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Reinsuring the Insurers of Last Resort

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Abstract

Hospitals face large and variable costs from treating indigent care patients. Two methods of "reinsuring" hospitals against these costs are providing these patients with insurance and directly providing hospitals with supplemental payments to cover the expected costs of treating the indigent. Currently, the U.S. uses a hybrid of these approaches, insuring some indigent patients through Medicaid and providing hospitals with supplemental payments through programs such as Medicaid Disproportionate Share. The researchers evaluate the economic fundamentals of supplemental payments in the U.S. safety net. They find that providing indigent care patients with insurance and providing hospitals with supplement payments are imperfect substitutes to hospitals because they differ in the extent to which they protect hospitals from risk, incentivize cost control, and incentivize certain investments. Overall, the authors find that supplemental payments are used to increase access to hospitals in areas with many indigent patients, rather than to provide efficient intertemporal risk-protection to hospitals or incentivize cost control.

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1 Introduction

Compared to nearly every other developed country, the United States (U.S.) relies more on private markets to provide health insurance and medical services. Due to equity concerns, the U.S. augments these markets with a social safety net that includes informal health insurance for patients through uncompensated care from private medical providers, formal insurance through Medicaid (i.e.the U.S. social insurer for the poor and disabled), and supplemental payments made by Medicaid directly to hospitals.

Hospitals provide uncompensated care for variety of reasons, including the intrinsic motivations of hospital boards, fulfillment of obligations for tax exemption, and federal requirements to provide emergency services to all. While medical providers can bill patients for these emergency services, the low-income uninsured pay only 20 and 35 cents of these bills [Finkelstein et al., 2019, Hadley et al., 2008, Coughlin et al., 2014, Mahoney, 2015], and providers write-off the remainder. Providing informal health insurance exposes U.S. hospitals to costs and uncertainty, the magnitudes of which vary across hospitals [Garthwaite et al., 2018]. This exposure is palpable: 5 percent of hospital costs are from uncompensated care, an amount that roughly equals the average hospital profit margin.[1]

Hospitals would have meaningfully higher uncompensated care costs absent Medicaid, which provides formal health insurance to many individuals who would otherwise be uninsured. As of 2019, Medicaid covered over 70 million Americans, making it the largest insurer in the U.S. Because the uninsured pay only a small fraction of their medical bills, hospitals and other "insurers of last resort" are some of the primary financial beneficiaries of formal insurance through Medicaid [Finkelstein et al., 2019, Garthwaite et al., 2018].

Even after receiving Medicaid payments for services rendered and collecting (partial) payment from the uninsured, many hospitals face economically meaningful losses on their care. To at least partially compensate hospitals for these losses, the government makes supplemental payments to hospitals through programs such as Medicaid Disproportionate Share (DSH). In contrast to Medicaid's fee-for-service payments, these supplemental payments are not explicitly tied to care provided to any particular patient.[2] Instead, these payments are intended to partially compensate hospitals for the *overall ex-post shortfalls* arising from treating indigent patients. States have broad discretion in how they distribute these supplemental payments to hospi-

[1] Average hospital margins varied between 2.0 and 5.5 percent from 1992 to 2010 [Garthwaite et al., 2018].

[2] We use fee-for-service to describe payment for medical services rendered to a particular patient, such as those that Medicaid makes to hospitals on a per-service, per-diem, or per-patient basis, including explicit fee-for-service payments or prospective payments. More generally, we use fee-for-service to describe any payments that are not supplemental payments.

tals, which makes it possible to use supplemental payments to pursue distributional goals that could not be achieved through fee-for-service payments.

Although supplemental payments account for roughly one quarter of all Medicaid payments to hospitals, their role in the safety net has received little attention compared to the role of formal health insurance coverage by Medicaid.[3] In this paper we analyze the economics of these supplemental hospital payments as part of the optimal design of the U.S. healthcare safety net.

When designing a safety net, the social planner must weigh several factors. The most obvious is ensuring access to care while minimizing patient financial exposure. This, in turn, requires providing sufficient payments to encourage hospitals to treat the indigent. Narrowly speaking, this means paying hospitals at least the expected marginal cost of treating these patients. However, the social planner may also want to incentivize investments in some public goods, such as assuring that hospitals locate near indigent patients and provide services that best meet their needs. Therefore, more broadly, the social planner may want to cover some of hospitals' fixed costs. The social planner may also want to partially insure the hospital against other shortfalls. Doing so has the further benefit of minimizing the financial risks facing hospitals, but comes with the downside of possibly disincentivizing hospitals from controlling costs.

In this paper we begin by documenting a number of patterns about the provision of indigent care in the U.S. as well as the extent to which supplemental payments "insure" against different types of exposure to indigent care in the U.S. We contrast supplemental payments with fee-for-service Medicaid payments. The former provide for additional "insurance" benefits but disincentivizing cost control. We also consider the possibility that providing hospitals with greater "insurance" against indigent care costs may in fact incentivize societally beneficial investments by hospitals, rather just disincentivizing cost control.

We find that Medicaid fee-for-service and supplemental payments are imperfect substitutes in the social safety net because each addresses and creates its own economic distortions. This finding stands in contrast to the prevailing policy wisdom, which is that these two types of spending are perfect substitutes because they both insure hospitals against indigent care costs.[4] An implication of this conclusion is that an efficient safety net likely includes both Medicaid fee-for-service payments and supplemental payments.

[3]Researchers have examined Medicaid's effect on healthcare utilization [Anderson et al., 2012, Card et al., 2008, Finkelstein et al., 2012, Kolstad and Kowalski, 2012, Miller and Wherry, 2017, Taubman et al., 2014], health outcomes [Goodman-Bacon, 2018, Baicker et al., 2013, Card et al., 2009, Currie and Gruber, 1996, Finkelstein et al., 2012, Miller et al., 2019], and financial health, especially for enrollees Finkelstein et al. [2019], Brevoort et al. [2018], Hu et al. [2018].

[4]This conventional policy wisdom is revealed in the text of the Affordable Care Act, which increased eligibility for formal Medicaid insurance a reduced supplemental payments.

Indeed, we find that relying on one of these types of payments in isolation would almost certainly constrain policymakers from efficiently accomplishing the economic goals of an optimal safety net. Absent supplemental payments, hospitals that are heavily exposed to indigent patients bear at least some of the incidence of their role in the safety net and are less able to provide additional public goods such as access to emergency or other hospital-based services in particular communities.[5] Therefore, supplemental payments *can* lead to a more complete safety net by providing policymakers with the discretion to target payments that further investments in public goods. This is true even in a system where Medicaid is expanded to cover all indigent patients but continues to pay below average cost because under such a system there would be potentially suboptimal incentives for hospitals to operate or invest in areas with numerous indigent patients.

We begin by showing that the existing safety net reinsures hospitals against much of their average exposure to indigent patients. For example, in 2006, an additional dollar of losses from treating indigent patients (prior to accounting for supplemental payments) increased supplemental payments by roughly 76 cents. This targeting effectiveness has grown over time. By 2013, this reinsurance rate had increased to 90 cents for every dollar of losses.

Despite this reinsurance against hospitals' average exposure to indigent patients, we find that supplemental payments provide far less reinsurance against year-over-year volatility in the losses from treating such patients. Supplemental payments reimburse hospitals for roughly $0.41 for every dollar of year-over-year variation in losses from treating indigent patients. This average amount of payments masks potentially important variation by ownerserhip status. Government-owned hospitals receive approximately $0.60 of reinsurance for every dollar of year-over-year variation in losses while for-profit and non-profit hospitals received far lower, but statistically indistinguishable, reinsurance of $0.38 and $0.29 per dollar of losses, respectively.

There are two potential efficiency rationales for reinsuring hospitals for more of their average exposure to indigent patients than for year-over-year volatility in their losses from treating such patients. First, reinsuring hospitals for their average exposure to indigent patients may affect the provision of societally valuable public goods by enabling hospitals to cover the fixed costs needed to operate in areas with many indigent patients. Second, providing more limited reinsurance for year-over-year variation in losses may better incentivize hospitals to control costs.[6] The relative importance of these two rationales may vary by ownership status.

[5] While it may be tempting to simply rely on a hospital's non-profit tax status to ensure the provision of an optimal amount of these public goods, there is limited evidence that this status has a meaningful effect on hospital behavior.

[6] States may reinsure hospitals against their expected average losses by conditioning supplemental payments on observable

In order to further evaluate the degree to which policymakers trade off the competing interests of risk protection and cost control, we estimate how supplemental payments differ for: (1) financial shocks over which hospitals have more control, specifically labor costs and capital investments; and (2) financial shocks that are largely outside of a hospital's control, specifically increased uncompensated costs caused by the closure of other hospitals in the local market. We hypothesize that differences between the use of supplemental payments to address these types of shocks would provide some evidence that policymakers are attempting to balance these competing interests.

Across all hospitals we find that supplemental payments provide coverage for both types of shocks, which suggests these supplemental payments are not being finely tuned to incentivize cost control. Reimbursement for more discretionary increases in losses, such as physical capital expenditures, creates an obvious concern that supplemental payments introduce a meaningful cost-plus system into the safety net. Rather than simply making hospitals financially whole for spending that would have occurred with or without the reinsurance, these reimbursements could induce wasteful spending.

When considered in greater detail, the results suggest that at least some supplemental payments are being targeted to promote potentially societally valuable investments that would not otherwise have occurred. Specifically, we find supplemental payments cover a higher share of investments in physical capital by government-owned hospitals than of other costs. It is possible that states are more concerned about keeping such hospitals solvent in the face of high losses on indigent patients or with incentivizing societally valuable investments at these hospitals than they are about inducing excess spending through cost-based supplemental payments. This would be particularly true if states believed that these hospitals generated meaningful positive externalities. We show in Figure 3 that government-owned hospitals are disproportionately exposed to indigent care patients and therefore may necessitate particular attention by policymakers.

Taken together, our results demonstrate that the various components of the existing social safety each address different economic concerns. While formal Medicaid health insurance is the majority of safety-net spending, it leaves gaps that would otherwise expose certain hospitals to large losses from treating indigent patients. This would be true even with broader Medicaid eligibility and therefore demonstrates that formal insurance and supplemental payments are imperfect substitutes in the healthcare safety net. Reinsuring hospitals using supplemental payments, rather than using payments tied to Medicaid patient

characteristics that will be correlated with a hospital's average losses, such as location, rather that by actually conditioning payments on hospitals' average losses.

care, increases payments to hospitals treating indigent patients more than the alternative of simply increasing Medicaid eligibility to cover more of the uninsured. The reason is that, as long as Medicaid fee-for-serve payments remain below the average costs of treating Medicaid patients, payments that are linear in the number of Medicaid patients expose hospitals with larger numbers of Medicaid patients to higher losses. By redistributing from hospitals with less exposure to indigent patients to hospitals with more exposure to indigent patients, Medicaid supplemental payments create incentives for hospitals to operate or invest in areas with a lot of indigent patients.

The rest of this paper is organized as follows. In Section 2, we provide an overview of the relevant features of the Medicaid program, particularly the different ways that states can reimburse hospitals. Section 3 describes the data. Section 4 presents the paper's central results, which are a number of estimates of the extent to which Medicaid supplemental payments reinsure hospitals against losses on the uninsured or from low Medicaid base reimbursement rates. Section 5 whether Medicaid reinsures hospitals more for certain types of losses that are arguably less subject to moral hazard than other types of losses that are arguably more subject to moral hazard. Section 6 presents evidence that our results are robust are unaffected by the existence of other public payments. Section 7 concludes.

2 The U.S. social safety net for hospitals

Medicaid is a social health insurance program that is jointly financed by the states and federal government. From relatively modest beginnings in 1965, the program has grown in size and scope. The federal government provides states with matching funding for "qualifying Medicaid expenditures." The rate of the match varies across states. Prior to the Omnibus Budget Reconciliation Act of 1981 (OBRA 1981), both Medicaid and Medicare reimbursed hospitals at cost-plus prices. OBRA 1981 authorized states to determine their own methodologies for Medicaid to reimburse hospitals and created the Medicaid Disproportionate Share (DSH) program, which required states to "take into account" the financial needs of hospitals treating predominantly low-income populations. OBRA 1981 also limited Medicaid hospital prices to "Upper Payment Limits" (UPLs), which required that Medicaid hospital prices remain, on average, below Medicare hospital prices. In the two sections below we discuss both the rational for supplemental payments and details about the structure of these payments that are important to our analyses.

2.1 An economic rationale for both Medicaid fee-for-service and supplemental payments

Health insurance in the U.S. is a patchwork that often leaves individuals without coverage. Even after the passage of the ACA and the subsequent expansion of Medicaid and growth of insurance marketplaces, about 10 percent of the U.S. population remains uninsured.[7] With a non-trivial portion of the population without insurance at any given time, many uninsured Americans are reluctant to seek care. When they do, hospitals may be reluctant to treat them, knowing that doing so may lead to large financial losses. Even when patients are covered by Medicaid, reimbursements may fall well short of average costs. This influences the size and nature of the fixed-cost investments that hospitals heavily exposed to indigent care patients would be willing to make.

Medicaid's fee-for-service payments are a form of "market-based" reinsurance that partially reinsure hospitals against their exposure to the indigent. They are a form of "market-based" reinsurance because those hospitals that attract more Medicaid patients receive more of this reinsurance. Using a "market-based" system is attractive because it provides incentives for hospitals to provide services in a cost-effective manner to attract Medicaid patients. However, Medicaid's fee-for-service payments do not fully reinsure hospitals against their exposure to the indigent because of two features of the U.S. Medicaid program.

First, Medicaid fee-for-service payments are often below average costs. Paying below average cost influences the size and nature of the fixed-cost investments hospitals that are heavily exposed to Medicaid patients will make. This would be true even if Medicaid provided universal coverage.

Second, Medicaid fee-for-service payments do not fully reinsure hospitals because Medicaid's current eligibility rules leave some uninsured. Because Medicaid fee-for-service payments are proportionate to the number of Medicaid patients a hospital treats, Medicaid fee-for-service payments do not reinsure hospitals against the costs of treating the uninsured. To see why, note that the hospitals that treat the uninsured may not be the same as the hospitals that treat Medicaid patients. The hospitals that treat the uninsured may not even be the primary beneficiaries of expansions of Medicaid. Often, the same patients choose to receive care at different hospitals when uninsured (and a source of uncompensated care costs for a hospital) versus when they are insured by Medicaid (and a source of Medicaid fee-for-service payments for a hospital). For

[7] As the result of a 2010 Supreme Court decision, states were given the option to pass a Medicaid expansion to all individuals earning less than 138 percent of the federal poverty line. Even in states that expanded Medicaid under the ACA, hospital uncompensated care costs accounts for approximately 3.1 percent of hospital operating costs. In states that have not expanded Medicaid and therefore have higher uninsurance rates, hospital uncompensated care costs remain approximately 5.7 percent of hospital operating costs [Dranove et al., 2016].

example, government-owned hospitals often provide societally-valuable services in indigent communitities, and treat a large number of uninsured patients. But Duggan et al. [2019] find that patients gaining Medicaid coverage through the ACA are less likely to seek care at government hospitals than they were when uninsured.[8]

Medicaid supplemental payments can in theory address some of the gaps left by Medicaid fee-for-service payments. Medicaid supplemental payments can be targeted towards hospitals that provide societally beneficial care but would otherwise be unable to cover their costs. This is true regardless of whether these hospitals are unable to cover their costs because of low fee-for-service Medicaid payments or because they treat large numbers of uninsured patients. However, discretionary Medicaid supplemental payments may not be able to incentivize hospitals to provide high quality, cost-effective care as well as "market-based" reinsurance. Furthermore, because the allocation of Medicaid supplemental payments is discretioary, it may be caprious or otherwise contrary to the goals of the social safety net.

By using a combination of fee-for-service Medicaid payments to give all hospitals some incentive to provide high quality, cost-effective care to Medicaid patients, and using supplemental payments to specifically target hospitals that would otherwise be unable to cover their fixed costs, Medicaid fee-for-service payments and supplemental payments serve complementary purposes. For this reason, a more complete safety net is likely comprised of both Medicaid fee-for-service and supplemental payments.

2.2 Background on the structure of supplemental payments

The existing system of supplemental payments involves a number of different programs. That said, as we discuss below, the economics of these various programs are often quite similar. Medicaid reimbursements can be categorized as nondiscretionary base payment rates or discretionary supplemental payments. Medicaid reimburses hospitals at base payment rates for care provided to patients (typically) on a fee-for-service basis. These base payment rates are (typically) lower than other payor rates and (typically) below average cost. States can provide hospitals with supplemental payments through Medicaid DSH or through other reimbursement methods. We refer to all non-DSH supplemental payments as UPLs because all such supplemental payments are subject to UPLs and are reported in aggregate in our data [MACPAC, 2019].[9] For

[8]These authors find no reduction in supplemental payments, but given that DSH funding had yet to be reduced at the national level the authors do not have the ability to observe the new, post-ACA equilibrium.

[9]Other type of supplemental payment are for graduate medical education and to hospitals that contract with Medicaid managed care organizations and are ineligible for DSH payments for services to managed care enrollees

any hospital that receives Medicaid DSH payment, which includes all hospitals in our main sample, Medicaid supplemental payments are capped so that they do not exceed the hospital's losses on uninsured and Medicaid patients; we define "indigent" patients as uninsured and Medicaid patients.[10] While DSH and UPL payments are subject to different rules and limits, the two types of supplemental payments are largely fungible and therefore we distinguish between them in most of our analyses. Each state is required to distribute Medicaid DSH according to methodologies codified in its Medicaid plans. However, states retain discretion—and are not required to codify their methodologies—in distributing further supplemental funds to hospitals, subject to UPLs. As a result, states typically have room to adjust supplemental payments to hospitals in response to shocks to hospital losses on indigent patients. Some adjustments to supplemental payments occur mechanically as a result of the state's Medicaid DSH methodology, but because of the discretion that each state has in making UPL payments to hospitals, how Medicaid supplemental payments are distributed is largely discretionary, and ultimately an empirical question.

OBRA 1981 also created an unintentional "opportunity" for states to shift Medicaid spending to the federal government with "fiscal shenanigans" [Baicker and Staiger, 2005] whereby states could increase matching federal Medicaid funding by raising hospital prices and financing these higher hospital prices through taxes on hospitals [Coughlin et al., 2004]. Some supplemental payments, including Medicaid DSH, were exempt from the UPL calculation. As a result, Medicaid DSH became a mechanism through which states could engage in "fiscal shenanigans." These were particularly notable for government hospitals. In some cases, state payments to government hospitals greatly exceeded typical payments, and these hospitals returned the excess to states through "intergovernmental transfers" (IGTs), which are transfers of funds between different levels and/or types of government entities.[11] Over time, Medicaid rules changed to limit these "fiscal shenanigans." Today states face a number of restrictions when making Medicaid payments to hospitals. A complete history of these rules and their enforcement is complex and beyond the scope of this paper [GAO, 2008, 2014].[12] Most salient for our analysis, these rules are intended to ensure that states

[10] This cap is sometimes violated, particularly prior to 2011, at which point states began facing penalties for noncompliance.

[11] IGTs lead to the soft budget constraints for government hospitals, as is discussed in Duggan [2000]. Local governments, which typically own government hospitals, may provide additional funds to these hospitals when hospitals' budgets are tight or re-appropriate excess funds from these hospitals when hospitals' budgets are not tight. Indeed, Duggan [2000] finds that when a government hospital received additional Medicaid payment, it was largely re-appropriated by the hospital's owner.

[12] Some important changes include: (i) Since 1987, states have been required to provide some DSH payment to all hospitals meeting certain criteria, although the amount of payment state provide remains discretionary. (ii) Since 1991, states face new limits on how they can raise funds used to receive matching federal Medicaid funds. Specifically, any taxes on providers must be "broad based", be "uniformly imposed," and cannot tie the supplemental payments to the taxes the provider pays. (iii) In 1993, Congress required that Medicaid DSH payments to hospitals could not exceed the costs of treating indigent patients. (iv) In 1997, Congress imposed state-level caps on DSH payments; these caps have not meaningfully changed over time and therefore variation in DSH

contribute meaningful matching funds to Medicaid, and that hospitals—rather than states—are the ultimate recipients of additional federal Medicaid matching funds. Therefore, concerns about the historical "fiscal shenanigans" documented in the literature are less of a concern in our time period. In Section 6, we provide evidence to this effect.

3 Data

Our dataset has one observation per hospital-year level for 2006 through 2014, and combines two main sources: Medicaid's Annual DSH Audit Reports (the "Audit Reports") and Medicare's Hospital Cost Reports (the "Cost Reports"). The Audit Reports report costs and payments separately for uninsured and Medicaid patients. Crucially, the Audit Reports disaggregate Medicaid payments into base and supplemental payments. The Audit Reports are only available for hospitals that receive Medicaid DSH payments. We limit our central analysis to this sample, which covers 57 percent of general acute care hospitals, two-thirds of general acute care-patient costs, and three-fourths of indigent patient costs[13] Section A.5 presents details on the characteristics of hospitals receiving Medicaid DSH payments. We further restrict the sample to general acute care hospitals that have available and internally consistent key data elements; the resulting sample of hospitals spans 43 states.[14] The Cost Reports contain additional financial information and characteristics for hospitals.[15]

We construct a number of variables from the Audit Reports. $Medicaid\ costs$ is costs of treating Medicaid patients, $Uninsured\ costs$ is costs of treating uninsured patients, and $IndCosts = Medicaid\ costs + Uninsured\ costs$. The Audit Reports calculate each patient's cost by multiplying the patient's "charges" (i.e., the list price for care) by the hospital's cost-to-charge ratios (i.e., total costs for all patients di-

allotments across states is a historical artifact. (v) Since 2003, Medicare has pursued enforcement actions to ensure that states do not repossess supplemental payments made to hospitals. (vi) Since 2006, Medicare has required states to report the Medicaid DSH Audit Reports data to monitor that states compliance with these laws. The Audit Reports create an audit trail, ensure consistency in report of data, and ensure that other Medicaid payment laws and regulations are followed. More generally, since 1981, Medicaid has taken action to reverse payment and financing trends that circumvent Medicaid payment rules.

[13] Hospitals that are not present in the Audit Reports may receive other supplemental Medicaid payments, such as UPLs.

[14] We exclude Arizona, South Dakota, and Utah because they lacked key data elements. We exclude District of Columbia, Delaware, and Maine because none followed reporting requirements and each provided DSH payments to very few general acute care hospitals. We exclude Iowa because of difficulty matching facilities to Medicare provider numbers. Finally, we exclude Massachusetts because its Medicaid waiver redirects Medicaid DSH payments to the state's insurance expansion. We restrict to general acute care hospitals because data availability and Medicaid payment rules differ for other facility types.

[15] A number of papers use the Cost Reports to study hospital provision of uncompensated and under-compensated care, but the Cost Reports lack the detail needed to perform our central analyses, are not audited, and have been criticized for data errors[Nikpay et al., 2015, Dranove et al., 2016, Nikpay, 2018].

vided by the total list price for all patients).[16] Medicaid costs include taxes imposed on hospitals to raise state Medicaid funds, but do not include IGTs from public hospitals to state or local governments.[17] *Medicaid base payments* is "base" (i.e., pre-supplemental payment) Medicaid payments, which are the direct payments for providing specific treatments and services to patients; *Uninsured base payments* is payments from uninsured patients; and $Base\ payments = Medicaid\ base\ payments + Uninsured\ base\ payments$.[18] Losses on indigent patients absent supplemental Medicaid payments are costs minus base payments for these patients (i.e., $Losses = IndCosts - Base\ payments$). Medicaid supplemental payments (*Supplemental payments*) are the sum of Medicaid DSH payments (*DSH*), and all other supplemental Medicaid payments (*UPL*).[19] Total payments for indigent patients is the sum of base and supplemental payments (i.e., $IndPayments = Base\ payments + Supplemental\ payments$). To place costs and payments on a comparable scale across hospitals of differing sizes, we divide these variables by each hospital's average costs (from the Cost Reports) over the sample period. To limit the effect of outliers, we winsorize the Audit Report variables at the first and ninety ninth percentiles.[20]

There are a number of reasons to believe the Audit Reports are more accurate than alternative data sources. First, the Audit Reports monitor state compliance with federal policies on Medicaid DSH and such compliance affects state, federal, and hospital Medicaid funding streams. Second, each state's data is independently audited.[21] Finally, each variable in the Audit Reports is precisely defined. For example, the Audit Reports specify rules for categorizing patients, determining allowable charges, and deflating charges

[16] Patient costs approximate average rather than marginal costs because the cost-to-charge ratio treats both fixed and variable costs as costs.

[17] Source is page 77922 of: https://www.govinfo.gov/content/pkg/FR-2008-12-19/pdf/FR-2008-12-19.pdf

[18] Base payments are direct payments for care to fee-for-service and managed care Medicaid enrollees.

[19] *UPL* is the sum of Supplemental / Enhanced IP/OP Medicaid Payments and Section 1011 Payments in the Audit Reports. While *Supplemental payments* should, as a result of OBRA 1993, be less than *Losses*, this is not strictly true in our data. There is uncertainty about exactly what a hospital's *Losses* will be at the time at which states distribute many supplemental payments. Until 2011, states were provided with some leeway in compliance with small deviations from this provision of OBRA 1993. Beginning with the 2011 data, states must redistribute any DSH payments that exceed the limit to other hospitals that remain below the limit or reimburse the federal government for the federal match share for those payments.[MACPAC, 2016] Roughly 9 percent of *Supplemental payments* in our data are in excess of the hospital's *Losses*. Figure A.13 illustrates that 10 to 12 percent of *Supplemental payments* in our data are in excess of the hospital's *Losses* in 2006 to 2010, and that this falls to 6 to 8 percent for 2011 to 2014. Unless otherwise noted, we censor *Supplemental payments* so that it is no larger than *Losses* because states must redistribute the excess or lose the federal match on it.. Table A.13 illustrates the the paper's central regressions are robust to imposing or not imposing the requirement that *Supplemental payments* not exceed *Losses*.

[20] For time series analyses, we run a regression with state and year fixed effects on the variable of interest, and obtain predicted residuals. We then replace any residuals below the first percentile of residuals with the first percentile and any residuals above the ninety-ninth percentile of residuals with the ninety-ninth percentile of residuals. The winsorized version of our variable is then the predicted values from this regression plus these winsorized residuals.

[21] Auditing is consistent across states. We obtained audit certifications for 39 of our 43 sample states in 2013. A single firm audited 34 of these states.

to costs.[22] While the Audit Reports are a unique and valuable source of data, we are unaware of any previous academic articles that use them [MACPAC, 2016]. We believe that one reason why others have not used the Audit Reports is the effort involved in gathering the data. Each state-year of the Audit Reports is in a separate file and files differ meaningfully in format. Consequently assembling the data for this project required reading in nearly 400 different files with a variety of incompatible formats.[23]

That said, these data are uniquely useful to understand our question of the extent to which Medicaid supplemental payments insure hospitals against *Losses* and whether states provide hospitals with similar protection against *Losses* that arise from different sources. We analyze the latter question by examining changes in *Losses* caused by either shocks to hospital costs or to hospital demand by indigent patients.[24]

We construct two shifters for *Losses* that are mostly in a hospital's control: a capital cost-shifter and a labor cost-shifter. As long as these cost-shifters do not result in higher *BaseRev* one-for-one, they will affect *Losses* and help provide evidence about the role of supplemental payments in insuring against those losses. The capital cost-shifter, *Capital costs*, is based on actual hospital-level capital costs, and captures the effects of new property, plant, and equipment purchases on *Losses*. We use *Capital costs* to examine the extent to which, through supplemental payments, Medicaid pays for capital costs above and beyond the explicit coverage that is tied to base payment rates for specific procedures. We calculate *Capital costs* as the product of two variables: (i) a hospital's total allowed capital costs from the Cost Reports for the year,[25][26] and (ii) a non-time-varying measure of the share of the hospital's costs that are from indigent patients.[27] The latter variable accounts for the fact that the effect of capital costs on *Losses* is proportional to the share of a hospital's costs that are from indigent patients. We also construct shocks to *Capital costs* by replacing (i) in the product described above by the difference between capital costs in one year and the next. The labor wage index, *Wage index*, is constructed from the hospital's actual wages, and is the product of: (i) the natural logarithm of a mean 1 wage index, (ii) a non-time-varying measure of the share of the hospital's costs that are from indigent patients, and (iii) labor's average share of hospital costs, which is 0.60.[28]

[22] Section A.1 validates the Audit Reports against a number of alternative data sources.

[23] We hope that future researchers incorporate the Audit Reports into their research, and will make these data available on our websites and by request.

[24] We also tested local economic shocks as instruments for *Losses*, but found these shocks did not predict *Losses*.

[25] We express this as a percent of the hospital's expected operating expenses in a year, so that it is scaled like *Losses*.

[26] *Capital costs* is a flow variable based on allowed costs, such as interest or depreciation, that are associated with new capital expenditures.

[27] New capital expenditures are stock variables. *Capital costs* is a flow variable based on allowed costs, such as interest or depreciation, that are associated with new capital expenditures.

[28] The mean 1 wage index is constructed by taking the product of the average hourly wage rate for each category of wages and that category's national share of wages and dividing by that category's average national wage. We exclude wages for service-lines,

We construct one shifter for *Losses* that is not in a hospital's control: losses from neighboring hospital closures.[29] *Closure shock* reallocates a closing hospital's *Losses* to remaining hospitals proportionately to the predicted reallocation of patients from the closing hospital to remaining hospitals. For example, if hospital A closes, and has one million dollars in *Losses*, and 30 percent of hospital A's patients are predicted to visit hospital B if hospital A closes, then hospital A's closure would be predicted to increase B's *Losses* by 300,000 dollars. To predict how patients will reallocate following a closure, we estimate a hospital choice model with Medicare data. We discuss the details of how we construct *Closure shock* further in Appendix A.2. We restrict to closures occurring between 2008 and 2013, so as to ensure sufficient pre- and post-closure data. We also require the hospital to be present in our Audit Report sample for multiple years directly prior to closure. In contrast to Garthwaite et al. [2018], which looked at an earlier sample of closures, in our time period most hospitals experience many years of declining patient volume prior to exit; for these hospitals, exit fails to produce a meaningful shock. We therefore exclude hospitals that a exhibit sharp trend or implausible volatility in *Losses* from the sample of closures.[30] We exclude these hospitals because hospitals that have sharp trends or volatility in *Losses* are likely to be taking actions that cause sharp trends or volatility in *Losses* of neighboring hospitals.[31] The final sample includes 30 closures.[32]

Table 1 reports means and within-hospital standard deviations of these variables because we use these variables in time series analyses that include hospital fixed effects. The mean and within-hospital standard devision of *Capital costs* and *Closure shock* are substantially smaller than the mean and within-hospital standard deviation of *Losses*. For example, the average within-hospital standard deviation in *Capital costs* is roughly 10 percent of the average within-hospital standard deviation in *Losses*. More drastically, the within-hospital standard deviation of *Closure shock* is very small because most hospitals were unaffected by

such as Skilled Nursing Facilities that are included in the Cost Reports, but not treated as costs for the hospital. Some overhead costs associated with labor are not assigned to specific categories. To include these costs, we create a ratio of all labor costs divided by non-overhead costs, and multiply *wage index* by that factor.

[29] We studied the effect of changes in *Losses* caused by the Affordable Care Act's Medicaid expansion. In 2014 some—but not all—states expanded Medicaid to all adults with incomes under 138 percent of the federal poverty level. Prior research illustrated that uncompensated care costs decreased by more in expansion states and that those decreases were larger for hospitals with historically higher uncompensated care costs[Nikpay et al., 2015, Dranove et al., 2016]. We use both the state-level shock and a hospital-specific shock that is based on preexisting exposure to low-income patients. We discuss the specifications for these analyses in more detail in Section A.7. However, the short post-ACA period in the data limits our ability to study the effect of this shock.

[30] We also excluded hospitals with negative *Losses* on indigent patients.

[31] For example, if a hospital closes a wing or department in the years prior to closing this could affect both the hospital's *Losses* and the *Losses* of neigboring hospitals, and therefore introduce pre-trends in the analysis.

[32] We exclude 10 hospitals that had irregular trends in *Losses* prior to closing. We exclude 17 hospitals because we had only a single year of Audit Report data for them, the Audit Report data was not for near the time of closure or the hospital earned a positive profit on indigent patients. We excluded many additional closures for hospitals that never appear in the Audit Reports.

the 30 closures that we study. As the final row of Table 1 illustrates, a small subsample of hospitals received meaningful shocks from closures. Finally, there is substantial year-over-year variation in *Wage index*.

Table 1: Summary Statistics

Variable	**Mean**	**Within hospital standard deviation**	**Number of Observations**
Capital costs	0.0020	0.0023	16,280
Wage index	0.0425	0.0206	16,280
Losses	0.0855	0.0271	16,280
Supplemental payments	0.0513	0.0192	16,280
Closure shock	0.0001	0.0004	16,280
Closure shock| highly affected hospital	0.0043	0.0024	234

Notes: We define highly affected hospitals those with *Closure shock* > 0.005 in some year.

4 Supplemental payments as reinsurance

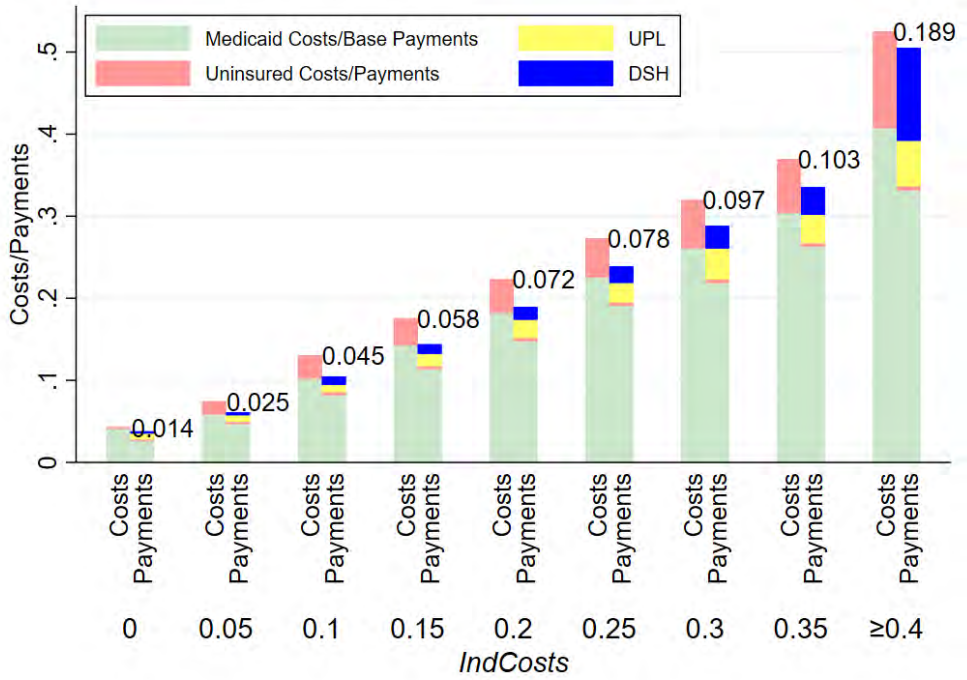
4.1 Cross-sectional estimates

We perform a number of cross-sectional analyses that examine the degree to which supplemental payments reinsure hospitals against their exposure to indigent patients.[33] In Figure 1, we place hospitals into 5 percentage point bins of *IndCosts*, with higher values indicating a greater share of indigent patients. For each bin, the two bars represent the hospital's costs and payments, disaggregated by patient type (i.e. Medicaid or uninsured) and source of funds (i.e. base payments, DSH, UPL). For each bin, we provide the value of the *Losses* (which was defined as the difference between *IndCosts* and *Base payments*).

Hospitals that treat more indigent patients (based on their values of *IndCosts*) receive more base payments from Medicaid for treating these patients (based on by their values of *Base payments*). This growth in payments is insufficient to keep up with the growth in costs. Therefore hospitals with higher *IndCosts* have higher *Losses*. Hospitals with *IndCosts* between 0 and 5 percentage points of operating costs, have *Losses* that are on average 1.4 percentage points of operating costs. By contrast, hospitals with *IndCosts* that exceed 40 percentage points of operating costs, have *Losses* that are on average 18.9 percentage points of operating costs.

[33] These analyses are conducted using 2012 data because the 2012 Cost Reports contain higher quality data on uncompensated care and Medicaid cost than earlier years. Recall that only hospitals receiving Medicaid DSH payments file Audit Reports, whereas the Cost Reports are available for all hospitals. We use the Cost Reports to analyze which hospitals receive Medicaid DSH in Appendix A.5.

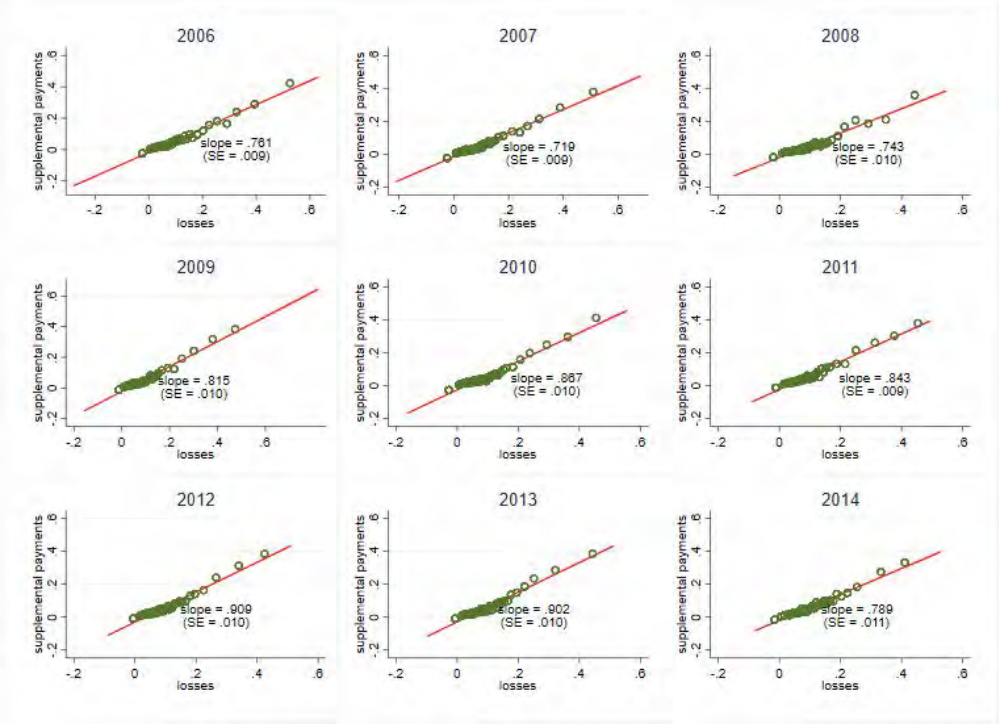
Figure 1: Costs and payments by type and *IndCosts*



Notes: Data is plotted in a bar chart, where hospitals are in bins of 0.05 for *IndCosts*. For example, the bin for 0 spans [0,0.05). For each bin, *Losses*, which is the difference between the costs and payments from treating indigent patients, is recorded on the graph.

If the safety net was entirely financed by Medicaid's fee-for-service payments, hospitals that were more exposed to the indigent would be forced to bear the cost of the incompleteness of the safety net. Importantly, supplemental payments (i.e. *DSH* and *UPL* payments) largely fill the gap for each hospital type, with progressively larger payments for hospitals with higher costs of treating indigent patients. This feature of the safety net has grown more complete over time. Figure 2 shows that the relationship between *Losses* and *Supplemental payments* becomes stronger in more recent years.[34] The important takeaway from this relationship is that after we add the value of supplemental payments, hospitals with higher *IndCosts* do not lose substantially more on indigent patients than hospitals with lower *IndCosts*.

Figure 2: Cross-sectional relationship between *Losses* and *Supplemental payments*



Notes: Data is plotted in a bin scatter, where hospitals are in bins of 0.05 for *Losses*. For example, the bin for 0 spans [0,0.05).

One potential benefit of supplemental payments is to provide states with discretion to address distributional goals. Such discretion can be seen in the heterogeneous relationship between *Losses* and *Supplemental payments*. Table 2 presents the relationship between *Losses* and *Supplemental payments*, disaggregated by hospital ownership. There is a stronger relationship between *Losses* and *Supplemental payments* for gov-

[34]For example, in 2006, an additional dollar of *Losses* increases *Supplemental payments* by roughly 76 cents, whereas in 2013, an additional dollar of *Losses* increases *Supplemental payments* by roughly 90 cents. Figure A.15 illustrates that these results remain similar when we do no restrict *Supplemental Payments* to be less than *Losses*.

ernment hospitals than for nonprofits or for-profits. For example, in 2012, an additional dollar of *Losses* increases *Supplemental payments* to government hospitals by 96 cents, versus 75 cents or 66 cents for for-profits or non-profits, respectively; these differences are all statistically significant.

Table 2: Cross sectional relationship between *Losses* and *Supplemental payments* (by year and ownership type)

Ownership type	2006	2007	2008	2009	2010	2011	2012	2013	2014
For profit	0.496	0.483	0.636	0.712	0.620	0.690	0.746	0.770	0.535
	[0.0264]***	[0.0225]***	[0.0278]***	[0.0292]***	[0.0280]***	[0.0310]***	[0.0325]***	[0.0329]***	[0.0267]***
Nonprofit	0.518	0.481	0.485	0.562	0.505	0.565	0.660	0.645	0.511
	[0.0156]***	[0.0152]***	[0.0163]***	[0.0176]***	[0.0170]***	[0.0175]***	[0.0182]***	[0.0186]***	[0.0164]***
Government	0.852	0.810	0.830	0.848	0.974	0.895	0.956	0.934	0.922
	[0.0164]***	[0.0171]***	[0.0173]***	[0.0160]***	[0.0113]***	[0.0128]***	[0.0150]***	[0.0123]***	[0.0149]***

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's operating costs. Hospitals are weighted by operating costs. * 0.10 ** 0.05 *** 0.01

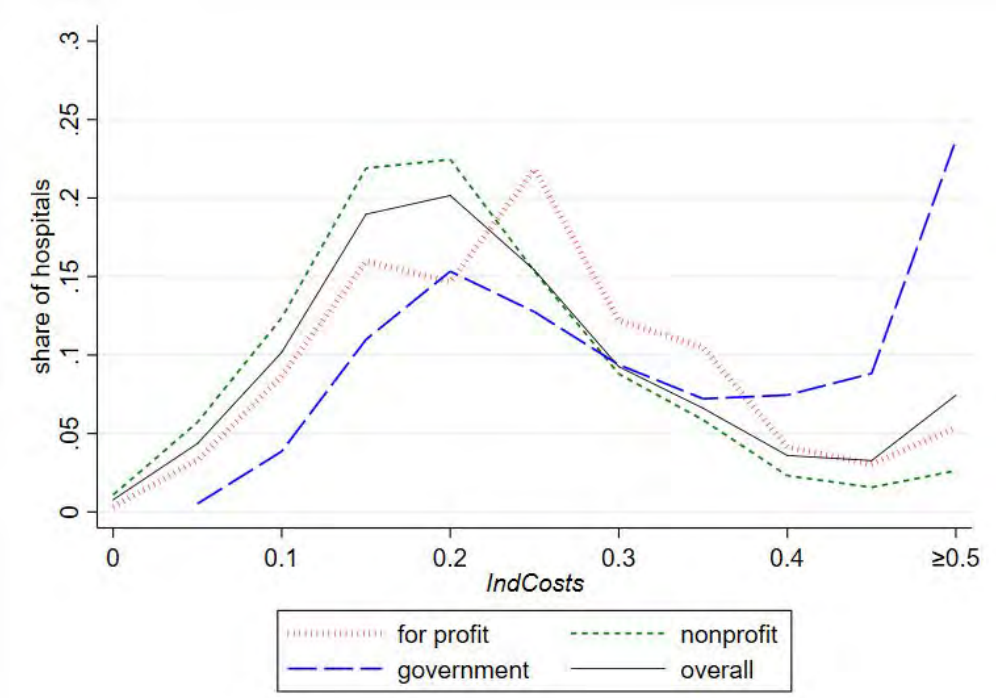
The fact that supplemental payments vary systematically both by exposure to the indigent and by hospital ownership is not a mere academic curiosity. As we discuss below, society can reinsure hospitals for losses from Medicaid and the uninsured through Medicaid expansions, supplemental payments, or a combination of both programs. One implication of our cross-sectional estimates is that—holding Medicaid spending constant—supplemental payments targeted at lower income hospitals result in more cross-hospital redistribution than even a very broad Medicaid expansion. To understand why, note that if Medicaid rates are below costs, then the burden of Medicaid underpayments falls disproportionately on hospitals with more Medicaid patients; expanding Medicaid to cover the uninsured does not eliminate this source of underpayment. Because *Supplemental payments* target hospitals with larger *Losses*, they reinsure hospitals against below-cost Medicaid reimbursement rates. [35]

States may consider ownership status when disbursing supplemental payments because of how the burden of indigent care is distributed across different types of hospitals. Figure 3 presents the share of hospitals by ownership type with differing levels of *IndCosts*. There are meaningful differences in facilities' exposure to indigent patients based on ownership status. Overall roughly 15 percent of hospitals that receive Medicaid DSH have *IndCosts* in excess of 0.4. By contrast, nearly 40 percent of government hospitals

[35] We illustrate this point more precisely in Figure A.16. More specifically, we determined what share of costs Medicaid base rates cover for each hospital. We then suppose that rather than receiving payments from the uninsured and *Supplemental payments*, that each hospital would receive proportionate reimbursements on the uninsured. i.e., that costs of uninsured care would be reimbursed at Medicaid's base rates. Next, we impose a budget neutral adjuster to ensure that total Medicaid payments to hospitals are the same under the counterfactual scenario as they are in actuality. We plot a bin scatter relationship between the actual and counterfactual payments measures, and a hospital's indigent costs in Figure A.16. For the hospitals comprising the lower 90 percent of *IndCosts*, payments increase slightly in the counterfactual. For the 10 percent of hospitals with the highest *IndCosts*, payments are substantially lower in the counterfactual.

have such high levels of *IndCosts*. This increased exposure to indigent patients demonstrates a unique and underdiscussed role in the safety net for government hospitals, a role that is difficult to finance using only Medicaid fee-for-service payments.

Figure 3: Share of hospitals by ownership and level of *IndCosts*



Notes: Sample is limited to 2012. Hospitals are categorized into bins of 0.05 for *IndCosts*. For example, the bin for 0 spans [0,0.05). The share of hospitals in each bin is weighted by total hospital costs.

4.2 Time series

The cross-sectional results provide clear evidence of the role of supplemental payments in closing the gap in hospital finances that arises from greater exposure to indigent patients. Next, we examine the extent to which states insure hospitals against fluctuations in *IndCosts* with supplemental payments. To this end, we estimate a time series specification where for each hospital h in year t, we let α_h be a hospital-specific fixed effect, and τ_t be a year-specific fixed effect. Our main estimating equation is:

$$Supplemental\ payments_{ht} = \alpha_h + \tau_t + \beta Losses_{ht} + \varepsilon_{st}. \tag{1}$$

The coefficient β is the level of insurance that hospitals receive against *Losses* (which was defined as

the difference between *IndCosts* and *BaseRev*). A coefficient of 0 means state Medicaid programs do not insure hospitals against variation in *Losses*, whereas a coefficient of 1 means state Medicaid programs fully insure hospitals against variation in *Losses*.

Table 3 presents regression results on the time-series relationship between *Losses* and *Supplemental payments*. According to the coefficient in column (1), supplemental payments insured hospitals against roughly 41 cents of each dollar of *Losses*. Column (2) replaces the year fixed effects in column (1) with state-year fixed effects; the coefficient shrinks to roughly 36 cents, but remains statistically significant.

Table 3: Effect of *Losses* on *Supplemental payments*

	(1)	(2)
Losses	0.410	0.362
	[0.0259]***	[0.0257]***
Fixed Effects		
Year	x	
State-year		x
N	16,128	16,128

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital.

Table 4 examines heterogeneity in responsiveness by hospital ownership. The coefficient for government hospitals is nearly twice as large as for for-profits and nonprofits, and the difference is statistically significant. Similar to our cross-sectional estimates, this suggests supplemental payments provide more insurance against variation in *Losses* to government hospitals than to those that are privately owned. The smaller difference between the effect for non-profit and for-profit hospitals could be the result of heterogeneity in the non-profit category. A great deal of research documents that not all non-profit hospitals have demonstrably different business practices from what we would expect from a for-profit hospitals [Dranove, 1988, Norton and Staiger, 1994, Duggan, 2000, 2002, Dranove et al., 2017]. It could be that state governments have better information to distinguish between "true" non-profits and those those that appear to be nothing more than "for profits in disguise" [Weisbrod, 2009]. To examine whether this is driving our estimates, we also performed a number of statistical tests to see if there is evidence that non-profit hospitals with greater "need" for supplemental payments, as indicated by greater expected losses, are reinsured at a higher rate. We find some evidence to support this hypothesis. Specifically, according to Table A.5 hospitals with the

lowest "expected" losses are reinsured at a lower rate than hospitals with higher "expected" losses.[36] Table A.6 finds that for all ownership types, hospitals with the lowest quartile of "expected" losses are reinsured at a lower than than hospitals with higher "expected" losses. The patterns is less pronounced for government hospitals, which are consistently reinsured at a higher rate than for-profits or nonprofits. The higher level of reinsurance for government hospitals suggests that states may simply view the role of government hospitals in the safety net differently with respect to the issue of supplemental payments. As we discuss below, this could because state governments worry that increased supplemental payments to private owned facilities could create a greater moral hazard related to hospital spending and/or that they have less ability to monitor the optimality of the spending decisions made by executives at these hospitals.

Table 4: Effect of *Losses* on *Supplemental payments*
(heterogeneity by hospital type)

	For profit	Nonprofit	Government
	(1)	(2)	(3)
Losses	0.380	0.291	0.602
	[0.0365]***	[0.0286]***	[0.0436]***
N	3,007	9,709	3,412

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital.

4.3 Supplemental payments and volatility of hospital profitability

One of the potential purposes of supplemental payments might be to reduce volatility in hospital finances. For hospitals that face constraints on liquidity, payment volatility could decrease the hospital's ability and incentive to engage in costly long-term investments. Payment volatility could also lead to the closure of hospitals that should, in expectation, be solvent, but because of unanticipated negative shocks are not. Therefore, in this section we ask whether supplemental payments increase or decrease volatility in hospital reimbursements.

Recall that hospitals receive larger *Supplemental payments* when they have larger *Losses*; this suggests that supplemental payments reduce volatility. However, if the relationship between *Losses* and *Supplemental*

[36]To determine "expected" *Losses*, we run a regression that explains *Losses* with year and hospital fixed effects and recover a hospital-specific fixed effect. We then run a regression where the dependent variable is the hospital-specific fixed effect and the independent variables are the expected payor mix of the hospital based on a measure developed in Garthwaite et al. [2020]. We classify hospitals into quartiles of "expected *Losses* based on the predicted values from this regression.

payments is sufficiently noisy, then supplemental payments may introduce additional volatility. In fact, *Supplemental payments* are themselves quite volatile; the within-hospital standard deviation in *Supplemental payments* after controlling for *Losses* is 0.016. [37] This is meaningful relative to hospital profits.

To study how *Supplemental payments* affect payment volatility, we compare the within-hospital deviations in *Losses* against the within-hospital deviations in *Losses* − *Supplemental payments*. If *Supplemental payments* reduce volatility, within-hospital deviations in the former will be larger than within-hospital deviations in the latter. We also construct a second counterfactual to compare both measures again. In particular, we approximate for a full Medicaid expansion, by allocating Medicaid payments (both base and supplemental) in proportion to each hospital's *IndCosts*. We present these three distributions in Figure A.18. The within-hospital standard deviation of *Losses*, *Losses* − *Supplemental payments*, and *Losses* under a full Medicaid expansion are roughly 0.027, 0.022, and 0.007. This suggests that Medicaid supplemental payments reduce volatility, but by less than deterministic reimbursements that are proportionate to patient treatment costs.[38] Table A.9 disaggregates these measures of volatility by hospital ownership type; volatility reductions are largest among government hospitals.

The above analysis estimates volatility resulting from *Losses* and *Supplemental payments* among hospitals receiving Medicaid DSH. In Appendix A.14, we study the effect of extensive margin changes in Medicaid DSH receipt on volatility in reimbursements.[39] We lack data on *Losses* and *Supplemental payments* for hospitals not receiving Medicaid DSH, and therefore cannot determine whether shocks to these variables are coincident with loss of Medicaid DSH. We establish, however, that hospitals that subsequently lose Medicaid DSH have lower *Losses* and *DSH* than hospitals that do not. We also establish that loss of Medicaid DSH does not meaningfully decrease hospital profitability. These facts suggest that extensive margin variation in DSH receipt does not dramatically affect reimbursement volatility.

[37] We calculate *Supplemental payments* $- E($*Supplemental payments*$|$*Losses*$)$ based on the regression results in column (1) of Table 3

[38] The conclusion that supplemental payments reduce reimbursement volatility is sensitive censoring *Supplemental payments* so that it does not exceed *Losses*. Figure A.19 repeats the analysis in Figure A.18, but without imposing that restriction. Absent that restriction, Medicaid supplemental payments slightly increase volatility. This is evidence that supplemental payments are more likely to reduce volatility in the future than they have in the past because states increasingly comply with the restriction that *Supplemental payments* do not exceed so that it does not exceed *Losses*.

[39] If extensive margin participation in Medicaid DSH is positively correlated with *Losses*, then extensive margin receipt of Medicaid DSH could reduce volatility. If extensive margin participation in Medicaid DSH was negatively correlated or uncorrelated with *Losses*, extensive margin receipt of Medicaid DSH could increase volatility.

5 Do supplemental payments vary based on the source of hospital losses?

In designing a reinsurance program for hospitals, states face the same trade-off between risk protection and moral hazard that emerges from any insurance program. On the one hand, states can provide hospitals with more risk protection if they reimburse for more of the losses from treating the indigent. On the other hand, reimbursing hospitals for the losses from treating the indigent decreases hospital incentives to control costs. Just as other insurers provide more risk protection against types of losses less susceptible to moral hazard, states' use of supplemental payments might vary based on the degree to which hospitals can control the source of the losses. The estimated relationship in Tables 3 and 4 reflects an average level of reinsurance hospitals are receiving for *Losses*. This estimate may mask heterogeneity in the extent to which states differentially reimburse hospitals for *Losses*. For example, if states use *Supplemental payments* to protect hospitals against payment volatility, but do not otherwise wish to alter hospital behavior, they should only use *Supplemental payments* to reimburse hospitals for *Losses* that are outside of the hospital's control. By contrast, states may use *Supplemental payments* to alter hospital behavior by changing the marginal incentives for hospitals. For example, reimbursing hospitals for *Losses* that arise from higher hospital costs may incentivize hospitals to adopt higher cost-structures – which could run counter to the goals of an efficient safety net.

We pursue an instrumental variables (IV) strategy to examine the potential for heterogeneity in supplemental payments based on the source of hospital *Losses*. In particular, suppose *shock* predicts *Losses*. Then for $Y_{ht} \in \{Losses, Supplemental\ payments_{ht}\}$, we estimate:

$$Y_{ht} = \alpha_h + \tau_t + \beta shock_{ht} + \varepsilon_{st}. \tag{2}$$

We first examine the "first stage" effect of *shock* on *Losses*. Next, we examine the "reduced form" effect of *shock* on *Supplemental payments*. The ratio of the reduce form and first stage effects is the IV effect of *Losses* on *Supplemental payments*. We construct a separate estimate of *Losses* on *Supplemental payments* for each type of shock to *Losses*, and compare these estimates to determine whether states differentially insure hospitals against some sources of *Losses*.[40]

[40] We drop singleton groups in the regression analyses. Furthermore, different shocks are constructed with different data that are missing for different observations. As a result, the sample sizes differ across regressions.

5.1 Cost shocks

We examine shocks to hospital losses that arise from higher hospital costs, sources of losses that are at least partially within a hospital's control.

Table 5 presents a the effect of two cost shifters on *Losses* and *Supplemental payments*, as well as the implied IV effect of *Losses* on *Supplemental payments*. The first cost shifter is hospital capital costs (*Capital costs*) and the second is hospital labor costs (i.e.our *wage index* measure). In Column (1), the coefficient on the relationship between *Capital cost* and *Losses* means that for a hospital that served only Medicaid patients, a dollar of additional capital costs leads to 1.13 dollars of additional *Losses*. Of note, we are able to rule out no effect on losses (i.e.the difference between this coefficient and 0 is statistically significant) but this estimate is not statistically distinct from a dollar for dollar effect of capital costs on losses. For the same hospital, a one percent increase in labor costs would increase *Losses* by 14.7 percent. [41]

In column (2), we show that both cost shocks also increase *Supplemental payments*. The IV estimate, presented in Column (3), suggests that *Supplemental payments* insure against 52.6 cents of each dollar in *Losses*.[42] Thus, as a result of Medicaid supplemental payments, Medicaid's reimbursement rules have a large "cost-plus" component to them. One concern with this analysis is that hospitals may choose to increase costs in response to positive shocks to state finances in anticipation of increases in *Supplemental payments*. To rule out this concern, column (4) adds state-year fixed effects; the coefficient in the IV regression drops by roughly 16 percent, but remains quantitatively similar and statistically significant. [43]

One question is whether there could be reverse causality in the relationship between *Losses* and *Supplemental payments*. For example, if hospitals that received more in *Supplemental payments* subsequently spent more on capital, there would be a positive correlation between capital costs and *Losses* and a positive correlation between capital costs and *Supplemental payments*. To evaluate this concern, Figure 4 presents lags and leads of the effect

[41] There are a number of potential hypotheses for why the coefficient is lower than labor's share of costs. One possibility is that labor costs may be reflected in base Medicaid rates; Table A.7 presents the effect of cost shocks on both costs and payments for indigent patients, but does not find support for this hypothesis. The coefficient may also be lower than labor's share of costs because of measurement error in the wage index.

[42] We present the KP rk Wald F statistic as a test for weak instruments. In column (3), both first-stage point-estimates are highly statistically significant, and the corresponding F-statistic for their joint significance is 11.02. Based on the Stock-Yogo weak identification test critical values - a commonly used but not precisely applicable threshold for evaluating the strength of instruments with clustered standard errors - there is between a 15 and 20 percent chance that we reject the null when testing at a nominal significance level of 0.05. As both instruments are highly statistically significant in the Reduced Form regressions, and are highly significant in the IV regressions, we proceed nonetheless. It is also worth noting that F-statistic in Section 5.2 is large enough that over-rejection of the null hypothesis is substantially less likely.

[43] Adding these controls reduces the power of our first stage regression; the F-statistic of the excluded instruments drops to 7.533.

Table 5: Effect of *Losses* on *Supplemental payments*
(cost shock IV)

	First Stage	Reduced Form	IV	IV
	(1)	(2)	(3)	(4)
	Losses	*Supplemental payments*	*Supplemental payments*	*Supplemental payments*
Capital costs	1.131	0.685		
	[0.327]***	[0.237]***		
Wage index	0.147	0.0688		
	[0.0348]***	[0.0303]**		
Losses			0.526	0.443
			[0.133]***	[0.184]**
Year FE	x	x	x	
Year-state FEs				x
KP rk Wald F statistic			11.03	7.534
N	16,128	16,128	16,128	16,119

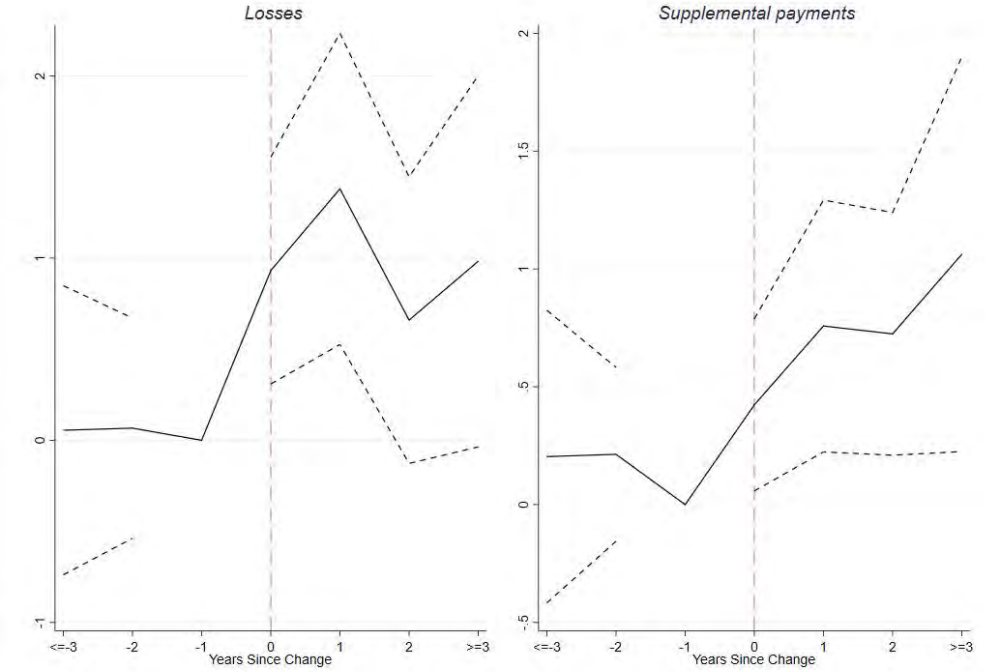
Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital. The cutoff for the Stock-Yogo weak identification test critical values with a 20% maximal IV size is 8.75 and the cutoff with a 15% maximal IV size is 11.59. * 0.10 ** 0.05 *** .01

of hospital capital costs shocks on both *Losses* and *Supplemental payments*. These estimates clearly demonstrate that our measure of capital costs shocks lead to upticks in both *Losses* and *Supplemental payments*.

Table 6 presents heterogeneity in the pooled effect of both cost shocks on *Losses* and *Supplemental payments* by hospital ownership type. When estimated separately for these three samples, the power of the cost shocks in the first stage regressions is lower; the F-statistic is below 10 for each ownership type. As a result, these results should be interpreted with some caution. Still, there is statistically significant evidence that both nonprofit and government hospitals are compensated with higher *Supplemental payments* for a sizable share of *Losses* that occur because of cost increases. The coefficient for the for profit hospitals is substantially smaller and less precisely measured. The differences in the coefficient on *Losses* is statistically indistinguishable across the three samples, but the results are quite suggestive of larger reinsurance payments for government hospitals. The strong effect for government hospitals appears to be driven by the effect of *Capital costs* on both *Losses* and *Supplemental payments* for government hospitals.[44] One economic rationale that could lead to such behavior is a recognition by states that government hospitals have disproportionately large exposure to the indigent. Since Medicaid is meant to pay only marginal costs,

[44]Figure A.17 re-presents the capital expense shock results separately for for-profit, government, and non-profit hospitals. It is predominantly government hospitals that are being reimbursed for capital expenses through Medicaid supplemental funds.

Figure 4: Effect of capital cost shocks on *Losses* and *Supplemental payments*



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital and year fixed effects. Hospitals are weighted by first year operating costs.

hospitals with a payer mix that skews towards Medicaid may require additional support to make fixed costs investments. Concerns about the economic viability of such facilities might trump worries about the moral hazard of the apparent cost-plus nature of DSH payments for these facilities.

5.2 Spillover effect of hospital closures

We next examine shocks to hospital costs that arise from the closure of another hospitals, costs that are largely outside of the control of the non-closing facilities. Figure 5 presents lags and leads of the effect of *Closure Shock* on *Losses*. Prior to the closure, *Losses* of other hospitals in our sample are flat. Over the next three years, *Losses* increase dramatically. The pooled post-period coefficient presented in column (1) of Table 7 is 3.495 and is statistically significant. While one might predict that the estimated effect of *Closure shock* should be one, this is actually only true under a number of fairly stringent assumptions.[45] Given the complexity of the process through which the treatment intensity measure is calculated and the large number of potential behavioral responses by patients and providers, a larger coefficient is neither surprising nor problematic. For example, if closing hospitals treated patients at lower costs, then the coefficient could be greater than one. Furthermore, if indigent patients are more likely to reallocate to remaining hospitals than the choice model predicts, then the coefficient could be larger than one. Based on results in Garthwaite et al. [2018], such an occurrence is likely. Garthwaite et al. [2018] find that when a hospital closes that most uncompensated care costs are reallocated to neighboring hospitals with ERs. In contrast, less of the closing hospital's revenue is allocated to neighboring hospitals. This pattern can be explained by insured patients being able to receive care previously provided by the closing hospitals at a wide variety of non-hospital providers (i.e. ambulatory surgical centers). Uninsured patients, however, are largely limited to receiving such care at hospitals with an ER since such facilities are required under EMTALA to stabilize patients requiring emergency care. Such a requirement does not apply to other providers. Such a pattern of uncompensated care and revenues would result in a coefficient that is meaningfully different that one.

Turning to the relationship between closures and *Supplemental payments*, the estimated coefficients in the pre-period are noisy, but the trend is roughly flat. *Supplemental payments* remain flat until two years after the closure, and then meaningfully increase. The pooled coefficient, presented in column (2) the

[45] Specifically, the coefficient would be one if the following assumptions held. First, all hospitals have equivalent treatment costs for the same patient and receive the same base reimbursements for the same patient. Second, indigent patient demand is constant over our sample period for each zipcode. Third, the choice model that is based on Medicare patient choices is a perfect predictor of choices for all patient types.

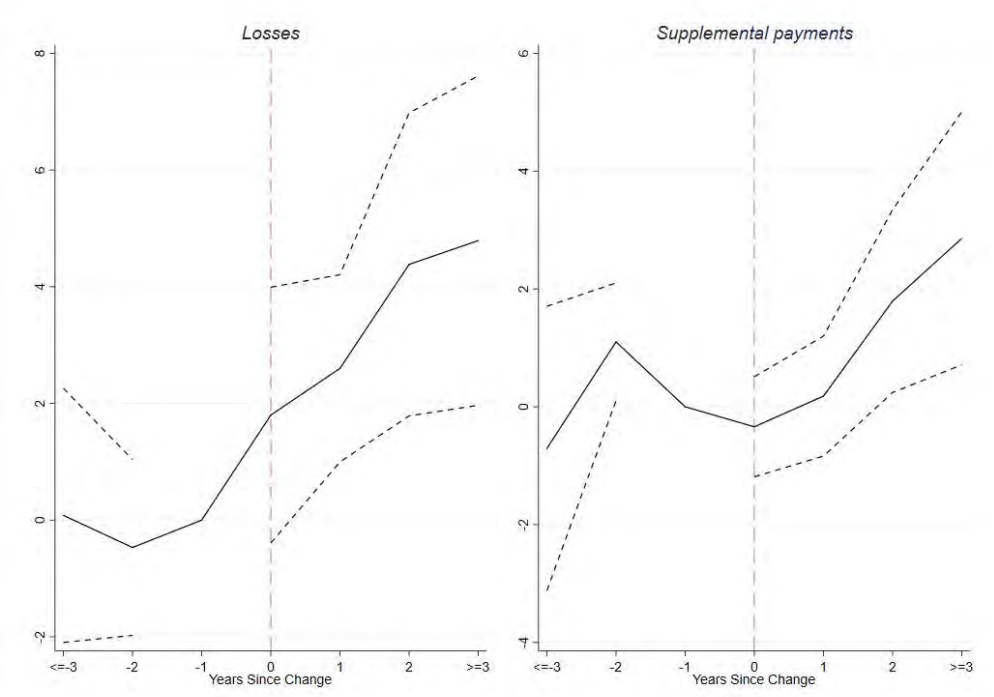
Table 6: Effect of *Losses* on *Supplemental payments*
(cost shock IV)

			Panel A: For profits		
	First Stage	**Reduced Form**	**IV**	**IV**	**IV**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
		Supplemental	*Supplemental*	*Supplemental*	*Supplemental*
	Losses	*payments*	*payments*	*payments*	*payments*
Capital costs	0.845	0.147		-1.483	
	[0.447]*	[0.365]		[2.527]	
Wage index	0.0336	0.0648	0.0590		
	[0.0674]	[0.0526]	[0.0480]		
Losses			0.174	1.929	0.241
			[0.390]	[2.762]	[0.366]
KP rk Wald F statistic			3.583	0.249	2.095
N	3,007	3,007	3,007	3,007	3,007
			Panel B: Nonprofits		
	First Stage	**Reduced Form**	**IV**	**IV**	**IV**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
		Supplemental	*Supplemental*	*Supplemental*	*Supplemental*
	Losses	*payments*	*payments*	*payments*	*payments*
Capital costs	0.682	0.213		-0.170	
	[0.512]	[0.194]		[0.271]	
Wage index	0.122	0.0687	0.0305		
	[0.0346]***	[0.0189]***	[0.0360]		
Losses			0.313	0.562	0.504
			[0.326]	[0.148]***	[0.177]***
KP rk Wald F statistic			1.769	12.52	6.352
N	9,709	9,709	9,709	9,709	9,709
			Panel C: Government		
	First Stage	**Reduced Form**	**IV**	**IV**	**IV**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
		Supplemental	*Supplemental*	*Supplemental*	*Supplemental*
	Losses	*payments*	*payments*	*payments*	*payments*
Capital costs	1.902	1.489		0.887	
	[0.523]***	[0.527]***		[0.676]	
Wage index	0.169	0.0536	-0.0789		
	[0.0695]**	[0.0702]	[0.0464]*		
Losses			0.783	0.316	0.623
			[0.209]***	[0.319]	[0.179]***
KP rk Wald F statistic			13.22	5.936	7.904
N	3,412	3,412	3,412	3,412	3,412

Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. In column (3), *Losses* are instrumented for by *Capital costs*. In column (4), *Losses* are instrumented for by *Wage index*. In column (5), *Losses* are instrumented for by *Capital costs* and *Wage index*. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

post period is 1.075. Turning to column (3), the IV estimate implies that for every dollar that a hospital loses because of a neighboring closure, *Supplemental payments* increase by a statistically significant 31 cents.[46] Table A.10 confirms that the results are robust to excluding any one of the 30 closing hospitals when constructing *Closure shock*. The results are also robust to specifications that eliminate variation from specific lags or leads that are outliers.[47] Given the other evidence of heterogeneity in the treatment of hospitals with different ownership types, it is natural to wonder whether, for example, government hospitals receive more reinsurance against shocks from hospital closures than do for-profits. Table A.17 examines heterogeneity in the effect of *Closure shock* by ownership types. Unfortunately, because the sample of closures is small, the first stage regression has the wrong sign for for-profit hospitals. The coefficients for nonprofit hospitals and government hospitals are similar, but the effects are only precisely estimated for nonprofits.

Figure 5: Effect of *Closure shock* on *Losses* and *Supplemental payments*



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital and year fixed effects. Hospitals are weighted by first year operating costs.

[46]Note that the F-statistic in Table 7 suggests that *Closure shock* is a strong instrument for *Losses*. The results in this section are not robust to including state-year fixed effects because our sample of closures is small, and therefore multiple closures rarely occur within the same state-year.

[47]Table A.8 illustrates that the magnitudes vary, but typically remain statistically significant when we make alternative assumptions about the relationship between the lag and lead structures in the first stage and reduced form regressions.

Table 7: Effect of *Losses* on *Supplemental payments*
(Closures IV)

	First Stage	Reduced Form	IV
	(1)	(2)	(3)
	Losses	*Supplemental payments*	*Supplemental payments*
Closure shock	3.437	1.021	
	[0.962]***	[0.666]	
Losses			0.297
			[0.131]**
KP rk Wald F statistic			12.77
N	16,024	16,024	16,024

Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. Sample excludes closing hospitals because *Closure shock* cannot be calculated for them. The cutoff for the Stock-Yogo weak identification test critical values with a 10% maximal IV size is 16.38. * 0.10 ** 0.05 *** 0.01

5.3 Summary of instrumental variables analyses

Based on the instrumental variables analyses, there is no evidence that states insure hospitals more for losses that are not in a hospital's control than for losses that are in a hospital's control. The purpose of the analyses that exploits shifters for hospital *Losses* is to examine whether states offer differing amounts of reinsurance to hospitals based on the cause of the change in the hospital's losses. The evidence for differences in reinsurance is based on estimates of the effect of *Losses* on *Supplemental payments* across shifters for *Losses*. Of course, differences in this relationship—or a lack thereof—could be because the level of insurance that hospitals receive or because of endogeneity. We believe the former interpretation is more appropriate than the latter. Specifically, it seems unlikely that a hospital would close and cause increases in the *Losses* of neighboring hospitals in anticipation of increases in *Supplemental payments* to the neighboring hospitals. Furthermore, the discrete nature of the capital cost shocks allowed us to examine the timing with which *Capital costs* translate into *Losses* and *Supplemental payments*.[48] The similarity in the degree to which states insure against these different types of losses suggests that this is not a tool that states use to control moral hazard.

[48]We cannot rule out the possibility that hospitals time capital expansions to be concurrent with expansions in *Supplemental Payments*, but such a concern seem unlikely, especially as the cost shifter results are robust to inclusion of state-year fixed effects.

6 Robustness to accounting for other sources of funds

Given the complex set of financial transfers between hospitals and local governments it is possible that changes in other payments could be correlated with *Losses* and *Supplemental payments*. If there were a systematic underlying relationship, this could result in hospitals receiving different reinsurance against *Losses* than our estimates imply. This section investigates such concerns.

In Table A.11, we illustrate that for every dollar of *Losses*, Medicare supplemental payments increase by roughly one cent. We also find a positive, but statistically insignificant relationship between *Losses* and participation in the Medicare 340B program. Thus, failing to account for Medicare supplemental payments from either of these sources does not substantively affect our time series results.

A broader concern is that since 1981, states have engaged in many "fiscal shenanigans" intended to substitute local government, federal government, and healthcare provider spending for state spending on Medicaid. To understand how these "fiscal shenanigans" could create bias, suppose they created a *quid pro quo* in which hospitals give money to states and record it in *Losses* and receive their money plus a federal match back in *Supplemental payments*. Such a scheme would introduce simultaneity and upward bias in the relationship between these variables. More generally, if "fiscal shenanigans" introduce measurement error into the analyses, they could also introduce bias. While a concern for all hospitals in the past, current laws and regulations require taxes to be broad based to be eligible for a federal match or to be an allowable Medicaid cost. Thus, if states are complying with regulations, such concerns should be of limited importance for non-government hospitals. In government hospitals, such concerns remain more important because they may not receive all funds that are allocated to them if governments subsequently transfer away the funds through IGTs. IGTs are not included in *Losses* or *Supplemental payments*, and account for roughly 4.3 percent of Medicaid payments.[49] Duggan [2000] illustrates that when public hospitals receive windfalls that local governments reduce funding to the hospitals. Even among non-government hospitals, the Government Accountability Office has reported on Medicare enforcement actions against states during years immediately preceding our sample, and raised concerns about whether data reporting requirements are sufficient to ensure compliance with all Medicaid payment laws and regulations [GAO, 2008, 2014].

We present four more reasons that "fiscal shenanigans" do not appear to explain our results. First, as Table A.11 illustrates, there is no relationship between IGTs from hospitals to government, as measured

[49] According to GAO [2014], federal funding covers roughly 57 percent of Medicaid spending. Of the remaining 43 percent, 10.1 percent are from IGTs.

in the Cost Reports, and *Losses*.[50] Second, Table A.15 illustrates that results are similar when we split states based on the extent to which they raise Medicaid funds from providers or local governments; if "fiscal shenanigans" were driving this paper's results, then they would be concentrated among the states that raise Medicaid funds from providers or local governments. Third, Table A.12 illustrates that *Losses* and *Supplemental payments* both affect hospital profitability as measured in the Cost Reports; if, due to "fiscal shenanigans," hospitals did not obtain the benefits of *Supplemental payments*, then the coefficient on *Losses* would be 0.[51] Finally, in the IV analyses, many sources of simultaneity and/or measurement error are less likely to result in biased coefficient estimates.

7 Conclusion

Optimally designing the U.S. social health insurance system requires a detailed understanding of the various institutions in the system. Through a series of implicit and explicit regulations, the U.S. requires hospitals (which are often private firms) to provide care to the indigent in exchange for payments that are below the average cost of that care. In this way, hospitals serve a critical role in the social safety net. One of the rationales for the Affordable Care Act's Medicaid expansion was to lower hospital uncompensated care costs. Using a novel dataset, we illustrate that most of these costs were already borne by the government through Medicaid supplemental payments. Thus, Medicaid was already serving as a "reinsurer of insurers of last resort" for a hospital's average exposure to the indigent. However, we also demonstrate that hospitals are far more exposed to the costs generated by volatility in their exposure to indigent patients. This suggests that some hospitals still serve an economically meaningful role in providing care to the marginal uninsured and/or Medicaid patient.

The patterns we uncover have counterintuitive implications for the long-term effects of Medicaid expansions on hospital finances. In particular, the ACA mandates cuts in Medicaid DSH payments. The

[50] We construct two measures of IGTs; the "narrow" measure is restricted to costs that are explicitly reported to be IGTs. However, as hospitals often use vague wording, we also construct a "wide" measure, which aggregates all "other expenses" on the Cost Reports. The magnitudes in this section of the Cost Reports are smaller than external estimates of IGTs; therefore we believe the magnitudes in these regressions are likely inaccurate, but that the results are directionally informative. We also tested for and failed to find evidence that IGTs from local governments to states are correlated with *Losses* using the Survey of Local Government Finances. The number of local governments consistently reporting IGTs to states from their hospitals was very small; we do not deem these results to be reliable and do not report them.

[51] The coefficient is roughly 0.20, which is substantially less than 1.00, but is of a similar magnitude to the coefficient on *Losses* in the same regression. Given the strong relationships between *Losses* and *Supplemental payments*, the high year-to-year volatility in both of these variables, the imperfect match in the timing of the Cost Reports and Audit Reports, and a number of potential endogeneity concerns in this regression, we do not view attenuation in the coefficient estimate as evidence that hospitals are not benefiting from *Supplemental payments*.

logic behind these cuts is that if hospitals are less exposed to uninsured patients, then they don't require as many supplemental payments. However, this ignores the control that states have over the use of supplemental payments. In particular, we find that states target these funds to government hospitals—facilities that have an disproportionate exposure to indigent patients. Looking at our results together, we demonstrate that if Medicaid base rates remain below "costs," then replacing Medicaid supplemental payments with a Medicaid expansion that covers all of the uninsured will redistribute money away from hospitals that serve lower-income patients to hospitals that serve higher-income patients. Such redistribution would likely meaningfully decrease the number of hospitals that would remain solvent in lower-income areas and the extent to which remaining hospitals in lower-income areas could afford to make large fixed-cost investments.

On the flip side, we demonstrate that supplemental payments are a very volatile stream of payments. This fact combined with variation in exposure to the indigent means that the current system of supplemental payments may prove ineffective at providing hospitals with the certainty necessary for making large fixed-cost investments.

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A Appendices (For online publication only)

A.1 Data validation

How comprehensive are the Audit Reports? The Audit Reports only include Medicaid DSH recipients; hospitals that receive other supplemental Medicaid payments but that do not receive Medicaid DSH are excluded. Furthermore, while the data are audited, it is not clear whether they are comprehensive. We validate the Audit Reports against two external sources. The first is the Medicaid Financial Management Reports (FMRs), which are based on form CMS-64, a source of information on annual state Medicaid spending. The second are the Medicare Cost Reports.

The FMRs include annual data on Medicaid payments to hospitals. Based on the FMRs, 55 percent of non-MCO payments are for base rates, 17 percent are for Medicaid DSH, and 27 percent are for other supplemental payments; the FMRs do not include managed care organization payments to hospitals. [52] As Figure A.1 illustrates, among our sample of states, 67 percent of non-MCO payments are for base rates, 17 percent are for Medicaid DSH, and 16 percent are for other supplemental payments. Some of the difference may be due to other sampling restrictions; our sample excludes non-general acute care hospitals (most of which are institutes of mental disease) and a number of states.

As Figure A.2 illustrates, our data is positively correlated with the FMRs at the state level. We plot the share of each state's fee-for-service Medicaid hospitals payments that are from supplemental payments in the DSH Audit Reports against the share in the FMRs. While we underestimate the relationship to some extent, we have a strong positive slope. Of note, some of the reasons for differences may be the exact treatment of managed care versus fee-for-service revenues.[53]

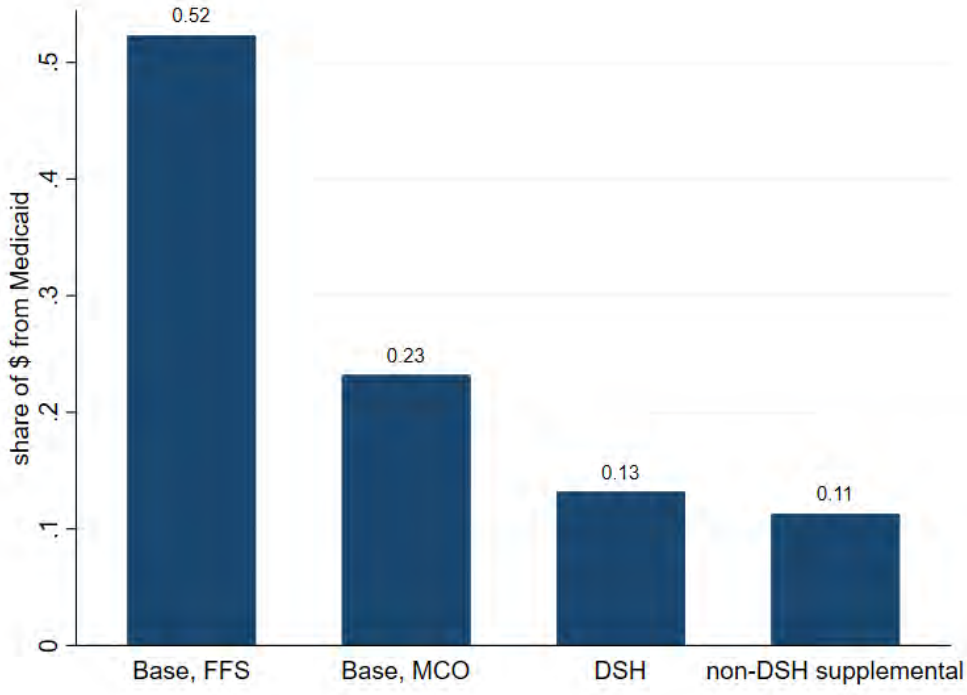
Do the Audit Reports and Cost Reports produce similar estimates of $IndCosts$, $Base\,payments$, $IndProfits = Base\,payments - IndCosts$, and total hospital costs? Figure A.3 presents these relationship for 2012.[54] The Cost Reports report lower costs, lower payments, and lower profits on indigent patients. However, the variables are strongly positively correlate across the two sources. Of note, the sources differ at effectively every step of the calculation of these variables. For example, the Audit Reports contain explicit criteria on what patients should be excluded, whereas the Cost Report's directions are less precise. In particular, the Cost

[52] Source: https://www.kff.org/report-section/understanding-medicaid-hospital-payments-and-the-impact-of-recent-policy-changes-issue-brief/

[53] For example, in the DSH Audit reports, Vermont is listed as having no managed care hospital payments; Vermont has a unique state-run MCO that administers most care; treatment of this likely explains the difference for Vermont.

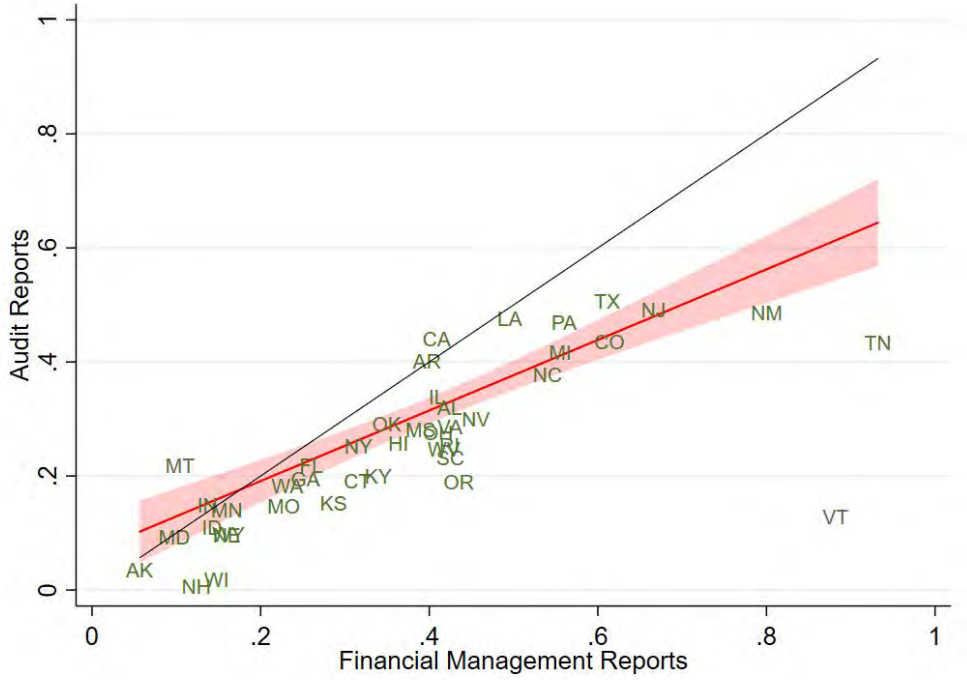
[54] The Audit Reports do not include total hospital costs in years prior to 2012.

Figure A.1: Hospital Medicaid payments by type



Notes: Calculated based on main sample of Audit Report data for 2012.

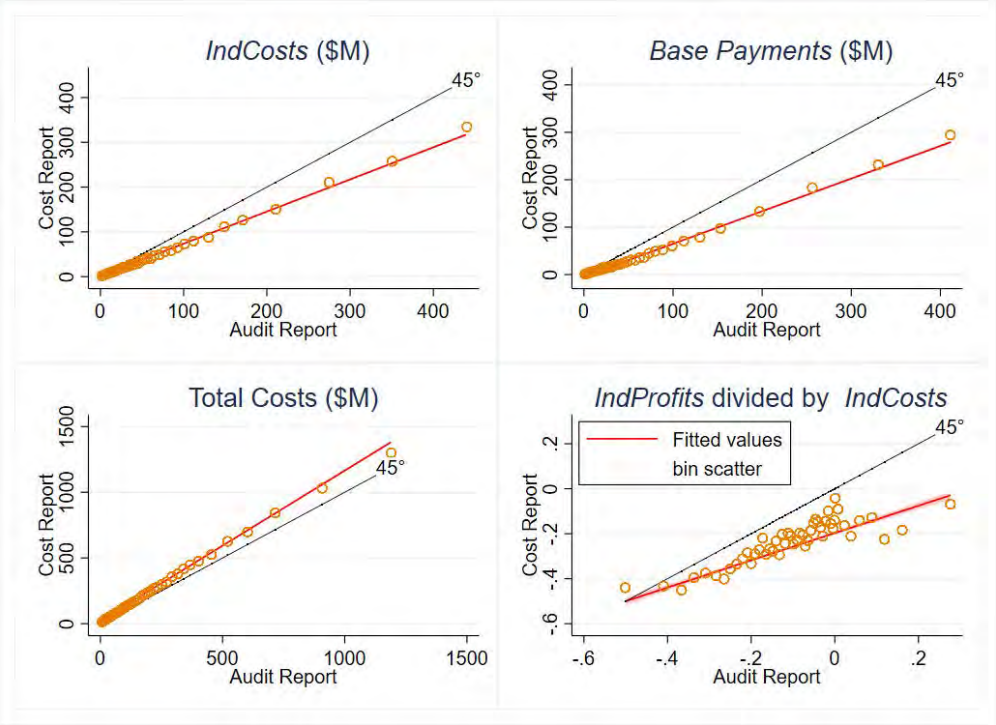
Figure A.2: *Supplemental payments* in Audit Reports and Financial Management Reports



Notes: Audit Report and Financial Management Report calculations are both based on 2012 data.
Supplemental payments are reported as a share of *IndPayments*.

Reports do not separate out bad debt from the uninsured from other bad debt; only the former is eligible for inclusion in the Audit Reports. The Cost Reports are also less explicit about sources of patient revenue hospitals should report. Finally, the Cost Reports deflate charges to costs using an overall, hospital-level cost-to-charge ratio; the Audit Reports provide states with greater flexibility in defining the cost-to-charge ratio used to deflate charges to costs.

Figure A.3: Cost Reports versus Audit Reports



Notes: Audit Report and Cost Report calculations are both based on 2012 data. Data is plotted in a bin scatter, where hospitals are placed into bins representing 5 percent of the data based on their value on the x-axis.

A.2 Details on construction of *Closure shock*

This section details how we construct *Closure shock*. We perform this analysis with Medicare's 2011 Hospital Service Area file, which counts admissions for each zipcode-hospital pair in the United States in 2011. We restrict the choice set for patients to the 25 closest hospitals to the patient's zipcode; we also discard any hospitals that are greater than 50 miles from the patient's residence. Using a conditional logit, we estimate the effect of four variables on patient choice: (1) the crow-flies distance from the patient's zipcode to the hospital's zipcode; (2) the geometric mean of the population density in the two zipcodes; (3) the product of 1 and 2; and (4) an indicator for the hospital that is closest to the patient's zip code. The number of patient

in zipcode z is N_z. The predicted probability that a patient living in zipcode z visits hospital h is $\hat{s}_{zh}$.[55] For a closing hospital c, we define $LossesPD_c$ to be average losses for hospital c in the years prior to closure divided by $\sum_z N_z \hat{s}_{zc}$. We predict the number of discharges that h will obtain from c's former patients to be: $\Delta\hat{s}_h^c = \sum_z N_z \cdot (\frac{\hat{s}_{zh}}{1-\hat{s}_{zc}} - \hat{s}_{zh})$. We define:

$$ClosureLosses_h^c = \frac{\Delta\hat{s}_h^c \times LossesPD_c}{op\,\hat{costs}_h}. \tag{3}$$

The hospital's operating costs in the first year in which it is in-sample is $op\,\hat{costs}_h$. We define:

$$Closure\ shock_{ht} = \sum_c ClosureLosses_h^c \times 1[c\ closes\ by\ year\ t]. \tag{4}$$

A.3 Do supplemental payments respond to external wealth shocks?

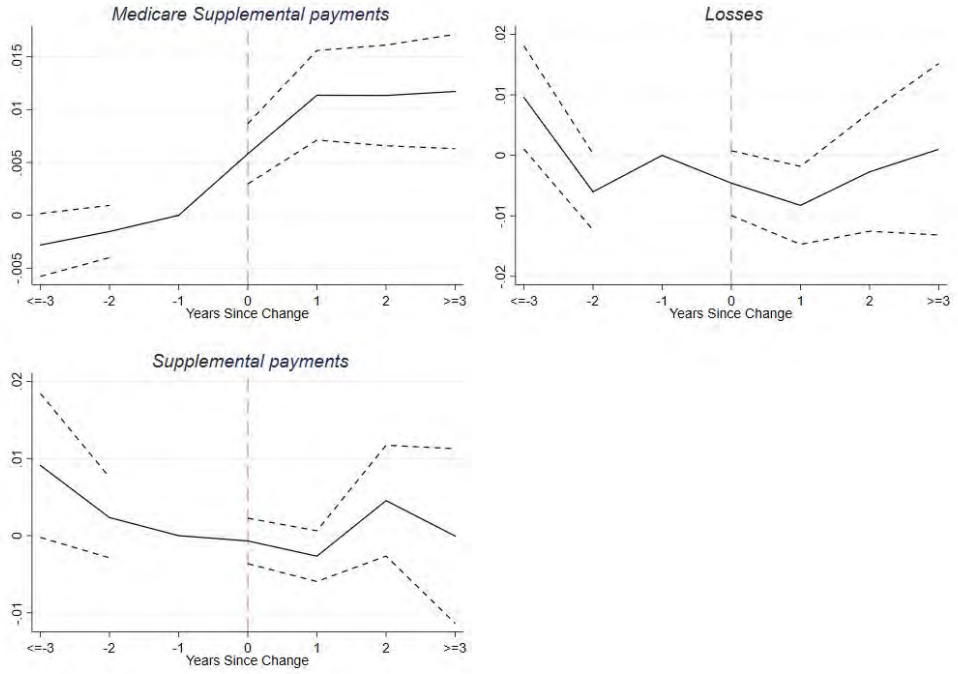
This section illustrates that negative shocks to hospital wealth that are unrelated to losses on indigent patients do not lead to changes in *Supplemental payments*. We investigate two different shocks.

The first shock comes from hospital introduction into Medicare's Sole Community Hospital (SCH) program. This program provides hospitals with a substantial increase in Medicare prices, and therefore should represent a positive shock to a hospital's long term profitability. In Figure A.4, we illustrate that Medicare supplemental payments (which we define as all payments in excess of a Hospital's base medicare DRG payments) increase by more than 1 percentage point of operating costs after a hospital joins the SCH program. *Losses* and *Supplemental payments* do not change after a hospital joins the SCH program.

Second, following Dranove et al. [2017], we use investment losses from the 2008 stock market crash as a shock to the wealth of nonprofit hospitals. Figure A.5 illustrates that this shock has no effect on *Losses* or *Supplemental payments*. A coefficient of 1 in the *Supplemental payments* regression in 2009 would imply that every dollar of hospital stock market losses was instantaneously returned to the hospital by state its state's Medicaid program. The coefficient is near zero and the range of the 95 percent confidence interval is less than 0.10, which rules out a meaningful response.

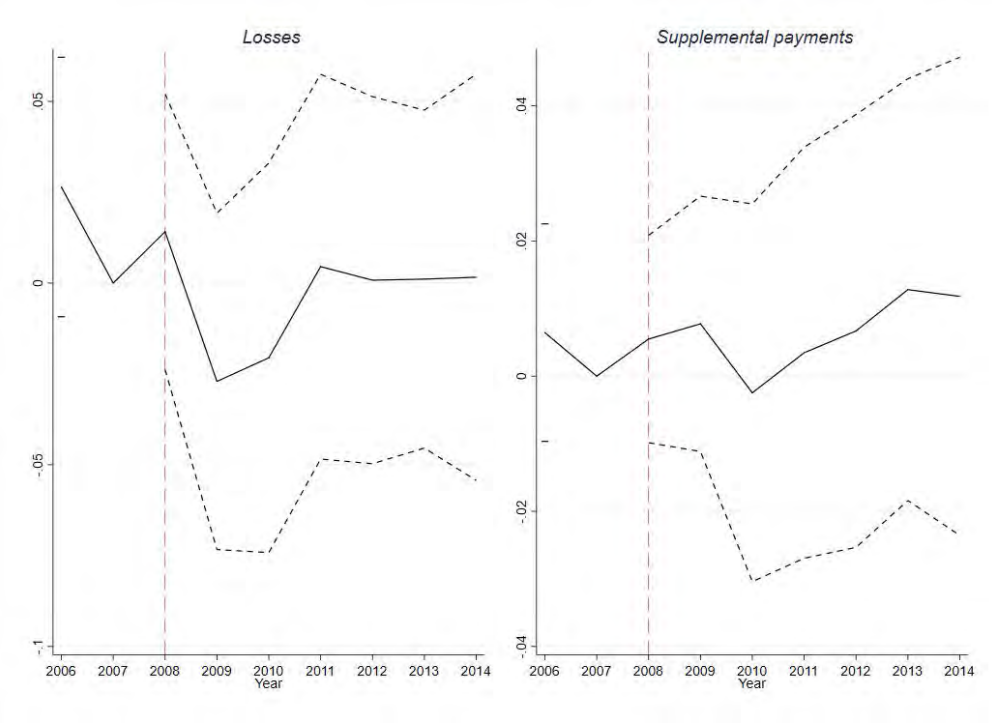
[55] Most of the closures in our sample occur prior to 2011. After obtaining parameter estimates from the model, we add these hospitals to patient choice sets prior to predicting $\hat{s}_{zh}$.

Figure A.4: Effect of introduction into Medicare's Sole Community Hospital program



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital fixed effects and year fixed effects. Hospitals are weighted by first year operating costs.

Figure A.5: Effect of Stock Market Crash on *Losses* and *Supplemental payments*



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital fixed effects and year fixed effects. Hospitals are weighted by first year operating costs.

A.4 Gubernatorial transitions

One concern with allowing states discretion over the distribution of supplemental Medicaid payments is that they may allocate it based on local political factors, rather than some broader social criteria. We investigate one potential avenue through which this might occur. Within states, discretion in allocation of Medicaid supplemental payments likely rests with the executive branch; Medicaid programs are typically administered by a state's department of human services, which is led by a political appointee. We test whether governors redirect supplemental payments towards areas in which they received greater support. If voters respond to changes in payments for local services, then the relationship between realized vote shares and hospital payments would be subject reverse causality. We therefore focus narrowly on variation resulting from: i. changes in the party controlling a state's governorship, and ii. average political lean of a county. Our key independent variable of interest, "County lean," is the expected vote share of the governor's party, based on elections between 2006 and 2014. Thus, if the Republican candidate for Governor typically wins 70 percent of the votes in a county, then the key independent variable would be 0.70 if a Republican was governor and 0.30 if a Democrat was governor.

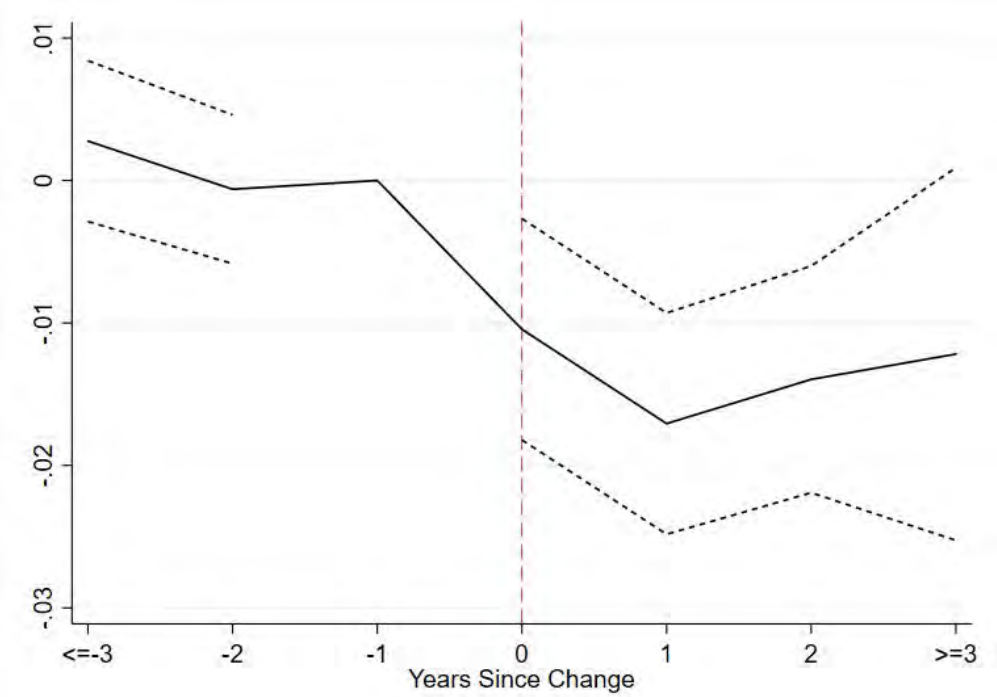
Table A.1: Governor Transitions

Panel A: Democrat -> Republican	
2008	Louisiana
2010	New Jersey, Virginia
2011	Kansas, Michigan, New Mexico, Ohio, Oklahoma, Pennsylvania
2013	North Carolina
Panel B: Republican -> Democrat	
2007	Arkansas, Colorado, Maryland, New York, Ohio
2008	Kentucky
2009	Missouri
2011	California, Connecticut, Hawaii, Minnesota, Vermont
2014	Virginia

Table A.1 lists which states experienced changes in the Governor's party by year and the direction of the transition.[56] Of note, because our identification strategy relies on switches in the Governor's party, the transitions will be from moderate states or gubernatorial candidates who outperformed their party within the state.

[56] We discharge Rhode Island from these analyses. Lincoln Chafee served as Governor from 2011-2015. He began his career as a Republican, ran for governor as an independent, and the switched to being a Democrat. As a result, the correct coding for Rhode Island is ambiguous.

Figure A.6: Effect of Gubernatorial party changes on *Supplemental payments*



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital fixed effects and year fixed effects. Hospitals are weighted by first year operating costs.

Figure A.6 presents lags and leads of the effect of Gubernatorial transitions on *Supplemental payments*. *Supplemental payments* are flat prior to the change in governor's party, and then fall in those counties where the new Governor's party typically does better. Based on column (2) of Table A.2, the coefficients in the post period is roughly -0.014, which means, for example, that if a Democrat is elected, that in a county where all voters typically vote for Democrats, that *Supplemental payments* would fall by roughly 0.014 percentage points of hospital operating costs. The sign is opposite to the anticipated coefficient if Governors were rewarding their constituents. We investigate two potential explanations. First, we examine whether the effect is stronger or weaker for governors who outperform their party in a state; such governors may have different constituents or objectives. We create a variable "governor overperformance," which is the difference between the governor's performance in the race and that party's average performance in state gubernatorial elections. In column (3), the coefficient on County lean*governor overperformance is negative (but insignificant), which suggests that the effect is stronger for governors who did better than anticipated in the election. Figure A.7 presents results by state.[57]

Table A.2: Effect of Gubernatorial party changes on *Supplemental payments*

	(1)	(2)	(3)
County lean	-0.0153	-0.0140	-0.0137
	[0.00442]***	[0.00425]***	[0.00901]
Losses		0.193	0.193
		[0.0226]***	[0.0226]***
County lean x			-0.00398
governor overperformance			[0.103]
N	15,996	15,996	15,996

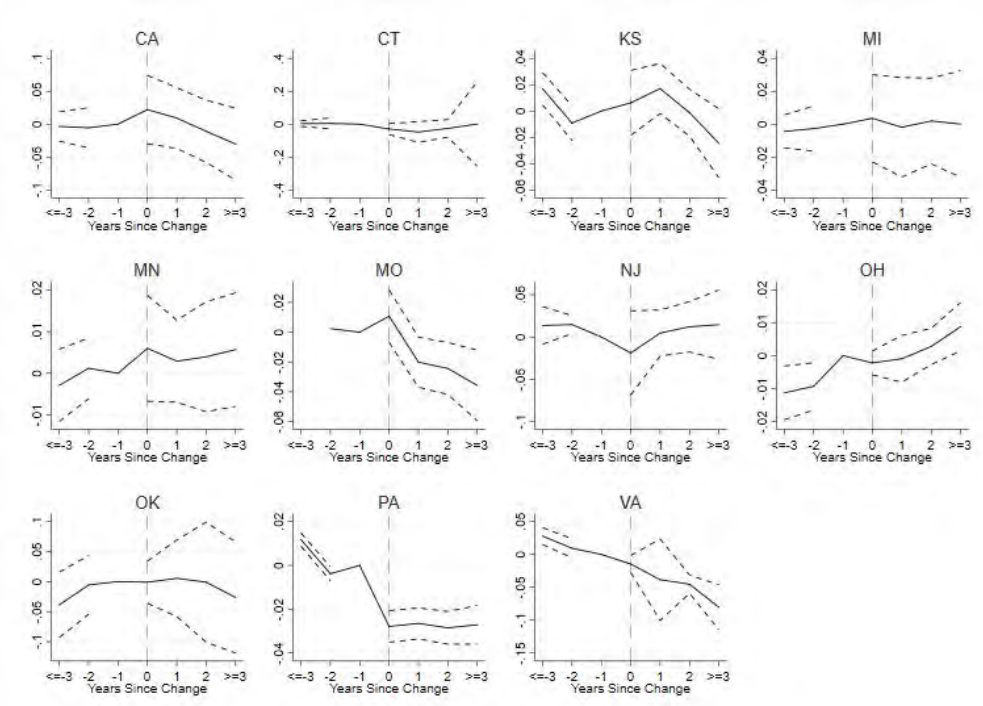
Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects and year-state fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

By studying changes in DSH payments to hospitals that receive DSH, we are not capturing any extensive margin changes in the number of hospitals within a county receiving DSH. To investigate whether there are extensive margin changes in the number of hospitals within a county receiving DSH, we aggregate the data to the county-year level and re-perform the analyses.[58] Figure A.8 confirms that that the results are similar at the county-year level, suggesting there aren't extensive margin changes in the number of hospitals receiving

[57] We restrict the state-by-state analyses to states with at least 20 hospitals in all years, and with a change in governor's party between 2009 and 2012.

[58] We no longer include a control for *Losses* as we only observe *Losses* for facilities in the DSH data. Column (1) vs Column (2) of Table A.2 suggest that for hospitals in the DSH data, *Losses* are not meaningfully correlated with County lean.

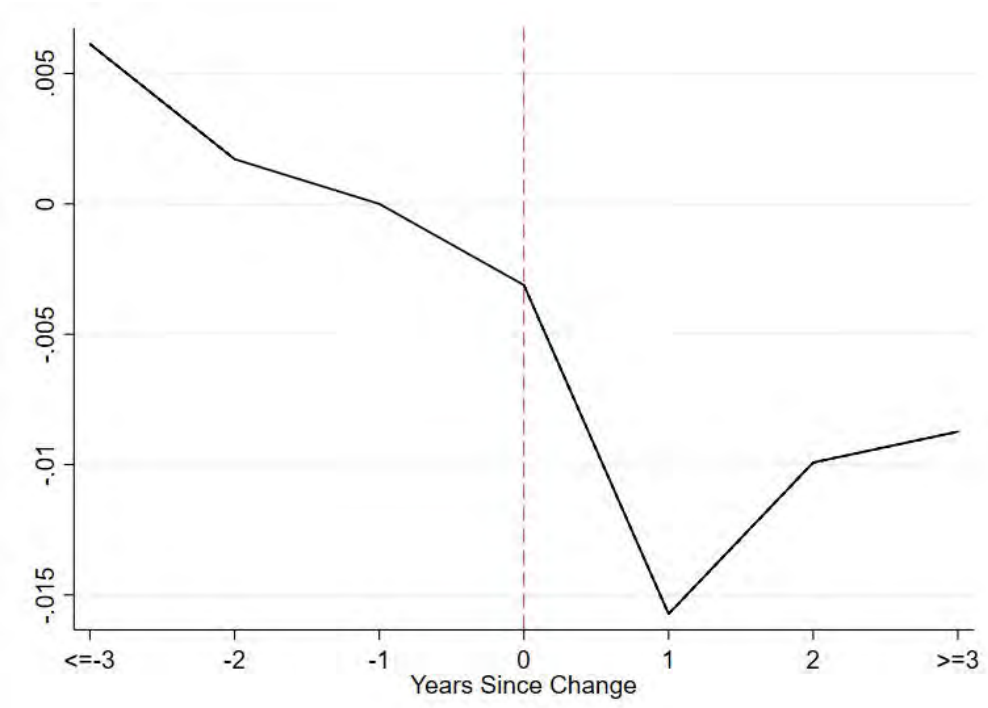
Figure A.7: Effect of Gubernatorial party changes on *Supplemental payments* (results by state)



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital fixed effects and year fixed effects. Hospitals are weighted by first year operating costs.

DSH.

Figure A.8: Effect of Gubernatorial party changes on *Supplemental payments* (by county)



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital fixed effects and year fixed effects. Hospitals are weighted by first year operating costs.

A.5 Extensive margin Medicaid DSH payments: cross sectionalA.5

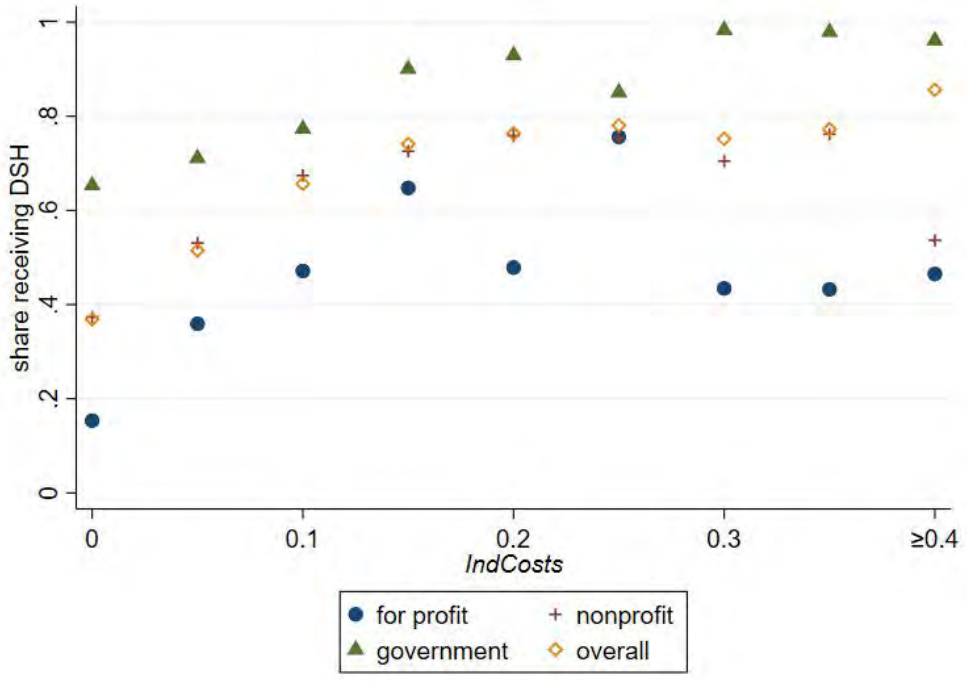
Which hospitals receive Medicaid DSH payments? Our central analyses are restricted to hospitals receiving DSH funds because the Audit Reports do not contain hospitals that do not receive DSH. However, evaluating the cross-hospital distributional effects of Medicaid supplemental payments necessitates a broader understanding of what types of hospitals receive these payments. We examine how receipt of Medicaid DSH varies with a hospital's ownership type and the share of the hospital's costs devoted to treating indigent patients in 2012.[59] To study which hospitals receive Medicaid DSH, we construct analogs to *IndCosts* and *IndPayments* from the Cost Reports in 2011 through 2014.[60] Hospitals receiving Medicaid DSH comprise two thirds of overall patient costs, and three fourths of costs for indigent patients. Thus, the characteristics

[59] We measure receipt of Medicaid DSH as inclusion in the Audit Reports.

[60] The Cost Reports only report uncompensated data with any level of completeness since 2011.

of hospitals receiving Medicaid DSH capture a large share of indigent care spending. Figure A.9 illustrates that the probability of receiving Medicaid DSH increase in *IndCosts*, the share of a hospital's costs that are for indigent patients. It also varies by hospital type. For example, just under 20 percent of for profit hospitals with *IndCosts* between 0 to 5 percent of patient costs received Medicaid DSH. By contrast, over 90 percent of government hospitals with *IndCosts* above 30 percent of patient costs received Medicaid DSH.[61]

Figure A.9: Relationship between *IndCosts* and receipt of Medicaid DSH



Notes: Sample is general acute care hospitals with 2012 Cost Report data in the 43 states for which we have Audit Reports. We measure participation in Medicaid DSH based on whether the hospital is present in the Audit Reports. The sample of hospitals receiving DSH includes hospitals that participate in Medicaid DSH but that are discarded from the central analyses because of missing or inconsistent data; in 2012 these hospitals represent roughly 0.7 percent of Medicaid costs. Data is plotted in a bin scatter, where hospitals are in bins of 0.05 for *IndCosts*. For example, the bin for 0 spans [0,0.05).

A.6 Extensive margin Medicaid DSH payments: time series

In this section, we investigate whether extensive margin changes in whether hospitals receive Medicaid DSH payments increase or decrease funding volatility for hospitals. This section is more qualitative and less precise in nature because we lack the data needed to fully quantify extensive margin volatility.[62] However, we

[61] Figure A.14 presents the relationship between *IndCosts* and *IndProfits* by Medicaid DSH status.

[62] We refer to the eventuality that DSH payment is zero as *ND*, and the eventuality that DSH payment is not 0 as *D*. For a variable *Y*, the law of total variance states:

conclude that extensive margin volatility in receipt of DSH payments likely does not substantially increase or decrease funding volatility for hospitals.

We analyze which hospitals that ever appear in the Medicaid DSH data lose DSH. We code a hospital as losing DSH if the hospital permanently exits from the DSH data.[63] Roughly 12 percent of hospitals that receive DSH payment in some year lose DSH payment over our sample period.[64] Table A.3 studies the relationship between past *Losses* and *DSH* and losing DSH. Hospitals with lower past DSH payments are statistically and economically meaningfully more likely to lose DSH. Additional analyses suggest that hospitals that lose DSH payments had, on average *DSH* of 1.8 percent of operating costs, which is roughly half as large as the DSH payments of other hospitals receiving DSH and similar to the overall standard deviation in DSH payments.

Table A.3: Effect of average past *Losses* and *DSH* on losing DSH

	(1)	(2)	(3)
avg *Losses*	-0.274		0.116
	[0.0996]***		[0.145]
avg *DSH*		-0.470	-0.558
		[0.104]***	[0.152]***
N	2,378	2,378	2,378

Notes: Average *Losses* and *DSH* reported as a share of hospital costs. Results are for a linear probability model in which the dependent variable is permanently losing DSH. Observations are weighted by hospital operating costs. * 0.10 ** 0.05 *** 0.01

Next, we examine whether losing DSH affects overall hospital profitability (measured from the Cost Reports). If losing DSH meaningfully increased funding volatility for hospitals, then we would find that losing DSH lowered hospital profitability. To test for this, we create an independent variable so that it is equal to a hospital's average *DSH* in the years in which the hospital is present in the DSH data. We interact this independent variable with years pre-post when the hospital loses DSH. Figure A.10 presents the effect of lags and leads of losing DSH on a hospital's total profits. If there were no observed reasons that hospitals

$Var(Y) = Var(Y|D) * P(D) + Var(Y|ND) * P(ND) + [E(Y|D)^2 + E(Y|ND)^2 - 2 * E(Y|D) * E(Y|ND] * P(D) * P(ND)$

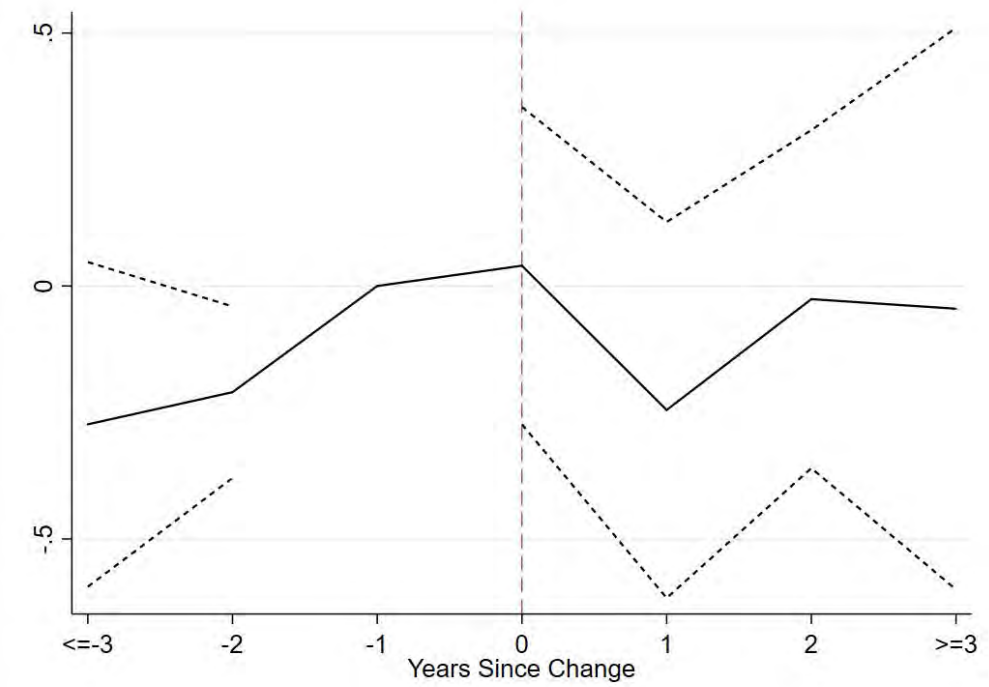
One could, with the right data, perform a decomposition using the law of total variance for *Losses* or *Losses* − *Supplemental payments*. However, we lack data on many of the relevant terms that condition on *ND*.

[63] There is additional volatility that arises from year-to-year variation in whether a hospital receives DSH that we abstract away from.

[64] This is roughly 50 hospitals per year. Fewer hospitals stopped receiving DSH payment from 2006 to 2007, likely because we had more difficulty matching to hospitals in 2006. More hospitals last received DSH payment in 2013; likely this is because some would in fact receive payment again in the future with a longer time series of data. We have confirmed these results are robust to excluding the hospitals that stop receiving DSH payment in 2013.

stopped receiving DSH that were correlated with profitability, no measurement error, no other sources of funds (such as UPLs) that could serve as policy substitutes, and no other actions that hospitals might take that would simultaneously affect profits, then we would expect a coefficient of -1 in the post period. There is no break from trend when the hospital loses DSH.

Figure A.10: Effect of losing DSH on total patient profits as a share of costs



Notes: The dependent variable is hospital profits as a share of the hospital's average operating costs, as measured in the Cost Reports. The independent variables are the hospital's average *DSH* in the years in which the hospital is present in the DSH data interacted with years pre-post loss of DSH payment. Unreported controls include hospital and year fixed effects. Observations are weighted by hospital average operating costs. The solid line is point estimates for the effect of the key independent variables and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital.

We take these facts as suggestive evidence that extensive margin variation in DSH receipt does not dramatically increase or decrease funding volatility for hospitals.

A.7 ACA Medicaid expansion

In this section, we treat the ACA's Medicaid expansion as a shock to losses on indigent patients. The ACA's Medicaid expansion shifted some of the uninsured onto Medicaid, and Medicaid base payments are higher than payments made by the uninsured. As a result, the ACA should have decreased losses on indigent patients. The ACA also mandated a large reduction in supplemental payments to states; these cuts were delayed from 2014 to no earlier than January of 2021. States will, in turn, be expected to cut DSH payments to hospitals, but will still be able to reimburse hospitals with other supplemental payments. Whether states cut supplemental payments in response to the Medicaid expansion or allow hospitals to keep them is an open question; expansion states retained the same state-level cap on DSH spending, but hospitals might have lower *Losses*, and therefore lower limits on the *Supplemental payments* they could receive.

The Audit Reports include 6 months of post-Medicaid expansion data in 2014 and therefore provide only a first glimpse and a relatively low-powered shock. We restrict the sample to states with no meaningful Medicaid for non-elderly, non-disabled, childless adults in 2013, and that either expanded Medicaid on January 1, 2014 or that have not expanded Medicaid.[65] Furthermore, we use a balanced sample of hospitals present in the 2011 to 2014 time period, so as to avoid the financial crisis and subsequent recession.

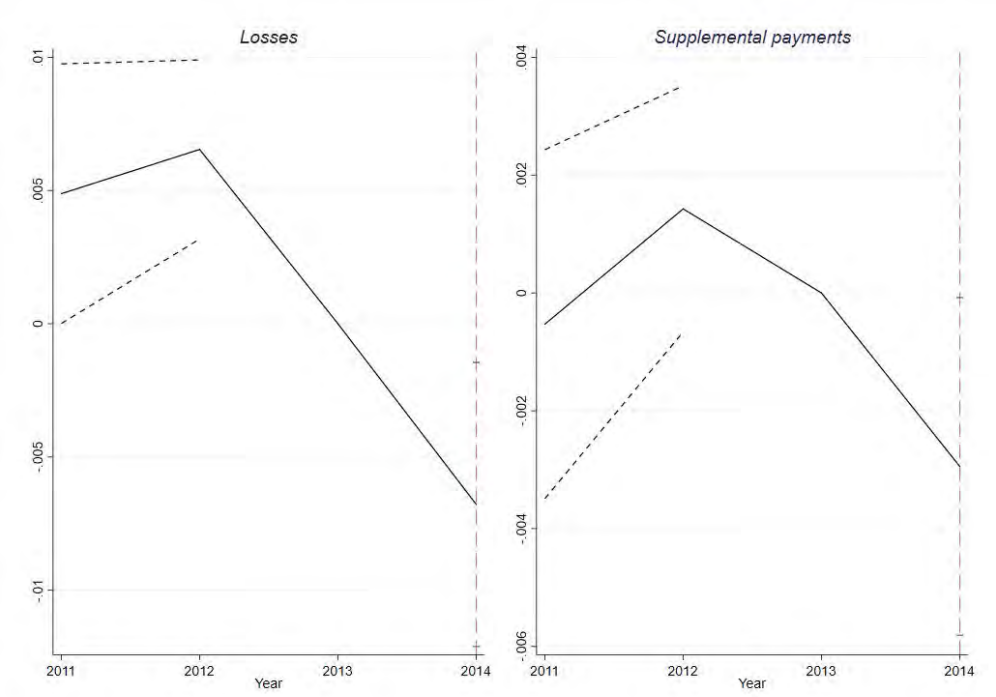
We treat state expansion of Medicaid as a shock to *Losses*, substituting $expanded_{ht}$, an indicator variable for whether hospital h is in a state that expanded Medicaid by year t, for $Shock_{ht}$, into Equation 2. Figure A.11 presents coefficient estimates from a lags and leads specification and illustrates that there is a decrease in *Losses* in expansion states, but that it begins in 2012, prior to the Medicaid expansion. Beginning in 2013, *Supplemental payments* also decrease in expansion states. Given the timing of these effects, it is unclear whether the decrease in *Supplemental payments* was caused by the decrease in *Losses*.

Within states, some hospitals benefited more from the Medicaid expansion than others. In particular, uncompensated care fell by more in parts of expansion states in which uncompensated care was initially higher. For $Y_{ht} \in \{Losses, Supplemental\ payments_{ht}\}$, we estimate:

$$Y_{ht} = \alpha_h + \tau_t + \beta_1 expanded_{ht} + \beta_2 (t = 2014) \cdot Uninsured\ costs_{h2010} + \beta_3 expanded_{ht} \cdot Uninsured\ costs_{h2010} + \varepsilon_{st}. \quad (5)$$

[65] The non-expansion states in our sample are: AL, FL, GA, ID, KS, ME, MS, MO, NE, NC, OK, SC, SD, TN, TX, UT, VA, WY. The expansion states in our sample are: AR, CO, IL, KY, MD, NV, NM, ND, OH, OR, RI, WA, WV.

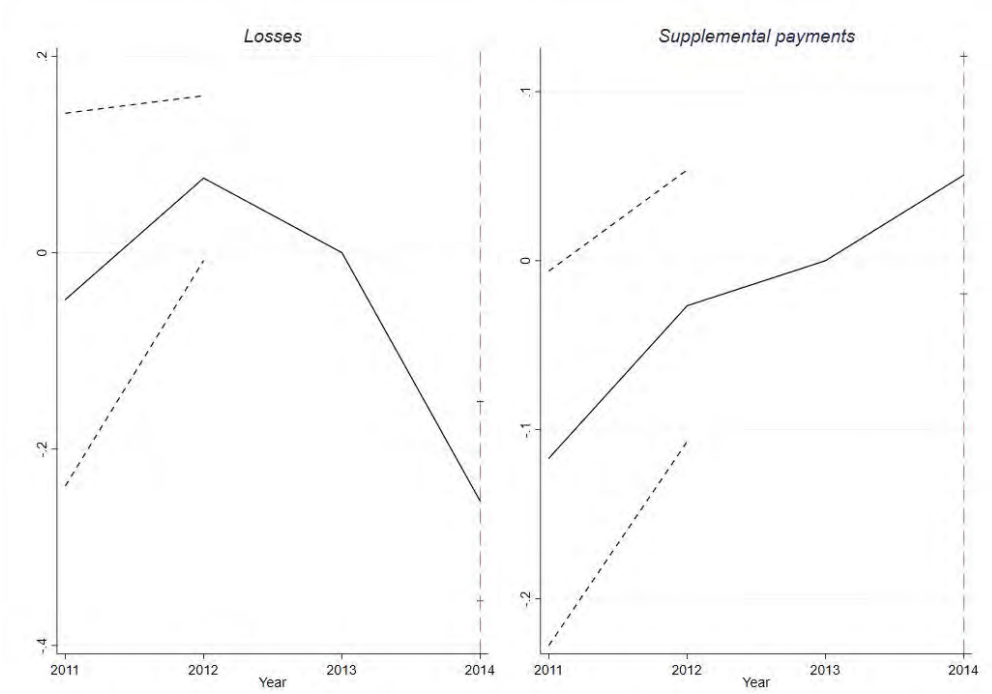
Figure A.11: Effect of Medicaid expansion on *Losses* and *Supplemental payments* (state-level variation in expansion decision)



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital and year fixed effects. Hospitals are weighted by first year operating costs.

The coefficient of interest is β_3. We report coefficients from a lags and leads specification in Figure A.12. There is clear evidence that *Losses* decreased in 2014 hospitals within expansion states that had high uninsured costs in 2010. *Supplemental payments* increase in these hospitals over the 2011 to 2013 period; there is no break from trend in 2014.

Figure A.12: Effect of Medicaid expansion on *Losses* and *Supplemental payments*
(local variation in intensity of expansion)



Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital fixed effects, year fixed effects for expansion states, year fixed effects for non-expansion states, and interactions between 2010 *Uninsured Costs* and year. Hospitals are weighted by first year operating costs.

Table A.4 illustrates that the IV estimates from these two identification strategies produce marginally statistically significant and oppositely signed effects. Given the clean break from trend in the effect of the expansion on *Losses* in Figure A.12, combined with the lack of a break from trend in *Supplemental payments* in that same Figure, we take the results of this section to suggest that the states did not recoup any windfall that the Medicaid expansion created from hospitals through the form of lower *Supplemental payments*. With only 6 months of post-ACA data, it is not clear what we should make of this result. It is possible that because the ACA has not yet cut state-level DSH funds, that states have not responded to the decreases in

uncompensated care, but will in the future. It is also possible that the type of policy induced-shock to uncompensated care that the Medicaid expansion represents is intentional and therefore not a shock that states wish to undo the consequences of.

Table A.4: Effect of *Losses* on *Supplemental payments*
(Medicaid expansion IV)

	(1)	(2)
Losses	0.306	-0.375
	[0.141]**	[0.159]**
Instrument	expanded	expanded×*Uninsured costs*
N	3,684	3,684

Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

B Backup tables and figures

Table A.5: Effect of *Losses* on *Supplemental payments*
(heterogeneity by expected *Losses*)

	lowest	..	..	highest
	(1)	(2)	(3)	(4)
Losses	0.0878	0.217	0.367	0.212
	[0.0173]***	[0.0439]***	[0.0386]***	[0.0497]***
N	3,688	3,725	3,717	3,704

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.6: Effect of *Losses* on *Supplemental payments*
(heterogeneity by hospital type and expect *Losses*)

	FP (1)	FP (2)	NFP (3)	NFP (4)	Govt (5)	Govt (6)
Effect of *Losses* by quartile of expected *Losses*						
1 (lowest)	0.122	0.161	0.104	0.110	0.448	0.421
	[0.0410]***	[0.0534]***	[0.0180]***	[0.0186]***	[0.0936]***	[0.0880]***
2	0.459	0.469	0.236	0.241	0.588	0.602
	[0.0655]***	[0.0680]***	[0.0621]***	[0.0628]***	[0.0854]***	[0.0815]***
3	0.456	0.464	0.425	0.429	0.611	0.604
	[0.0690]***	[0.0658]***	[0.0444]***	[0.0462]***	[0.0533]***	[0.0546]***
4 (highest)	0.398	0.381	0.386	0.387	0.522	0.514
	[0.0574]***	[0.0555]***	[0.0755]***	[0.0742]***	[0.0934]***	[0.0911]***
year FE	x		x		x	
year-quartile FEs		x		x		x
N	2,709	2,709	9,124	9,124	3,001	3,001

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital.

Table A.7: Effect of cost shocks on Medicaid and uncompensated care costs and payments

	Payments		Costs	
	Medicaid (1)	Uninsured (2)	Medicaid (3)	Uninsured (4)
Capital costs	1.091	-0.0123	1.734	0.476
	[0.537]**	[0.0541]	[0.591]***	[0.163]***
wage index	-0.0411	0.0146	-0.00412	0.0808
	[0.0332]	[0.00404]***	[0.0317]	[0.0166]***
N	16,128	16,128	16,128	16,128

Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.8: Effect of *Losses* on *Supplemental payments*
(closure IV robustness to alternative decisions about pooling, lags, and leads)

	(1)	(2)	(3)	(4)	(5)
Losses	0.297	0.164	0.335	0.465	0.399
	[0.131]**	[0.139]	[0.129]***	[0.105]***	[0.115]***
Instruments	pooled	pooled	pooled	all lags	all lags
Controls		lead 3+	lead 3+, lead 2		lead 3+
N	16,024	16,024	16,024	16,024	16,024

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.9: Within-hospital volatility in profitability of indigent patients (by hospital ownership type)

Profit Measure	For profit	Nonprofit	Government
Losses	0.030	0.024	0.035
Losses − Supplemental payments	0.025	0.021	0.025
Full expansion	0.007	0.006	0.008

Notes: Calculation of volatility is described in Section **??**. * 0.10 ** 0.05 *** 0.01

Table A.10: Effect of *Losses* on *Supplemental payments* (closure IV robustness to leaving out one closure)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Losses	0.338	0.354	0.344	0.359	0.345	0.343	0.346	0.340	0.471	0.280
	[0.139]**	[0.139]**	[0.133]**	[0.138]***	[0.137]**	[0.137]**	[0.139]**	[0.140]**	[0.112]***	[0.144]*
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Losses	0.336	0.308	0.330	0.350	0.382	0.367	0.358	0.345	0.342	0.322
	[0.126]***	[0.162]*	[0.138]**	[0.134]***	[0.134]***	[0.145]**	[0.134]***	[0.138]**	[0.137]**	[0.152]**
	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
Losses	0.301	0.341	0.325	0.335	0.344	0.336	0.351	0.266	0.326	0.342
	[0.157]*	[0.142]**	[0.152]**	[0.165]**	[0.141]**	[0.141]**	[0.137]**	[0.146]*	[0.138]**	[0.137]**

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.11: Effect of *Losses* other supplemental costs and payments

	Supplemental	Other payments			Other costs	
	Payments	Medicare DSH	All Medicare	in 340B?	IGTs (narrow)	IGTs (wide)
Losses	(1)	(2)	(3)	(4)	(5)	(6)
	0.410	0.00593	0.0106	0.0546	0.00000770	0.0106
	[0.0259]***	[0.00240]**	[0.00453]**	[0.0553]	[0.00000655]	[0.0361]
N	16,128	16,101	16,101	16,128	2,322	6,345

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.12: Relationship between *Losses* and *Supplemental payments* and net income

	(1)	(2)
Supplemental payments	0.189	0.210
	[0.0791]**	[0.0905]**
Losses	-0.208	-0.210
	[0.0439]***	[0.0446]***
Year FE	x	
Year-state FEs		x
N	16,044	16,044

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.13: Effect of *Losses* on *Supplemental payments* (robustness to not restricting *Supplemental payments*)

Specification	*Supplemental payments* set to $\leq$ *Losses* (1)	*Supplemental payments* unconstrained (2)
OLS	0.410	0.250
	[0.0259]***	[0.0229]***
Cost Shock IV	0.526	0.455
	[0.133]***	[0.150]***
Medicaid Expansion IV	-0.375	-0.497
	[0.159]**	[0.222]**
Closure IV	0.297	0.345
	[0.131]**	[0.138]**

Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Table A.14: Relationship between *Losses* and *Supplemental payments* (by quartiles of baseline net assets)

	lowest	...	...	highest
	(1)	(2)	(3)	(4)
Losses	0.223	0.386	0.307	0.273
	[0.0426]***	[0.0754]***	[0.0557]***	[0.0543]***
N	1,991	2,319	2,333	2,135

Notes: *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Net assets are measured relative to a hospital's operating costs. These correspond to the variable "reserves" in Dranove et al. [2017]. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital.* 0.10 ** 0.05 *** 0.01

Table A.15: Relationship between *Losses* and *Supplemental payments*
(by ownership type and state use of local Medicaid funding according to GAO [2014])

Panel A: States with lower local Medicaid contributions				
	All	**For profit**	**Nonprofit**	**Government**
	(1)	**(2)**	**(3)**	**(4)**
losses	0.344	0.342	0.245	0.506
	[0.0376]***	[0.0439]***	[0.0310]***	[0.0904]***
N	8,466	1,763	4,773	1,930
Panel B: States with higher local Medicaid contributions				
	All	**For profit**	**Nonprofit**	**Government**
	(1)	**(2)**	**(3)**	**(4)**
losses	0.459	0.410	0.327	0.663
	[0.0342]***	[0.0520]***	[0.0436]***	[0.0420]***
N	7,662	1,244	4,936	1,482

Notes: States are split by the share of non-federal Medicaid Payments that are funded by health care providers and local governments in 2012, based on whether this share is above or below 21.3 percent. These funds include provider taxes, provider donations, intergovernmental transfers, and certified public expenditures. *Supplemental payments* and *Losses* are both measured as a share of a hospital's first year operating costs. Net assets are measured relative to a hospital's operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital.* 0.10 ** 0.05 *** 0.01

Table A.16: Relationship between *Losses* and *Supplemental payments*
(cost shock IVs by ownership type and expected losses)

	Quartiles of baseline losses			
Ownership Type	**1 (lowest)**	**2**	**3**	**4 (highest)**
For profit	-0.812	0.930	0.721	0.386
	[1.336]	[0.384]**	[0.219]***	[0.253]
Nonprofit	0.326	0.0925	0.482	0.509
	[0.318]	[0.0842]	[0.286]*	[0.382]
Government	0.698	0.393	0.439	0.435
	[0.137]***	[0.379]	[0.252]*	[0.308]

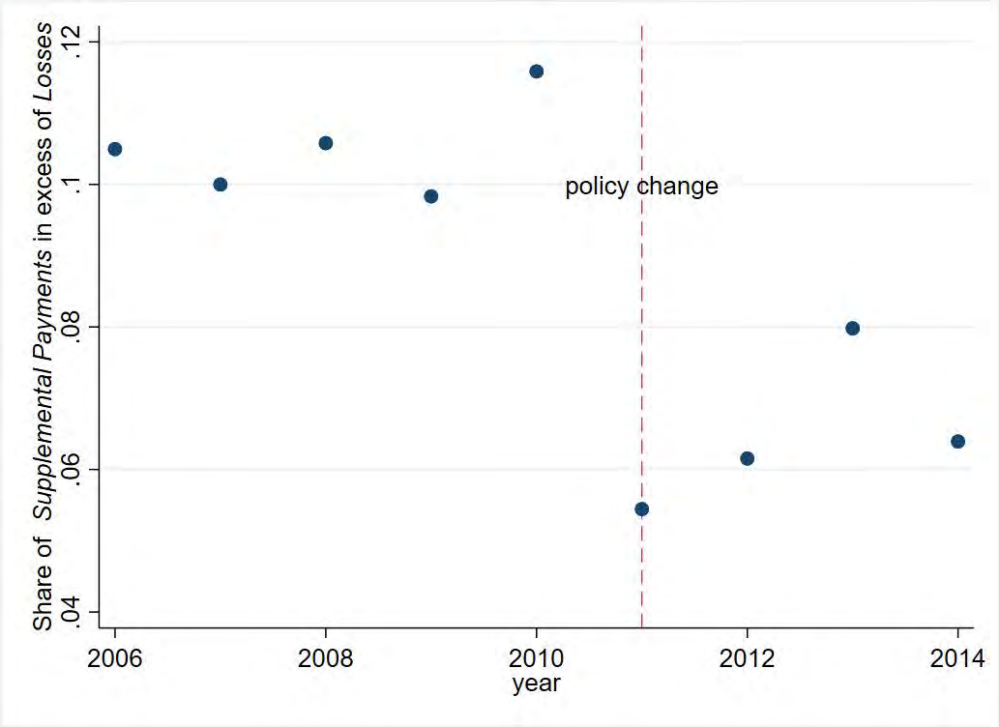
Notes: Medicaid DSH/supplemental payments and uncompensated care/Medicaid losses are both measured as a share of a hospital's first year operating costs. Presented coefficients are the effect of *Losses* on *Supplemental Payments*. *Losses* are instrumented for with *Capital Costs* and *Wage Index*. Hospitals are weighted by first year operating costs. Regression contains hospital fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01.

Table A.17: Effect of *Losses* on *Supplemental payments*
(*Closure Shock* IV; heterogeneity by ownership type)

	For profits			Nonprofits			Government		
	First Stage	Reduced Form	IV	First Stage	Reduced Form	IV	First Stage	Reduced Form	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Losses	*Supplemental payments*	*Supplemental payments*	*Losses*	*Supplemental payments*	*Supplemental payments*	*Losses*	*Supplemental payments*	*Supplemental payments*
Closure Shock	-0.303	-1.486		3.908	1.435		2.631	0.962	
	[1.689]	[1.340]		[1.055]***	[0.717]**		[2.062]	[2.495]	
Losses			4.898			0.367			0.366
			[23.77]			[0.112]***			[0.759]
KP rk Wald F statistic			0.0323			13.71			1.628
N	2,987	2,987	2,987	9,644	9,644	9,644	3,393	3,393	3,393

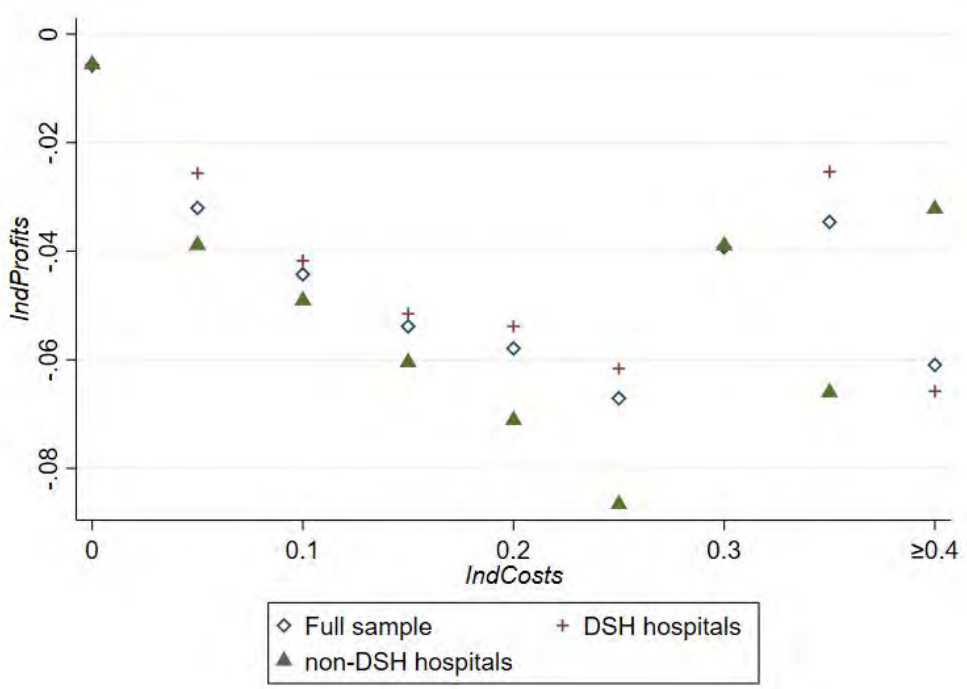
Notes: *Supplemental payments* and *Losses* are measured as a share of a hospital's first year operating costs. Hospitals are weighted by first year operating costs. Regression contains hospital and year fixed effects. Standard errors are clustered by hospital. * 0.10 ** 0.05 *** 0.01

Figure A.13: Share of *Supplemental payments* in excess of *Losses* by year



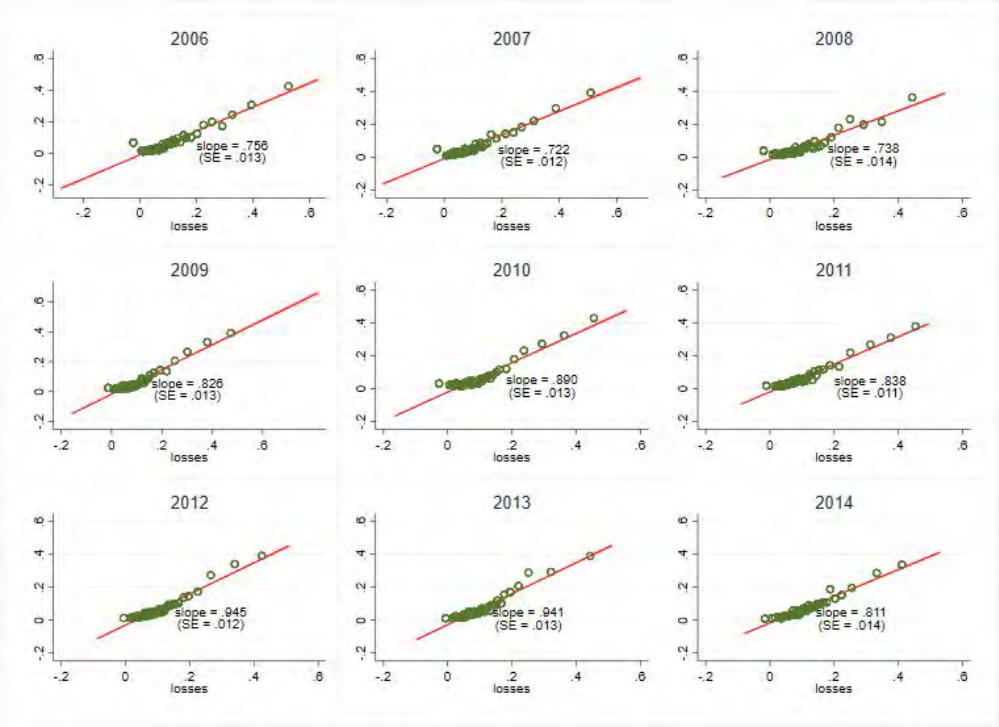
Notes: In 2011, Medicare began requiring that states redistribute *Supplemental payments* in excess of *Losses* or repay the federal match.

Figure A.14: Relationship between *IndCosts* and *IndProfits* by DSH status



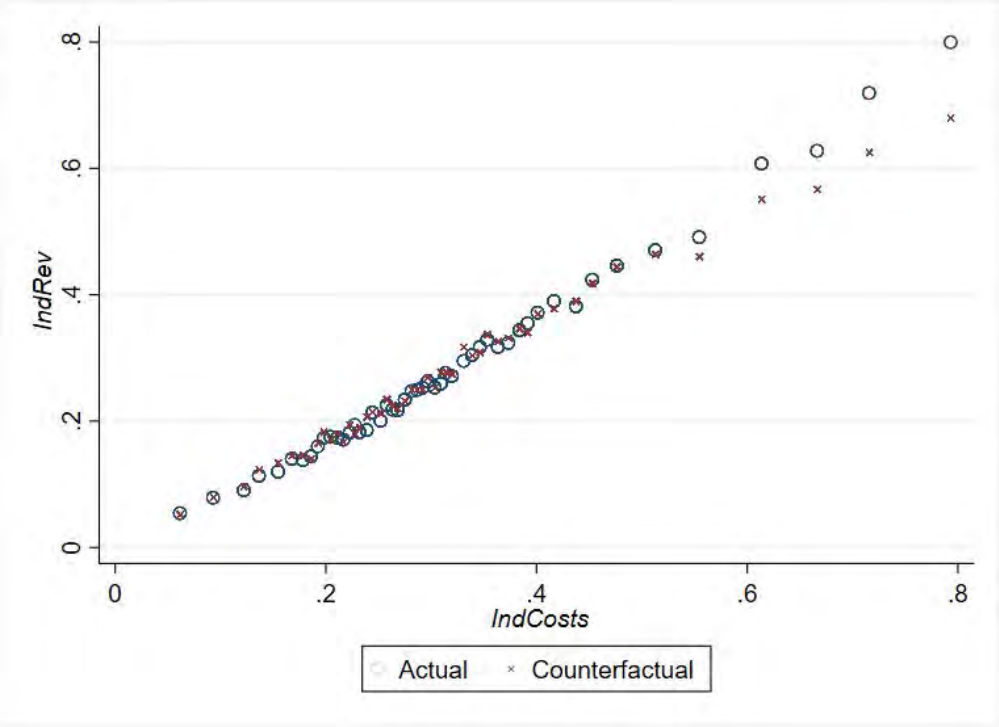
Notes: Sample is general acute care hospitals with 2012 Cost Report data in the 43 states for which we have Audit Reports. We measure participation in Medicaid DSH based on whether the hospital is present in the Audit Reports. *IndProfits* are measured from the Cost Reports. Data is plotted in a bin scatter, where hospitals are in bins of 0.05 for *IndCosts*. For example, the bin for 0 spans [0,0.05).

Figure A.15: Cross-sectional relationship between *Losses* and *Supplemental payments* (robustness to allowing *Supplemental payments* to exceed *Losses*)



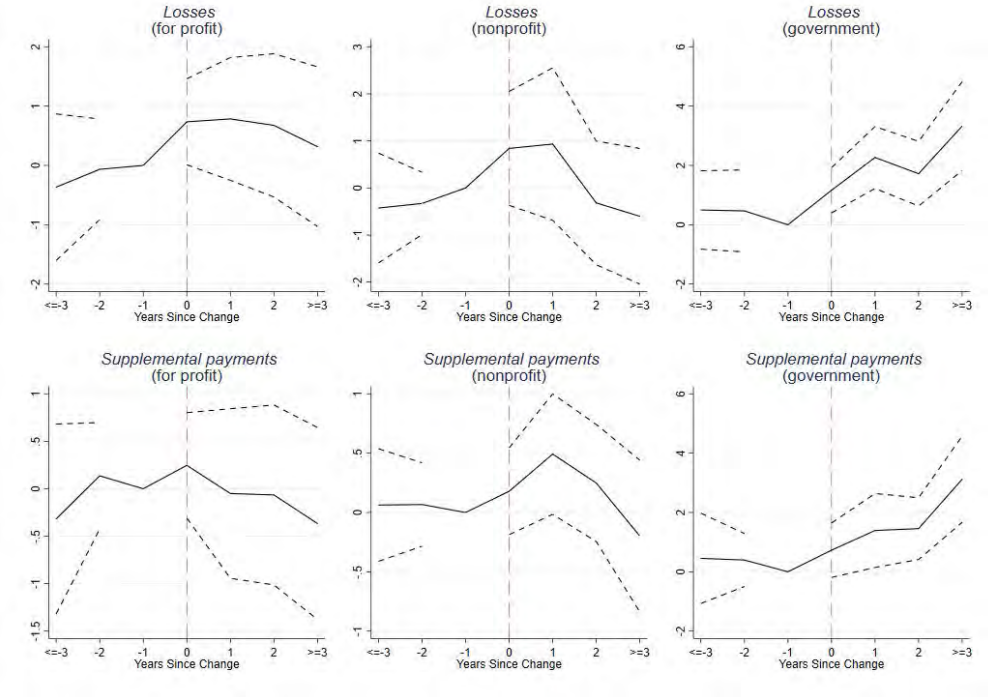
Notes: Data is plotted in a bin scatter, where hospitals are in bins of 0.05 for *Losses*. For example, the bin for 0 spans [0,0.05).

Figure A.16: Distributional effect of replacing DSH/UPL programs with a full Medicaid expansion



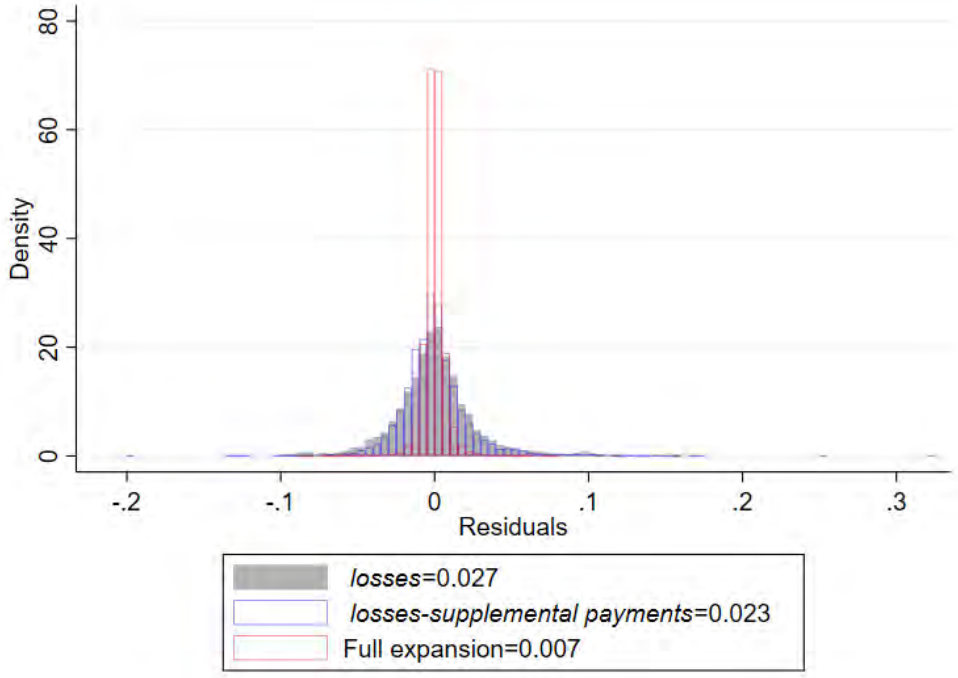
Notes: Data is plotted in a bin scatter, where hospitals are in bins of 0.05 for *IndCosts*. For example, the bin for 0 spans [0,0.05).

Figure A.17: Effect of capital cost shocks on *Losses* and *Supplemental payments*



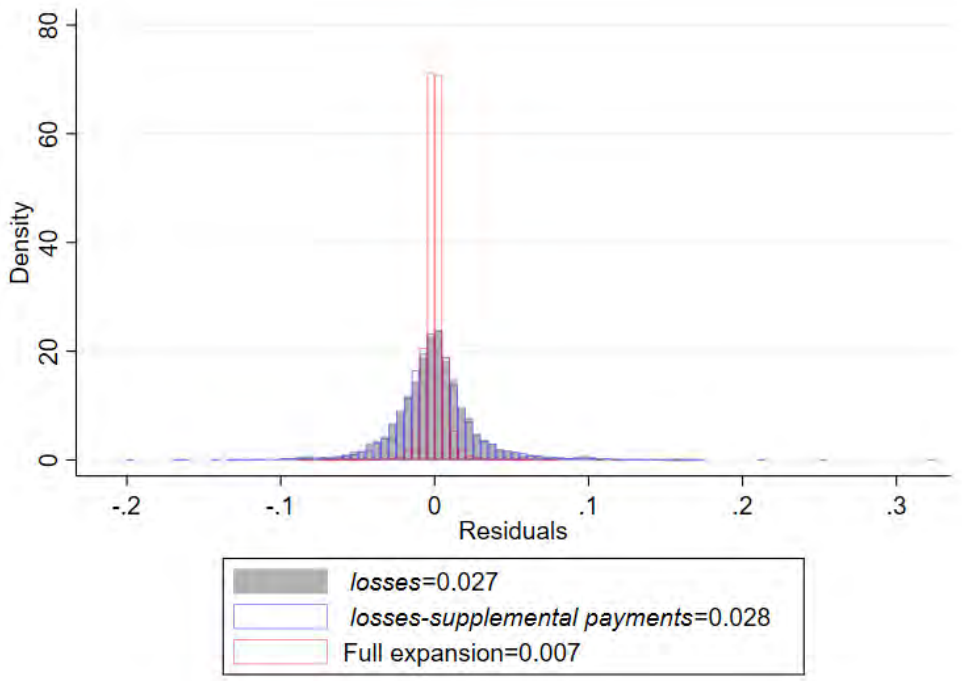
Notes: The solid line is point estimates for the effect of lags and leads of the key independent variable and the dotted lines are the 95 percent confidence interval for those coefficients, based upon standard errors that are clustered by hospital. Unreported controls are hospital and year fixed effects. Hospitals are weighted by first year operating costs.

Figure A.18: Within-hospital volatility in profitability of indigent patients



Notes: Residuals are calculated based on a regression with hospital and year fixed effects, where hospitals are weighted by first year operating costs.

Figure A.19: Within-hospital volatility in profitability on indigent patients
(Robustness to allowing *Supplemental payments* to exceed *Losses*)



Notes: Residuals are calculated based on a regression with hospital and year fixed effects, where hospitals are weighted by first year operating costs.