

[18] This calculation uses the regression line in Figure A19 to calculate fitted value for share uninsured at 0 and 1, which we use as proxy for relative cost-to-charge ratio for insured and uninsured. We then use that ratio to adjust the overall cost-to-charge ratio to a cost-to-charge ratio specific to the uninsured, which inflates the main results by approximately 10 percent.

Calculating the actual marginal economic costs, however, is difficult. As an alternative, we consider the revenue that hospitals receive from Medicaid. While Medicaid is generally the lowest reimburser among all insurance programs, we note that nearly all hospitals, including for-profit hospitals (which we assume are profit maximizing), accept Medicaid-covered patients. This suggests that Medicaid, while paying less than other insurers, likely reimburses hospitals for at least their direct variable costs. Therefore, we construct a revenue-to-charge ratio for Medicaid patients using Medicare cost reports, as in Dranove, Garthwaite, and Ody (2014). Using this data, we find that the average Medicaid revenue-to-charge ratio is 0.44 compared to 0.60 for all patients. To understand how our main estimates change using this alternative ratio, Panel A of Table 2 presents estimates on the sub-sample of hospitals that can be matched to Medicaid revenue-to-charge data in the Medicare cost reports, but uses the same cost-to-charge adjustment used in Table 1. Panel B of Table 2 presents estimates of the costs of the uninsured using this alternative Medicaid revenue-to-charge measure. Using the ratio between these two panels as an approximate adjustment factor, these estimates suggest that a plausible lower bound estimate of the economic costs for hospitals for each newly uninsured person is approximately $640.[19]

Finally, another means of examining the cost-to-charge ratio is to consider its relationship to other data on the medical expenditures of the uninsured. If the uncompensated care costs of hospitals represent a reasonable fraction of the expected spending of the marginal uninsured individual, this would suggest that the use of adjusted charges provide a credible estimate of uncompensated care costs. We use the MEPS to calculate the average costs of the uninsured based on age, sex, and race. We then merge those means into the CPS and calculate the expected health-care expenditures of the uninsured in each state and year. We then replace the share-uninsured variable on the right-hand side of the regression equation above with this measure; doing so provides an estimate of the share of the costs of the newly uninsured borne by hospitals compared to other parts of the healthcare system.[20] Panel C of Table 2 presents the estimates of this specification; it suggests that hospitals bear 47 to 55 percent of the expenditures of the newly insured. Hospitals have historically accounted for 30 percent of the health expenditures of all patients (National Center for Health Statistics 2015). Given the important role of the emergency department in providing health care services for the uninsured, it should not be surprising that hospitals bear a disproportionate burden in caring for the uninsured. That being said, these estimates make it clear that a large fraction of the costs are borne by other parts of the health care system.

[19] This estimate comes from ($431/$533)*$793. An implicit assumption in this calculation is that the adjustment factor calculated in this sub-sample of hospitals is valid for the "unmatched" hospitals that do not appear in the Medicare cost reports (but do appear in the full sample of hospitals in AHA data used in Table 1).

[20] Given that charges are the common data elements across the MEPS and AHA data, we use data on charges for this exercise.

5. THE SUPPLY OF UNCOMPENSATED CARE

The estimates above suggest that the demand for uncompensated care, which is a function of the size of the uninsured population, affects hospital uncompensated care costs. Hospitals in a local market serve as the "residual payer" for medical services following changes in the generosity of public health insurance. In this way, private hospitals provide an additional form of social insurance in that they are health insurers of last resort.

If the uninsured require a certain amount of medical care regardless of their ability to pay, and hospitals in a market serve as insurers of last resort, then the amount of uncompensated care hospitals provide should also be a function of the supply of care provided by other nearby hospitals. We examine this hypothesis next. To do so, we estimate the spillovers of both uncompensated and compensated care across hospitals following the closure of one local hospital. If the provision of uncompensated care occurs because the uninsured demand a minimum and unavoidable quantity of medical services for which they cannot pay, then closing competing facilities should not reduce the total provision of uncompensated care in a geographic area. Instead, each remaining hospital should see its uncompensated care costs increase, as uninsured patients are reallocated from the closing facility to the remaining hospitals in the market. However, if hospitals provide care solely at their discretion or if the very existence of a facility induces care that otherwise would not be demanded, then a hospital closure would reduce the total amount of uncompensated care in a local market.

5.A. UNCOMPENSATED CARE SPILLOVERS FROM HOSPITAL CLOSURES

We examine spillovers of uncompensated care across hospitals with a combination of the OIG and AHA data described in Section 3. In total, we identify 359 hospital closures from 1987 through 2000 that exist in our sample. The vast majority of the closures in our data are for acute-care hospitals. We therefore limit our sample to acute-care hospitals with an emergency department, the hospitals that are most likely to receive new patients following the closure of an acute-care hospital in their market.

A key question is how to define the local market. A market definition that is too narrow will miss out on patients who move to hospitals outside of the defined market. On the other hand, a market definition that is too broad will lack the power to detect economically meaningful spillovers. We begin our analysis at the county level, the market definition considered by Duggan (2002). Examining the patterns in our data, we find that when considering spillovers across hospitals, both counties and hospital service areas (HSAs) are too narrow of a market definition and we move to results using a definition based on the commuting patterns of local residents.

Using the OIG closure data, we identify a sample of 117 counties that suffered a large hospital closure as the first closure in this time period, where we define large closures as those where the closing hospital ac-

counted for an above-average percentage of uncompensated care among closing hospitals, or more than nine percent of the total uncompensated care in the local market.[21] In our sample of large closures, the mean closing hospital accounted for approximately 35 percent of the county's uncompensated care costs in the year prior to its closure. Using this sample, we estimate the following event-study specification:

$$y_{ct} = \lambda_c + \delta_t + \sum_{i=-4}^{5} \beta_i \cdot I\{\text{i years since closure}\}_{ct} + \varepsilon_{ct}.$$

Here λ_c are a set of county fixed effects, δ_t are year fixed effects, and ε is an error term that allows for arbitrary correlation between observations from the same county. The coefficients of interest, β_i, captures the change in uncompensated care costs in the county for the 4 years before and the 5 years after closure, with the year before the closure serving as the omitted category.

As outcomes, we focus on the number of hospitals in the county, the logarithm of uncompensated care costs for hospitals that do not close, and the logarithm of total uncompensated care costs in the county. Appendix Figure A12 presents the estimated change in the number of hospitals after a closure, which is relatively stable in the years prior to the closure and then drops by approximately one in the year following the closure. Figure 6 suggests that the amount of uncompensated care provided by hospitals that do not close is stable prior to the closure and then increases by approximately 10 percent following the closure. The dashed horizontal line shows that the closing facility accounted for approximately 30 percent of uncompensated care costs in the county prior to its closing. The figure suggests that most of the costs previously borne by the closing hospital are not transferred to the remaining hospitals in the county. Therefore, it should not be surprising that in Figure 7 the overall amount of uncompensated care provided by county hospitals falls by 20 percent following the closure. This demonstrates that either the closure of a hospital decreases the amount of uncompensated care consumed by the uninsured, or that uninsured patients travel outside of the original county of treatment to receive these services following a closure.

In order to distinguish between these two possibilities, we next consider other definitions of the local market. Two traditional market definitions in the literature are the hospital service area (HSA) and the hospital referral region (HRR). These areas provide measures of local health care markets and are defined by the historic utilization care for Medicare patients. HSAs are groups of zip codes in which more Medicare patients receive hospital care in the local hospital than in any single HSA (Wennberg et al., 1996). Therefore, HSAs are a fairly

[21] Some markets suffered more than one closure throughout our sample period. For consistency across markets, we only include the first closure from these markets and only include markets where the first closure is a large closure. We find similar results to our main findings for a sample limited to only markets with a single large closure during the entire sample period.

localized hospital market definition. By contrast, HRRs represent a collection of HSAs whose residents were referred for cardiovascular and neurosurgery treatments. This is a far larger market definition. In total, we have 2,886 HSAs and 162 HRRs in our analysis sample.

But these traditional definitions of hospital markets are likely not appropriate in our setting. HSAs likely suffer from the same problem as counties, in that after a facility closes, many uninsured patients leave the HSA to receive medical care. As a result, when using HSAs we may erroneously conclude that these closures reduce the total amount of uncompensated care. On the other hand, HRRs are quite large. Therefore, the closure of a hospital may have little detectable effect on the provision of services in an area that large. In addition, both HSAs and HRRs are based on the flow of Medicare patients. Uninsured patients may seek care based on factors different from Medicare patients.[22]

Therefore, we next consider the spillover of uncompensated care across hospitals located within the same commuting zone. Often used in the local labor markets literature, commuting zones are mutually exclusive collections of counties that have strong commuting ties between each other and weak ties to other areas (Tolbert and Sizer, 1996; Autor and Dorn 2013). These areas have the advantage of being larger than an HSA or county but smaller than an HRR. In addition, given that they are based on daily traffic patterns rather than the medical-care decisions of elderly insured patients, which may better capture the relevant catchment area for uncompensated care.

In our data, we identify 60 commuting zones that had a large closure as their first closure during our sample period. The first of these occurred in 1987 and the last in 1998. The mean hospital closure accounted for approximately 25 percent of the uncompensated care provided in the commuting zone in the year prior to the closure. The first panel of Figure 8 displays the event-study estimates for the logarithm of uncompensated care costs at hospitals in the commuting zone that did not close. These coefficients show little change in uncompensated care costs prior to the closure and then a large and immediate increase that accounts for the vast majority of uncompensated care costs from the closing hospital. Therefore, it should not be surprising that in the next

[22] Appendix Figure A6 presents event-study estimates based on HSAs. The estimates for the HSA-based samples largely mirror those from the county-based analysis: a sudden increase in uncompensated care costs for the remaining hospitals, but an overall decrease in the amount of medical care provided without compensation. For the estimates using HRR as the unit of analysis, we are able to clearly identify the closure of a hospital based on the number of hospitals in the area. However, we cannot identify meaningful changes in the uncompensated care costs of remaining hospitals or in the amount of uncompensated care provided in the area. This is likely the result of the size of HRRs. For example, the average hospital closing accounted for only six percent of the uncompensated care costs in the year prior to its closure, making this geographic aggregation underpowered to detect meaningful spillovers.

panel of Figure 8, there is – at most – a slight decline in the overall amount of uncompensated care provided in the commuting zone. None of the event-study coefficients are statistically distinguishable from zero.

One concern with these results is that the act of closing a hospital may cause a general reorganization of the provision of uncompensated care in the local market. If this were the case, then our spillover estimates could be driven by such an unobserved factor. To examine this question, Appendix Figure A8 presents estimates from a sample that contains all closures where the event-study coefficient is allowed to vary based on whether there was a large or a small closure. The large-closure estimates broadly follow the pattern in Figure 8(a). However, hospitals that remain open in markets that suffer a small closure see no noticeable change in their uncompensated care costs in the years after the closure. These estimates demonstrate that it is not some other feature associated with hospital closures that drive the main, large-closure estimates.

To more carefully estimate the magnitude of these spillovers, we next estimate a differences-in-differences version of this event-study regression equation that replaces the individual post-closure coefficients with a single indicator variable for the 4 years after a closure. Panel A of Table 3 presents estimates of this specification for a dependent variable defined as the logarithm of uncompensated care. Column (1) shows that, following a closure, there is an approximately 17 percent increase in uncompensated care at the remaining hospitals in a commuting zone following a closure. This accounts for most of the uncompensated care provided by the closing hospital, and as a result the estimate in column (2) shows a statistically insignificant decline in total uncompensated care in the commuting zone of approximately 6 percent. By contrast, a similar model estimated on the county-based sample shows a statistically significant decline in uncompensated care of 25 percent.

5.B. Revenue Spillovers from Hospital Closures

In addition to the spillover of uncompensated care, one would also expect a spillover of profits from insured patients. Appendix Figure A6(a) describes the change in revenue for hospitals that remain open in a county after a closure. Following the closure, these hospitals experience an approximately 10 percent increase in revenue. This increase represents only a fraction of the revenue earned by the hospital that closed. This can be seen in Appendix Figure A6(b) which shows a sharp reduction in the consumption of medical services (as measured by revenue) in the county following a closure. This reduction is at least partly the result of insured patients seeking medical care at facilities located outside of their original treatment county.

Guided by our uncompensated care spillover estimates, we next consider revenue spillovers within a commuting zone. The average hospital that closes accounted for 20–30 percent of the revenue in its commuting zone. Figure 9(a) shows a statistically significant increase in revenue for the hospitals in the commuting zone

that remained open following a closure. Figure 9(b) suggests that the total revenue for hospitals in the commuting zone decreased following a closure. To examine the magnitude of these changes, Panel B of Table 3 presents difference-in-difference estimates with hospital revenue as the dependent variable. Following a closure, we estimate a 6.4 percent increase in revenue for the remaining hospitals and an overall decline of 10 percent of the revenue in the commuting zone at hospitals.

These estimates suggest that even in commuting zones, hospital closures lead to a reduction in overall care provided by hospitals. This pattern may be driven by insured patients leaving the commuting zone to receive medical care after a closure. We note, however, three facts. First, commuting zones are far larger than counties, suggesting that the average insured patient would have to travel a great distance for care if they left the region. Second, we do *not* find a statistically significant decrease in a commuting zone's aggregate uncompensated care costs following a closure. Third, many hospitals that close have their facilities converted into outpatient medical facilities. Given these facts, a reduction in the consumption of insured medical services following a closure would be consistent with a model in which the *hospital care* of insured patients is more discretionary than the *hospital care* of uninsured patients. This could either be because closing a patients' preferred provider increases the cost of receiving these services and as a result these marginal services are no longer purchased. Or it could be that this care shifts to non-hospital medical settings such as an outpatient facility or a physician's office. By contrast, we see no statistically significant reduction in uncompensated care. While the estimated changes in these two outcomes are not statistically distinguishable, the patterns suggest individuals seeking uncompensated care at a hospital are less able to either defer care or switch the type of provider in response to a closure of their preferred facility.

6. Which Hospitals Serve as Insurers of Last Resort?

The estimates above suggest that hospitals serve as a vital part of the United States social insurance system in providing health care to the uninsured without compensation. A remaining question, however, is whether all hospitals bear this burden equally. In particular, it is unclear whether non-profit hospitals serve a singular role as private social insurers. A unique feature of the American health care sector is the large fraction of firms that are structured as non-profit organizations. In our data, 51 percent of all hospitals and 73 percent of private hospitals are non-profits. These organizations are exempt from federal, state, and local taxes. In exchange for this preferential tax treatment, they are expected to provide a community benefit, an important component of which is charity care for the uninsured. There exists, however, a divisive debate over whether these organizations actually behave differently from for-profit hospitals.

We examine this question by testing whether non-profit hospitals respond differently to the share uninsured than for-profit hospitals. We begin by estimating our main state-year specification based on the ownership status of the hospital. Given the importance of EMTALA regulations, we would expect that all hospitals, regardless of their ownership structure, should experience an increase in uncompensated care costs resulting from uninsured emergency patients. However, if non-profit hospitals serve a unique role, we would expect them to exhibit a larger increase in uncompensated care costs following changes in the share uninsured.

Table 4 presents the effect of share uninsured on uncompensated care by hospital ownership. Columns (1) through (4) present estimates when the dependent variable is uncompensated care per capita. Panel A presents the estimates for non-profit hospitals and Panel B presents estimates for for-profit hospitals. Accounting for socioeconomic covariates and including region-by-year fixed effects, column (4) suggests that every newly uninsured person in a state is associated with $624 in uncompensated care costs for non-profit hospitals. The estimate for for-profit hospitals, however, has the opposite sign and is statistically insignificant at conventional levels. We can reject the null hypothesis that these two estimates are equal with a *p*-value lower than 0.001.

Estimates for the change in uncompensated care at for-profit hospitals may be imprecise because there are fewer for-profit hospitals, and they tend to be smaller than non-profit hospitals. This smaller size means that even if they change their provision of uncompensated care in response to changes in their local market, this may be hard to detect when measured as state-level uncompensated care per capita. For that reason, columns (5) through (8) present estimates when the dependent variable is uncompensated care costs as a percentage of overall expenditures. For non-profit hospitals, a 10 percentage point change in the share uninsured increases the percentage of overall costs from uncompensated care by 1.8 percentage points. By contrast, we find no statistically significant effect for for-profit hospitals. However, a test of the equality of the coefficients across these hospital types is not statistically significant at conventional levels.

One potential concern with the estimates for non-profit hospitals is that they represent a large and diverse set of hospitals. At the broadest level, these hospitals can be divided into those that are affiliated with a religious organization and those that are unaffiliated with a religious organization. These ownership structures could lead to differences in the intrinsic motivations of the firms. Appendix Table A5 presents estimates of the effect of the uninsured on non-profit hospitals based on their religious affiliation. The table presents very similar estimates for church-operated hospitals versus hospitals with no religious affiliation and suggests that the mission of different types of non-profit hospitals are not driving our results.

The smaller response among for-profit hospitals does not necessarily mean that these facilities simply deny services to the uninsured. For-profit hospitals may more carefully manage the *intensity* of services provided to

the uninsured residents in order to meet certain financial targets. Such a policy would allow them to comply with EMTALA without increasing overall costs. In addition, for-profit hospitals may simply locate in different areas or provide a set of services that are less amenable to the provision of uncompensated care. For example, for-profit hospitals may locate in markets in which fewer individuals are on the margin between being insured and uninsured. Changes in the statewide insurance coverage rate may not reflect changes for those markets. In accordance with this view, Norton and Staiger (1994) find that non-profit and for-profit hospitals located in the same area serve a similar number of uninsured patients, but for-profit hospitals choose to locate in areas with fewer uninsured people.

To explore that possibility, we next examine whether location can explain the difference here between non-profit and for-profit hospitals. Panels C and D of Table 4 present estimates of the same regression solely for hospitals located in HSAs that have both a non-profit and for-profit acute-care hospital with an ED. Given the small size of an HSA, these represent a fairly local market definition. The non-profit hospitals in these HSAs have a fairly similar response as the full non-profit sample. However, the for-profit hospitals in these HSAs have a much smaller response to changes in the share uninsured than the non-profit. The *p*-value on the test of equality of these coefficients is 0.15. The estimate for these for-profits is also approximately one-fifth the size of the estimate from the full for-profit hospital sample. This provides suggestive evidence that for-profit hospitals with a local non-profit competitor are even less exposed to increased uncompensated care costs resulting from changes in the share uninsured in the state.

These estimates suggest that, at least at the geographic level of the HSA, differential location cannot fully explain the differences in the response of for-profit and non-profit hospitals to changes in the demand for uncompensated care. It should further be noted that even if the remaining differences result from non-profit hospitals choosing to locate or remain in areas *within* HSAs that result in a greater burden from changes in the share uninsured, this is a difference in firm behavior.

All of these results suggest that non-profit hospitals bear more of the burden from changes in the demand for uncompensated care. We next ask whether the same is true after changes in the supply of uncompensated care. We test whether the closure of a nearby hospital affects non-profit hospitals differently from for-profit hospitals. Columns (3) and (4) of Table 3 present estimates of the change in uncompensated care costs following a closure by ownership of the hospital. Non-profit hospitals account for all of the increase in uncompensated care after the closure of a nearby hospitals. The effect among for-profit hospitals, by contrast, is negative and statistically insignificant. While these estimates are not statistically distinguishable from each other, this is primarily driven by the imprecision of the estimates for for-profit hospitals. Figures 8(c) and 8(d) present event-

study point estimates for non-profit and for-profit hospitals respectively. Prior to the closure, the estimates for non-profit hospitals are statistically insignificant and near zero; they then rise in the post-closure years and become statistically significant. We do not see a similar post-closure increase in costs at for-profit hospitals.

Columns (3) and (4) of Panel B in Table 3 present the estimated change in revenue by ownership status. Following a closure, non-profit hospitals see a statistically insignificant increase in revenue of approximately 11 percent. The change in revenue for for-profit hospitals is roughly 5 percent and is also statistically insignificant at conventional levels. This pattern can also be seen in Figures 9(c) and 9(d) which present event-study coefficients for the change in revenue among facilities that did not close for non-profit and for-profit hospitals respectively. The lack of a similarly large revenue increase for for-profit hospitals suggests that some portion of the lack of the increase in uncompensated care may come from the for-profit hospitals serving different local markets from the non-profit hospitals within a commuting zone.

Overall, the results point towards for-profit hospitals being less affected than non-profit hospitals by factors that affect the supply and demand of uncompensated care. While each part of the analysis often lacks statistical power to precisely distinguish the responses of for-profit and non-profit hospitals, the pattern of results consistently suggests that for-profit hospitals are less affected.

7. Can Hospitals Pass Uncompensated Care Costs onto Privately Insured Patients?

As a whole, the results above suggest a non-profit hospital's own costs are a function of the supply and demand for uncompensated care in its local market. A final, remaining question is whether hospitals actually bear financial risk from these cost shocks or if they simply pass on these costs by raising the prices that they charge privately insured patients.

Researchers and policymakers have long debated whether hospitals are able to pass on financial shocks to their paying customers. Historically, this question has centered on the degree to which changes in the reimbursement rate for government insurance programs are passed along to the privately insured. For example, the AHA has historically referred to reimbursement cuts as a "hidden tax" on all Americans (Health Insurance Association of America, 1982). Ten years later, a similar argument was made to blunt the complaints of hospitals regarding Medicare reimbursement cuts (ProPAC, 1992). This argument found new life during the debate over the ACA, as proponents of the ACA argued that it would benefit every American by reducing uncompensated care and thus the associated cost shifting (*National Federation of Independent Business v. Sebelius*).

The attractiveness of cost-shifting arguments to policymakers is obvious. However, there is little theoretical or empirical support for this argument. Theoretically, it is not obvious how hospitals could raise prices on one group of patients following a lump-sum financial shock from another group.[23] If hospitals were maximizing profits, then prices should have been optimal before the shock. For a price increase to be the optimal response to a financial shock requires two conditions. First, the hospital must possess some degree of pricing power in the private insurance market. Second, the hospital must not have fully exercised this power prior to the shock.

Dranove (1988) provides one such model of non-profit hospital behavior, where hospitals are maximizing both social welfare and profits. Under his model, in prosperous financial times hospitals keep prices low for the sake of social welfare. Following a lump sum financial shock, hospitals raise prices to preserve their profits.[24] While Dranove (1988) finds evidence of such a phenomena in the 1980s marketplace, an increase in insurer market concentration likely leaves hospitals less able to set prices for privately insured patients (Gowrisankaran and Town, 1997). Accordingly, Dranove, Garthwaite, and Ody (2014) find that only a small subset of hospitals with considerable market power raised prices in response to financial shocks from the 2008 recession. Other hospitals adjust by altering other parts of their community benefit such as decreasing the offering of less profitable services such as trauma centers. The average hospital likely absorbed some or all of the financial shock through lower profit margins.

In an attempt to estimate the financial incidence of increases in uncompensated care costs, we next examine the changes in profits from patient services that come from changes in the local demand for uncompensated care. If hospitals can fully recoup the lost funds in the form of higher prices on the privately insured, then their profit margins should be largely unaffected by increases in uncompensated care costs. In order to address this question, we require a precise definition of hospital profits. Given we are interested in the ability of hospitals to pass cost increases onto private patients, we focus our analysis on patient-care profits. We define patient-care profits as the direct revenue from treating patients minus the total costs. Given the large number of facilities with negative profits, we focus on the profit margin, profits divided by revenues, as the independent variable.

We begin by returning to the state-year regression equation described in Section 4, with this definition of patient-care profit margins as the dependent variable. Table 5 presents estimates for different samples of hospitals. Panel A presents the estimates for all hospitals and suggests that a 10-percentage-point increase in the

[23] If hospitals face rising marginal costs and a decreased quantity of privately insured patients, then it may be optimal for them to raise prices on the insured once the the number of uninsured patients rises. Such a possibility follows if more uninsured patients means fewer hospitalizations overall and that this, in turn, affects the marginal costs of the privately insured.

[24] Other work has found that in a model of capacity constrained physicians, providers can exhibit cost-following where a decrease in Medicare prices results in a decrease in private prices (Clemens and Gottleib, 2014).

share uninsured in a state is associated with a 1.1-percentage-point decline in the patient-care profit margin (standard error 0.8 percentage points). Panels B and C present the estimates for non-profit and for-profit hospitals respectively. Note that our estimates of increases in uncompensated care costs in Table 5 show that non-profit hospitals bore the majority of these increases. Accordingly, these non-profit hospitals experience a 1.3 percentage point decrease in their patient margin following a 10-percentage-point increase in the share uninsured. This estimate is statistically significant ($p = 0.01$) and is fairly similar across alternative specification as shown in the columns of the table.[25] The effect for for-profit hospitals is approximately one-sixth the magnitude of the estimate for non-profit hospitals and is statistically insignificant. It should be noted, however, that the estimates across ownership type are not statistically distinguishable, primarily because of the imprecision of the for-profit estimates.

These declines in patient margins show that non-profit hospitals are not able to pass *all* of the uncompensated care costs onto private insurers. We next conduct a back-of-the-envelope calculation to provide some understanding of how much of the cost may be passed along. Based on our estimates above, in 2011 a 10 percentage point increase in the share uninsured in the United States would increase uncompensated care costs at non-profit hospitals by between $10.3 and $11.5 billion.[26] This would decrease patient margins by between 2.0 and 2.2 percentage points. Our estimates suggest that hospitals absorb between 60 and 67 percent of the increased costs in lost profits on patient services.

While hospitals are not able to fully pass these costs onto the privately insured, this does not mean that they absorbed some of the costs and actually lost profits. It is possible that other revenue sources such as DSH payments or other government transfers could reimburse hospitals for these expenses. If this were the case, then we may see a decline in patient margin even if hospitals could pass this cost on to their privately insured patients. Again, we stress that this behavior should only apply to non-profit hospitals, who may consider the utility of privately insured patients in their objective function. Transfers from government sources should not affect

[25] Appendix Tables A14 through A18 present the main regression estimates with controls for state-specific linear time trends. The results with state trends have similar magnitudes, statistical significance, and patterns of heterogeneity (e.g., across ED/non-ED hospitals and non-profit/for-profit hospitals). The hospital-closure results are particularly robust to the inclusion of state-specific trends, which is to be expected given the sharp "on impact" effects in the event-study figures. Nevertheless, we prefer the main specifications presented by Tables 1 through 5 because the panel regression results in these tables more closely line up with the magnitudes of the cross-section and long-difference results in Figure 1 as well as the implied magnitudes of the state-specific case studies in Appendix Table A8.

[26] These costs represent forgone revenues, and therefore we must account for the fact that many of these newly uninsured patients likely came for social insurance programs that pay below the cost of providing care. Therefore, the low end of the range would occur if the change in the uninsured came from Medicaid patients, with an assumption that Medicaid is currently paying hospitals 90 percent of the costs of care (AHA, 2015). The high end of this range assumes that the patients come from payers that are reimbursing the hospital at zero profit level.

the profit maximizing price for for-profit hospitals or non-profit hospitals that are choosing to simply maximize profits. Appendix Table A6 present estimates of the relationship between the share uninsured and both operating margins and total margins. Both of these estimates show a similar decline to the patient-profit margin, suggesting incomplete reimbursement for uncompensated care costs and an inability of hospitals to fully pass on uncompensated care costs onto the privately insured.

In addition, we note that these profit-margin estimates provide a useful bounding exercise for concerns about measuring uncompensated care by adjusting hospital charges using a cost-to-charge ratio. These estimates of financial harm do not rely on any charge-based measures, and therefore our pass-through estimates could also represent a lower bound of the cost to hospitals in a situation of zero pass-through. Given our main estimates, this would suggest that even if hospitals are unable to actually pass any cost along, then each uninsured person would cost approximately $600.

8. CONCLUSION

American hospitals serve as insurers of last resort, providing an informal form of social insurance that partially fills the holes in the existing social safety net. Hospitals are put in this role by a combination of factors that force them to provide health care regardless of the patient's ability to pay. As a result, when governments do not provide health insurance, hospitals must provide it instead.

Our estimates can inform policymakers about the likely consequences of the ACA. That area is of substantial interest due to the recent decision, by some states, not to expand Medicaid. As of November 2016, 19 states have chosen not to implement the ACA's Medicaid expansion, even though the federal government will fund 90 percent of the cost through 2020. As a result, approximately 5.2 million individuals in these non-expanding states will not receive coverage under the ACA (Holahan et. al, 2012). The state portion of the cost of covering these individuals as of 2022 is estimated to be $6.25 billion.[27] Our estimates suggest that the uninsured population will generate approximately $6.4 billion in uncompensated care costs for hospitals that year. However, we note that our analysis of the average expenditures of the uninsured suggest that this represents only half of the direct medical costs accrued by the uninsured.

While hospitals may pass a small portion of these costs onto private insurers, they will be forced to either accept lower profits or adjust to higher costs in other manners. The Governor of Tennessee, Bill Haslam, al-

[27] The cost of the expansion to states is phased in over time, and as of 2022 states are responsible for their full portion (i.e. 10%) of the expansion costs.

luded to that possibility when he made the following remarks about the potential ACA Medicaid expansion in that state.

> We have to remember what the state went through seven years ago when it made the difficult decision to cut a lot of people from the TennCare rolls. We have to be very deliberate about making a decision to add that many and more back to the rolls, but I also understand that the decision isn't just as easy as standing here today and saying, 'We're not going to expand Medicaid.' There are hospitals across this state, many of them in rural communities, that are going to struggle if not close under the health care law without expansion, and that's not something to take lightly (Haslam, 2013).

Future research is needed to explore the long-run effects of uncompensated care costs. Potentially, as Governor Haslam suggests, uncompensated care shocks may eventually lead some hospitals to close. Indeed, from 1990 to 2009, approximately 30 percent of the nation's EDs closed, primarily due to hospital closures (Hsia, Kellerman, and Shen, 2011).

The overall welfare effects of such changes are unclear. On the one hand, ED closures and other reductions in services could reduce the efficiency of care provided, even to the insured. On the other hand, some existing research suggests that hospital closures have little effect on mortality (Joynt et al., 2005). Moreover, the results above suggest that, after a hospital closure, most of the uninsured are still able to find care by going to a different hospital in their commuting zone.

Lastly, this paper expands upon a large literature that has sought to estimate the benefits of public health insurance programs. The previous studies have focused on the effect of these programs on the beneficiaries themselves (Cutler and Gruber, 1996; Gross and Notowidigdo, 2011; Finkelstein et al., 2012;). This paper broadens that focus to the benefits of public health insurance on health-care providers. Specifically, we note that health insurance provides financial protection not just to enrollees, but also to the private firms they visit.

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Table 1. Effect of Uninsured Population on Uncompensated Care at All Hospitals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable:	Per-capita uncompensated care				Uncompensated care divided by expenditures			
				A. All Hospitals				
Share of population uninsured	793.37	814.14	841.77	830.51	0.17	0.16	0.16	0.14
	(299.71)	(295.10)	(335.49)	(302.37)	(0.04)	(0.05)	(0.05)	(0.04)
	[0.01]	[0.01]	[0.02]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.870	0.872	0.889	0.892	0.824	0.827	0.859	0.863
N	1,224	1,224	1,224	1,224	1,224	1,224	1,224	1,224
				B. Hospitals with an ED				
Share of population uninsured	797.34	816.90	845.59	832.43	0.18	0.17	0.16	0.15
	(308.06)	(304.26)	(349.55)	(315.75)	(0.05)	(0.05)	(0.05)	(0.05)
	[0.01]	[0.01]	[0.02]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.864	0.866	0.884	0.887	0.819	0.821	0.857	0.861
N	1,224	1,224	1,224	1,224	1,224	1,224	1,224	1,224
				C. Hospitals without an ED				
Share of population uninsured	- 4.21	- 3.10	- 5.04	- 3.21	0.02	0.02	0.02	0.03
	(11.14)	(11.93)	(17.84)	(17.65)	(0.04)	(0.05)	(0.05)	(0.05)
	[0.71]	[0.80]	[0.78]	[0.86]	[0.69]	[0.68]	[0.66]	[0.58]
R^2	0.480	0.480	0.549	0.551	0.294	0.295	0.389	0.391
N	1,200	1,200	1,200	1,200	1,200	1,200	1,200	1,200
				D. Acute-Care Hospitals with an ED				
Share of population uninsured	764.80	766.75	785.55	757.67	0.18	0.17	0.17	0.15
	(280.74)	(265.85)	(308.68)	(264.71)	(0.05)	(0.06)	(0.05)	(0.05)
	[0.01]	[0.01]	[0.01]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.869	0.871	0.888	0.891	0.818	0.821	0.857	0.862
N	1,224	1,224	1,224	1,224	1,224	1,224	1,224	1,224
State-year controls		✓		✓		✓		✓
Region-year fixed effects			✓	✓			✓	✓

Notes: The sample consists of the dependent variables calculated for each state and year from 1988 through 2011, for the given hospitals. The standard errors in parentheses are robust to auto-correlation between observations from the same state; associated p-values in brackets. Year and state fixed effects not shown.

Table 2. Effect of Uninsured Population on Uncompensated Care,
Different Methods of Adjusting Charges
Dependent Variable: Per-capita uncompensated care charges adjusted with given ratio

	(1)	(2)	(3)	(4)
	A. Main Specification for Hospitals that can be Matched to Medicaid Revenue-to-Charge Ratio			
Share of population uninsured	533.13	533.27	549.46	531.77
	(147.59)	(140.23)	(167.64)	(145.73)
	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.893	0.894	0.909	0.911
N	1,224	1,224	1,224	1,224
	B. Charges adjusted by Medicaid Revenue-to-Charge Ratio			
Share of Population Uninsured	431.26	432.61	364.34	378.17
	(133.34)	(123.86)	(127.31)	(107.82)
	[0.00]	[0.00]	[0.01]	[0.00]
	0.847	0.847	0.912	0.914
	1,224	1,224	1,224	1,224
	C. Share of MEPS Expenditures			
Expected health care charges of the uninsured	0.555	0.531	0.527	0.472
	(0.131)	(0.125)	(0.134)	(0.117)
	[0.000]	[0.000]	[0.000]	[0.000]
R^2	0.895	0.896	0.889	0.924
N	1,224	1,224	1,224	1,224
State-year controls		✓		✓
Region-year fixed effects			✓	✓

Notes: The sample consists of the dependent variables calculated for each state and year from 1988 through 2011. For Panels A and B, only hospitals that could merged to Medicaid revenue from Medicare Cost Reports are included. The standard errors in parentheses are robust to auto-correlation between observations from the same state; associated p-values in brackets. Year and state fixed effects not shown.

Table 3. The Effect of a Hospital Closure on Uncompensated Care at Neighboring Hospitals

Dependent Variable: The logarithm of uncompensated care or patient revenue

	(1)	(2)	(3)	(4)
Sample	Remaining hospitals	Total for commuting zone	Remaining non-profit hospitals	Remaining for-profit hospitals
		A. Uncompensated Care		
Post Closure	0.149	- 0.061	0.173	0.004
	(0.052)	(0.054)	(0.068)	(0.203)
	[0.004]	[0.252]	[0.011]	[0.983]
R^2	0.959	0.959	0.940	0.863
N	12,952	12,953	10,139	3,250
		B. Patient Revenue		
Post Closure	0.064	- 0.100	0.096	0.012
	(0.032)	(0.029)	(0.058)	(0.124)
	[0.044]	[0.000]	[0.096]	[0.921]
R^2	0.986	0.986	0.965	0.908
N	12,963	12,963	10,152	3,263

Notes: The sample consists of commuting zones. Commuting zone and year fixed effects not shown. The standard errors in parentheses are robust to autocorrelation between observations from the same commuting zone; associated p-values in brackets. Patient revenue refers to "net patient revenue," revenue received by the hospital for patient care irrespective of charges.

Table 4. Effect of Uninsured Population on Uncompensated Care By Hospital Ownership

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable:	Per-capita uncompensated care				Uncompensated care divided by expenditures			
				A. Non-profit hospitals				
Share of population uninsured	517.26	525.30	583.07	581.82	0.19	0.18	0.19	0.17
	(158.84)	(145.55)	(166.93)	(146.03)	(0.05)	(0.05)	(0.05)	(0.05)
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
R^2	0.870	0.874	0.890	0.892	0.803	0.806	0.840	0.845
N	1,224	1,224	1,224	1,224	1,224	1,224	1,224	1,224
				B. For-profit hospitals				
Share of population uninsured	- 34.09	- 28.09	- 54.57	- 58.86	0.05	0.06	0.04	0.04
	(54.59)	(47.62)	(57.51)	(52.36)	(0.04)	(0.04)	(0.04)	(0.04)
	[0.54]	[0.56]	[0.35]	[0.27]	[0.22]	[0.13]	[0.37]	[0.34]
R^2	0.745	0.754	0.824	0.826	0.715	0.717	0.774	0.774
N	984	984	984	984	984	984	984	984
p-value from test of equality with Panel A	0.001	0.001	0.001	0.000	0.013	0.051	0.023	0.052
				C. Non-profit hospitals with a nearby for-profit hospital				
Share of population uninsured	236.78	274.73	286.39	307.93	0.15	0.12	0.16	0.13
	(116.81)	(120.20)	(126.05)	(126.07)	(0.06)	(0.06)	(0.08)	(0.07)
	[0.05]	[0.03]	[0.03]	[0.02]	[0.01]	[0.04]	[0.04]	[0.10]
R^2	0.885	0.887	0.904	0.905	0.691	0.697	0.775	0.779
N	880	880	880	880	880	880	880	880
p-value from test of equality with Panel A	0.156	0.186	0.158	0.157	0.564	0.433	0.784	0.653
p-value from test of equality with Panel B	0.037	0.021	0.015	0.008	0.125	0.346	0.157	0.318
				D. For-profit hospitals with a nearby non-profit hospital				
Share of population uninsured	- 44.93	- 47.28	- 65.73	- 81.04	0.03	0.04	0.03	0.01
	(60.06)	(52.81)	(70.07)	(61.93)	(0.05)	(0.05)	(0.07)	(0.07)
	[0.46]	[0.38]	[0.35]	[0.20]	[0.51]	[0.47]	[0.71]	[0.87]
R^2	0.611	0.627	0.692	0.703	0.579	0.581	0.682	0.685
N	850	850	850	850	850	850	850	850
p-value from test of equality with Panel C	0.034	0.016	0.016	0.007	0.118	0.271	0.185	0.255
State-year controls		✓		✓		✓		✓
Region-year fixed effects			✓	✓			✓	✓

Notes: The sample consists of the dependent variables calculated for each state and year from 1988 through 2011, for the given hospitals. The standard errors in parentheses are robust to auto-correlation between observations from the same state; associated p-values in brackets. Year and state fixed effects not shown. We define a non-profit hospital as having a nearby for-profit hospital if at least one for-profit hospital exists in the same HSA. All hospitals in the sample are acute-care hospitals with an emergency room.

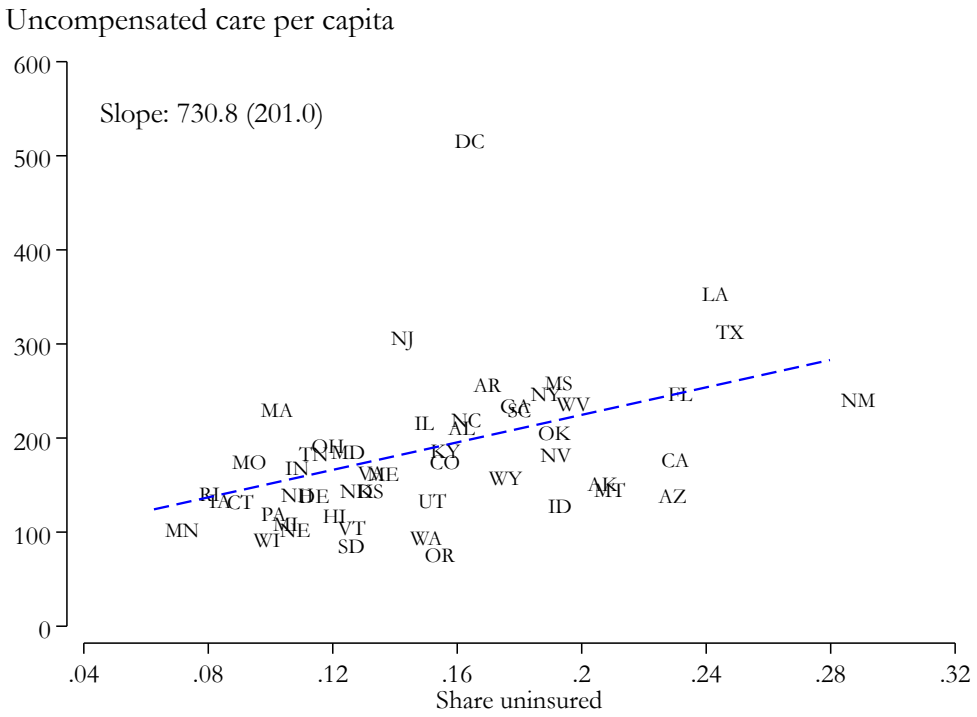
Table 5. Effect of Uninsured Population on Profit Margins
Dependent Variable: Patient-care profit margin

	(1)	(2)	(3)	(4)
		A. All hospitals		
Share of population uninsured	- 0.089	- 0.104	- 0.145	- 0.160
	(0.062)	(0.058)	(0.067)	(0.068)
	[0.158]	[0.080]	[0.034]	[0.022]
R^2	0.659	0.663	0.707	0.708
N	1,224	1,224	1,224	1,224
		B. Non-profit hospitals		
Share of population uninsured	- 0.102	- 0.108	- 0.135	- 0.143
	(0.043)	(0.044)	(0.045)	(0.046)
	[0.023]	[0.017]	[0.005]	[0.003]
R^2	0.666	0.667	0.716	0.717
N	1,224	1,224	1,224	1,224
		C. For-profit hospitals		
Share of population uninsured	- 0.090	- 0.041	- 0.076	- 0.039
	(0.147)	(0.145)	(0.165)	(0.167)
	[0.542]	[0.776]	[0.650]	[0.814]
R^2	0.599	0.604	0.658	0.664
N	1,049	1,049	1,049	1,049
p-value from test of equality with Panel B	0.924	0.816	0.771	0.577
State-year controls		✓		✓
Region-year fixed effects			✓	✓

Notes: The sample consists of the dependent variables calculated for each state and year from 1988 through 2011, for the given hospitals. The standard errors in parentheses are robust to auto-correlation between observations from the same state; associated *p*-values in brackets. Year and state fixed effects not shown. All hospitals in the sample are hospitals with an emergency room.

Figure 1. Share Uninsured and Uncompensated Care Costs

A. 2000 Cross Section



B. 2000–2005 Changes

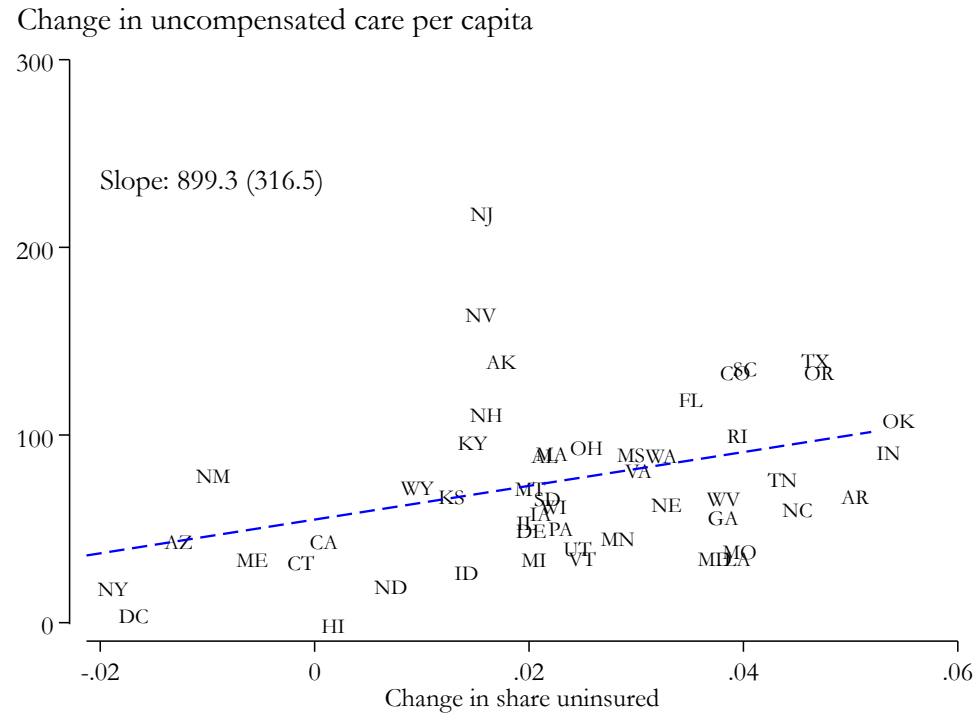
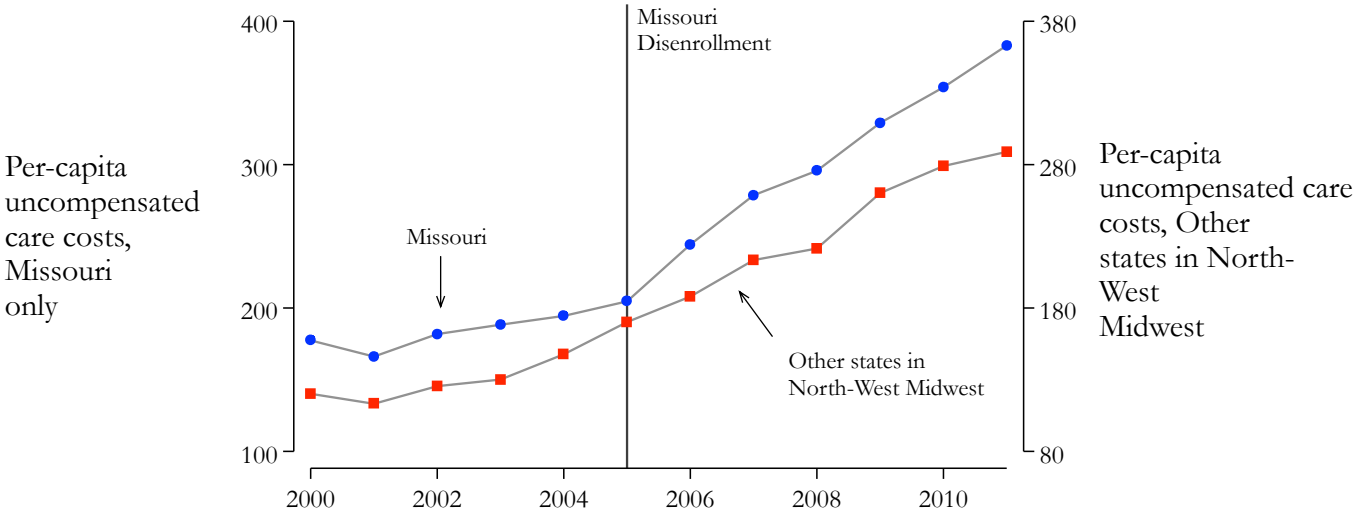
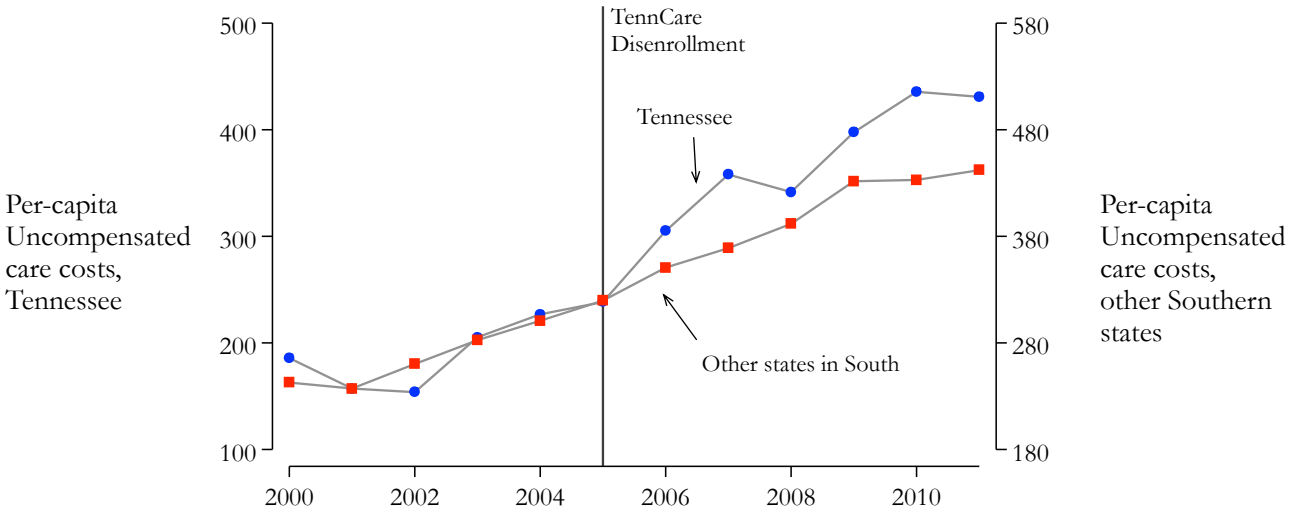


Figure 2. Total Uncompensated Care Costs in Missouri



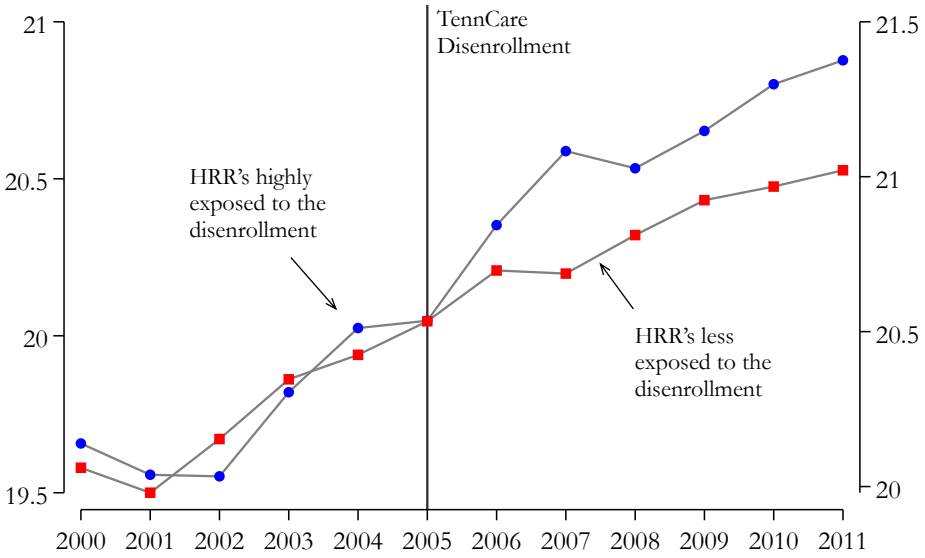
Note: This figure presents total uncompensated care costs in Missouri versus other states in the North-West Midwest, as reported in the AHA survey. See text for details.

Figure 3. Uncompensated Care Costs in Tennessee



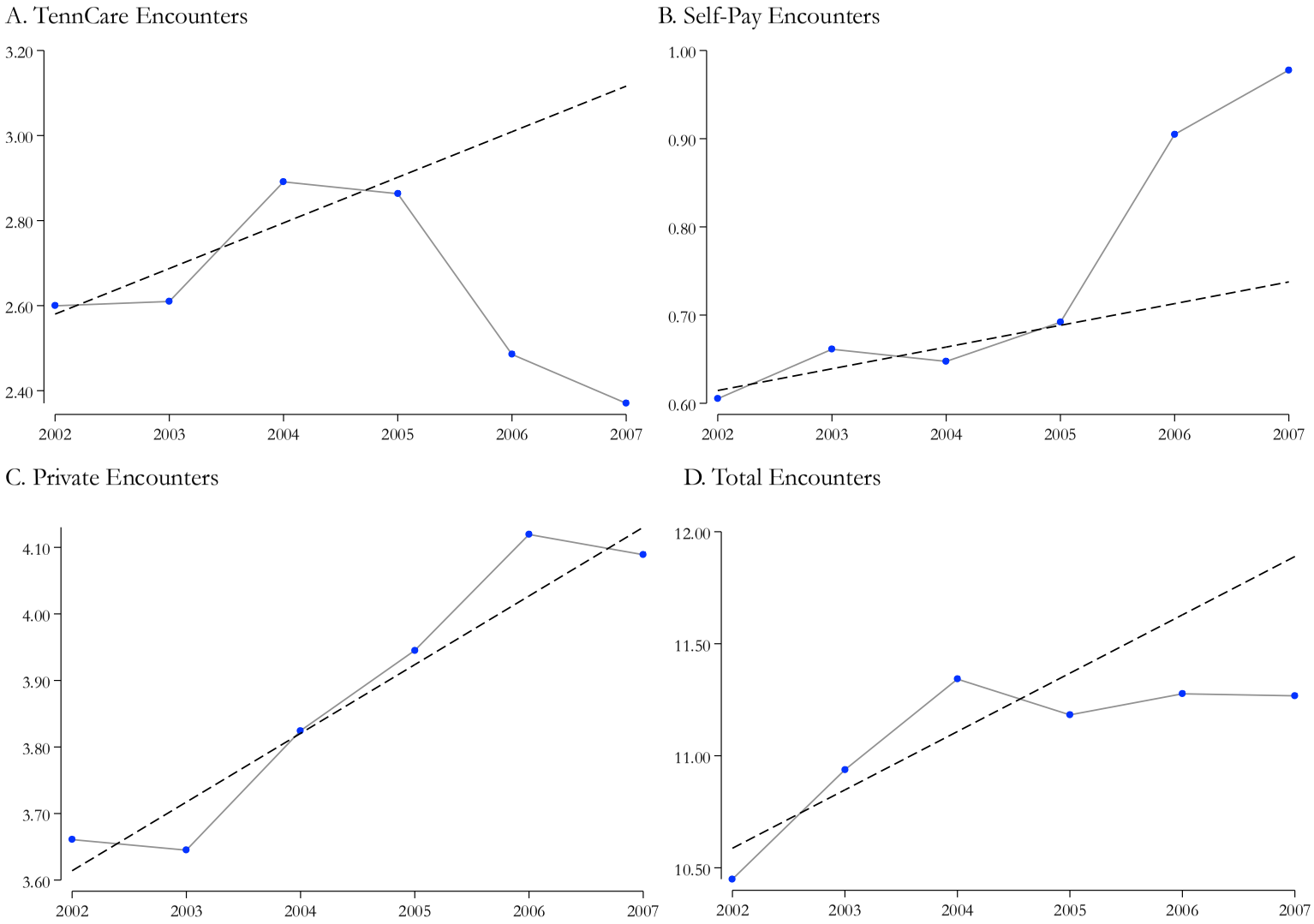
Note: This figure presents total uncompensated care costs in Tennesse versus other Southern states, as reported in the AHA survey. See text for details.

Figure 4. Changes in Uncompensated Care Costs within Tennessee, AHA Data



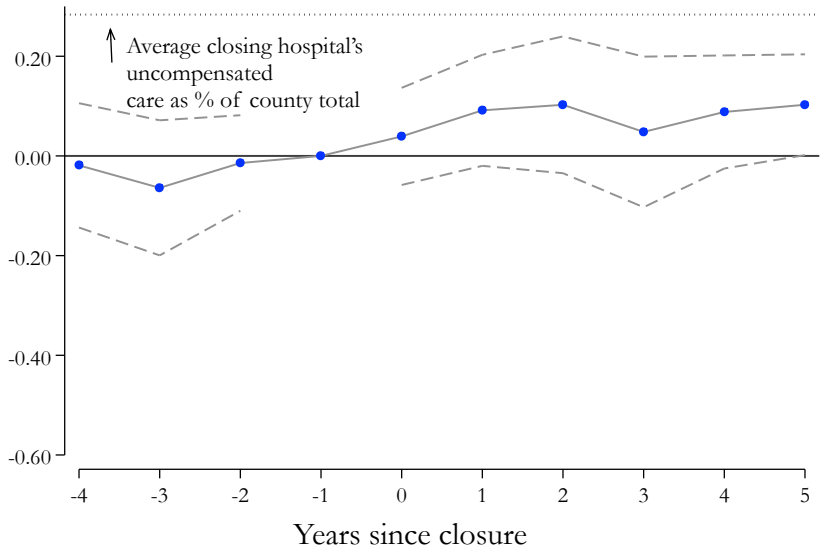
Note: This figure presents the natural logarithm of uncompensated care costs for Hospital Referral Regions (HRR's) that contain Tennessee hospitals before and after the TennCare disenrollment. For each HRR, we calculate the change in TennCare enrollment between 2004 and 2005 divided by the 2004 population. HRR's with that number greater than the median are categorized as highly exposed. See text for details.

Figure 5. Hospital Encounters in Tennessee, JAR Data



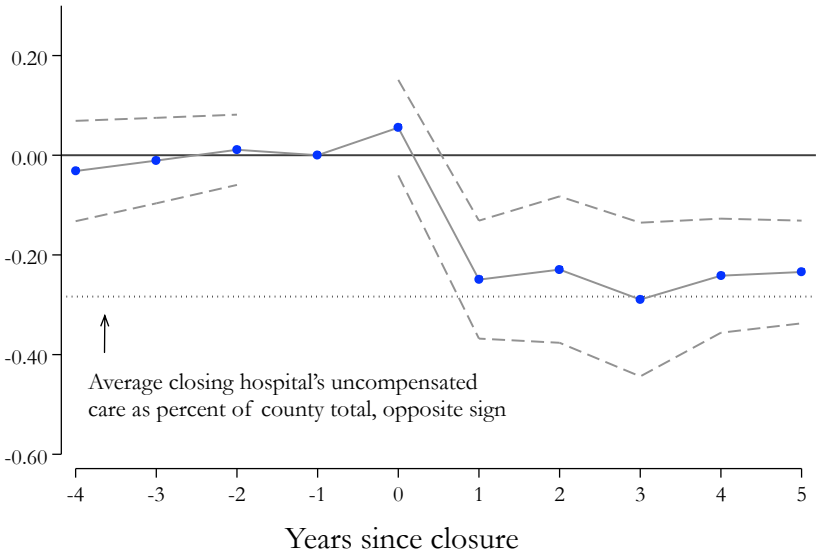
Note: This figure presents the number of hospital encounters (ED visits, outpatient visits, and inpatient visits) at hospitals in Tennessee, as recorded in the JAR data. The figures plot encounters in millions. In each panel, the dashed line plots predicted encounters based solely on 2002 through 2005.

Figure 6. Change in Uncompensated Care in County's Remaining Hospitals After a Closure



Note: This figure plots point estimates from a regression of total uncompensated care for each county's surviving hospitals on a series of exhaustive indicator variables for the years since the closure of a large hospital. The year before the closure is the omitted category. The data consist of GAO records of hospital closures combined with the AHA survey. See text for details. The dashed lines connect 95-percent confidence intervals.

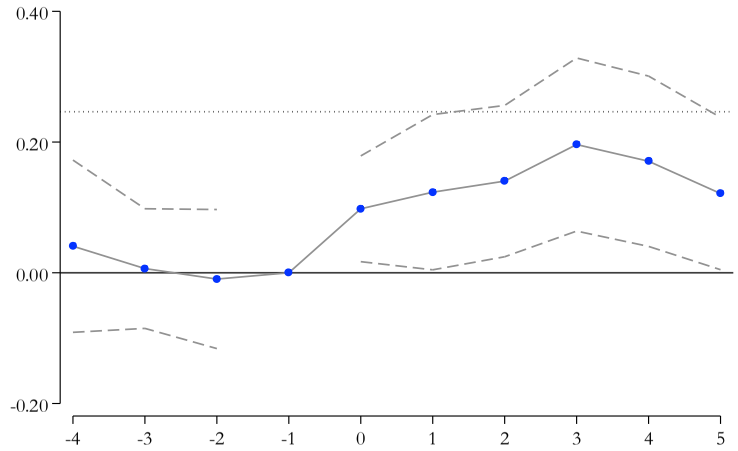
Figure 7. Change in Total Uncompensated Care in County After a Hospital Closure



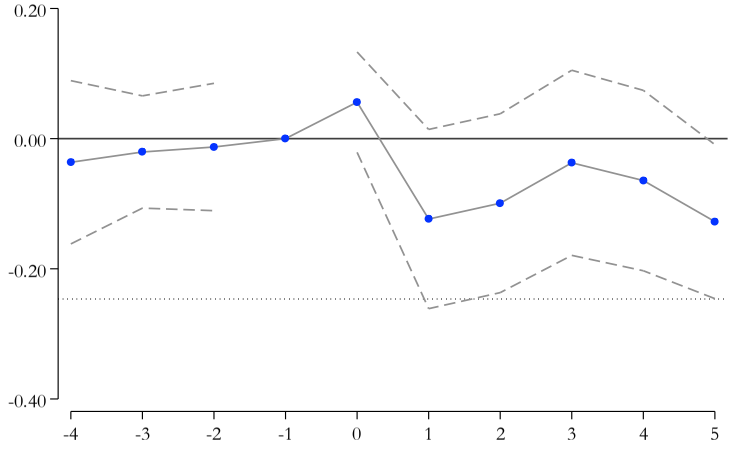
Note: This figure plots point estimates from a regression of total uncompensated care for each county on a series of exhaustive indicator variables for the years since the closure of a large hospital. The year before the closure is the omitted category. The data consist of GAO records of hospital closures combined with the AHA survey. See text for details. The dashed lines connect 95-percent confidence intervals.

Figure 8. Change in Uncompensated Care in a Commuting Zone After a Hospital Closure

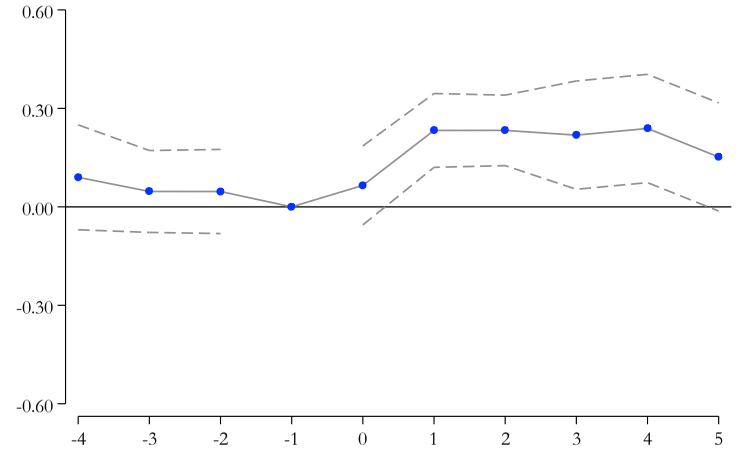
A. Uncompensated Costs in Remaining Hospitals



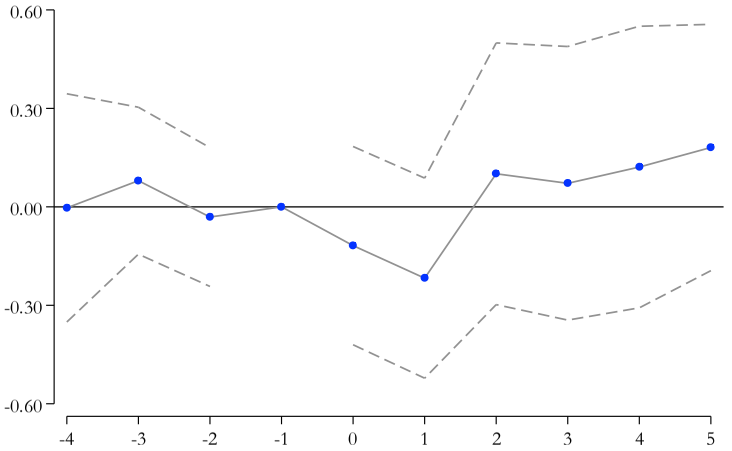
B. Total Uncompensated Care in Commuting Zone



C. Uncompensated Costs in Remaining Non-Profit Hospitals



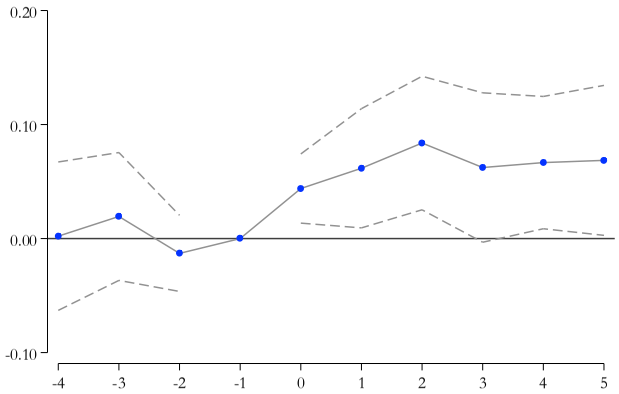
D. Uncompensated Costs in Remaining For-Profit Hospitals



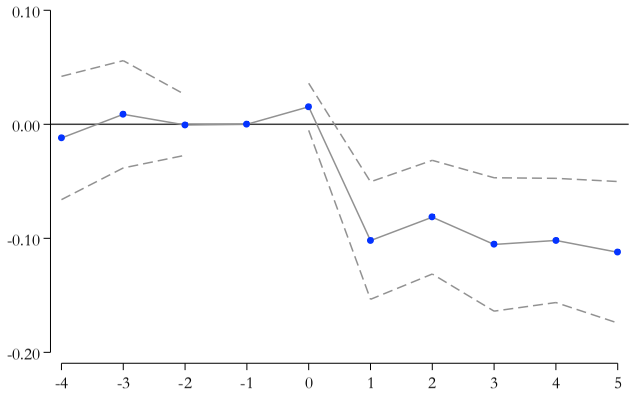
Note: This figure plots point estimates from a regression of hospital uncompensated care in each commuting zone on a series of exhaustive indicator variables for the years since the closure of a large hospital. The year before the closure is the omitted category. The data consist of GAO records of hospital closures combined with the AHA survey. See text for details. The dashed lines connect 95-percent confidence intervals.

Figure 9. Change in Revenue in a Commuting Zone After a Hospital Closure

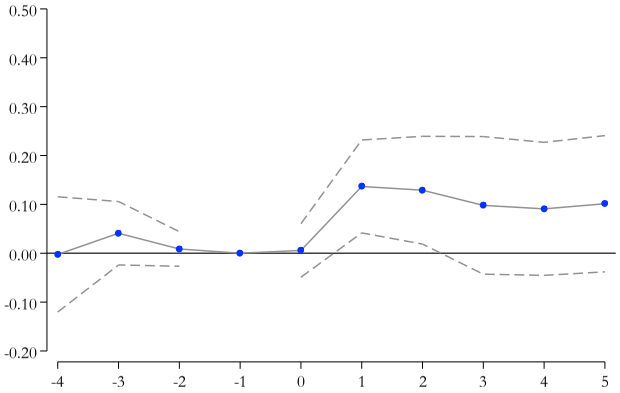
A. Revenue in Remaining Hospitals



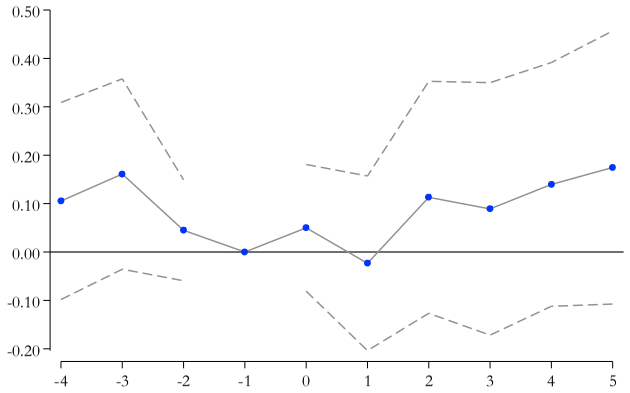
B. Total Revenue in Commuting Zone



C. Revenue in Remaining Non-Profit Hospitals



D. Revenue in Remaining For-Profit Hospitals



Note: This figure plots point estimates from a regression of hospital revenue in each commuting zone on a series of exhaustive indicator variables for the years since the closure of a large hospital. The year before the closure is the omitted category. The data consist of GAO records of hospital closures combined with the AHA survey. See text for details. The dashed lines connect 95-percent confidence intervals.