Good for your Fiscal Health? The Effect of the Affordable Care Act on Healthcare Borrowing Costs

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Abstract

We study the effect of the Affordable Care Act (ACA) on hospital credit risk through the municipal finance channel. The ACA increased insured healthcare demand but decreased expected reimbursement rates for treating insured patients. Healthcare yields decreased by 39 basis points relative to non-healthcare yields following a favorable 2012 ACA Supreme Court ruling, suggesting the demand effect dominates. We further identify the demand effect by showing larger yield reductions in Medicaid-expansion states and urban areas. Weaker effects for public hospitals and long-term bonds suggest that expected reimbursement cuts and subsidy uncertainties are also important determinants of hospital credit risk.

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1. Introduction

The Patient Protection and Affordable Care Act (ACA) is widely considered to be the most significant regulatory overhaul of the U.S. healthcare system since the passage of Medicaid and Medicare in 1965.[1] Signed into law in March 2010, the ACA provides low-income U.S. residents with better access to health insurance through a combination of federal subsidies for low-income households and an expansion of the income threshold for Medicaid eligibility. Hospitals in the U.S. have largely benefited from the expanded insured customer base since the ACA went into effect in 2014 (Dranove, Garthwaite, and Ody, 2016; Duggan, Gupta, and Jackson, 2019). However, one major issue highlighted by policymakers is that hospital default risk may increase over time due to ongoing ACA-associated cuts to Medicare and Medicaid reimbursement rates by the federal government, which was responsible for $1.5 trillion of U.S. healthcare spending, or 43% of all U.S. healthcare spending, in 2017 alone (Selden et al., 2015; Young et al., 2019; CRFB, 2018). In light of the competing effects stemming from the higher insured rate but lower anticipated revenues per patient in the long run, the purpose of this study is to test how the ACA has affected credit risk for U.S. hospitals.

We use the healthcare municipal bond market to study hospital credit risk around the implementation of the ACA. Healthcare municipal bond yields are forward-looking and reflect the long-term market consensus about hospital default risk. Healthcare municipal bonds are also one of the main sources of tax-exempt financing for non-profit hospitals, which represent about 70% of all hospitals in the U.S. Further underscoring the importance of these bonds for healthcare infrastructure development, the American Hospital Association (AHA), which represents 5,000 member hospitals and 270,000 affiliated physicians, has stressed that "the ability to obtain tax-exempt financing is a key benefit of hospital tax-exemption that works to make access to vital hospital services available in communities large and small across America" (AHA, 2017).

We show that the ACA significantly reduced hospital credit risk. In particular, we show that healthcare municipal bond offering yields decreased by 39 basis points after the U.S.

[1]The ACA is often referred to as "Obamacare" because of its association with President Barack Obama, who strongly endorsed the bill and signed it into law during his first presidential term. Medicaid is a federal and state program that provides healthcare subsidies for low-income U.S. residents. Medicare is a federal program that provides health insurance for U.S. residents aged 65 or older.

Supreme Court narrowly upheld the constitutionality of the ACA in 2012. The Supreme Court ruling (SCR) represents an important shock to the probability that the ACA provisions would remain in place. The 39 basis point yield change is measured relative to a control group of non-healthcare municipal bonds which were not affected by the Supreme Court ruling. The yield change is also highly economically significant, representing 28.9% of the average default spread between Aaa-rated and Baa-rated municipal bonds, $3.0 million in interest savings on the average healthcare issue, and $1.74 billion in aggregate interest savings on all healthcare municipal bonds issued from mid-2012 to 2015. Overall, our results indicate that the positive insurance effect for hospitals (the "demand effect") dominates the negative reimbursement effect (the "supply effect").

We further identify the demand effect on healthcare yields by exploiting variation in state-level decisions to expand Medicaid as part of the ACA. The ACA originally required that states expand their Medicaid-eligibility ceilings to 138% of the federal poverty line; the additional Medicaid expenses would be mostly paid for by the federal government. However, the Supreme Court also ruled in 2012 that states are not required to expand Medicaid and accept more federal funding. As a result, 25 states voted at different times to expand Medicaid before the ACA went into effect in January 2014. We find that state-level healthcare yields decreased by an additional 17 basis points after the state votes to expand Medicaid. The yield change corresponds to additional interest savings of $320 million for healthcare bonds issued in those states. In supporting tests, we find that emergency room (ER) usage by Medicaid-insured residents significantly increased in Medicaid-expansion states, while ER usage by privately-insured residents significantly increased in non-expansion states, although to a lesser extent. Longer-term inpatient procedures, however, did not significantly change in any payor category. Thus, the ACA-associated reductions in hospital credit risk are strongly related to demand-driven changes in ER usage, especially in the Medicaid-expansion states.

Additional evidence in the cross-section of hospitals provides further insight into the ACA-associated demand and supply effects on yields. First, we find that the reduction in hospital credit risk was much larger in urban areas, with healthcare yields decreasing by 42 basis points in urban areas and only 25 basis points in rural areas. This finding is consistent with evidence in Dickstein et al. (2015) that the costs associated with uninsured hospital visits have remained relatively high in rural areas because many residents could not afford the higher deductibles on the available insurance plans. Therefore, the smaller yield changes

in rural areas are largely being driven by weaker demand effects. Second, we find that the reduction in hospital credit risk was also much larger for private non-profit hospitals (43 basis points) than public hospitals (27 basis points). Prior to the ACA, public hospitals had lower yields because they admitted more low-income patients and thus received greater Disproportionate Share Hospital (DSH) subsidies from the federal government.[2] Following the implementation of the ACA, however, the federal government significantly downsized DSH subsidies to pay for the additional Medicaid subsidies, thereby offsetting some of the ACA-related gains to these hospitals (King, 2019). Therefore, the smaller yield changes for public hospitals are largely being driven by stronger negative supply effects.

Finally, we examine how healthcare municipal bond yields were affected by ACA uncertainty. Koijen, Philipson, and Uhlig (2016) provide evidence of a sizable "medical innovation premium" in healthcare equity markets which stems from the risk that the federal government may significantly cut reimbursement payments to hospitals. In a similar fashion, healthcare municipal bonds may also price the uncertainty of ACA repeal. We test the ACA effect on healthcare yields by bond maturity, with the intuition that longer-term bonds are more exposed to the longer-term risk that the executive and legislative branches of the U.S. government will eventually align in agreement to repeal the ACA. Consistent with this intuition, we find that the ACA-associated reduction in yields was lower for long-term healthcare bonds (35 basis points) than short-term healthcare bonds (47 basis points). When we separate out the cash flows on long-term bonds into the long-term and short-term components, we find that the yield reduction on the long-term component was only 10 basis points, further suggesting that long-run ACA uncertainty is significantly priced in healthcare municipal bond markets. Therefore, the ability of local municipalities to cheaply finance healthcare infrastructure in the long run is still somewhat constrained by repeal risk.

Our study contributes to the literature at the intersection of health economics and finance. Hult and Philipson (2012) stress that government expansions often "lower demand prices to improve access to healthcare but also lower supply prices (reimbursements) through government monopsony power." Koijen et al. (2016) show that healthcare equity investors price

[2]Disproportionate Share Hospitals are defined in Section 1886(d)(1)(B) of the Social Security Act as hospitals that serve a significantly disproportionate number of low-income patients. DSH subsidies are provided to these hospitals to partially offset their high rates of uncompensated care. Public hospitals treat a higher proportion of low-income patients and thus are more likely to receive DSH subsidies (Garthwaite, Gross, and Notowidigdo, 2018).

the risk that the government will adjust reimbursement schedules for hospitals in an effort to control costs. Furthermore, R&D spending in the healthcare industry has also been lower because of this risk. We show that the ACA, widely considered to be the most important healthcare regulation since the passage of Medicare and Medicaid since 1965, significantly reduced healthcare borrowing costs through the subsidy-driven demand channel, even with the expected decline in reimbursement rates and greater intervention risks from the federal government. Adelino, Lewellen, and Sundaram (2015) show that investment spending by nonprofit hospitals, particularly those that are financially constrained, is positively related to cash flow shocks from the hospital's endowment fund. In our setting, the ACA represents a similar shock to expected future hospital cash flows which may be borrowed against today. Our evidence of weaker yield reductions for long-term healthcare bonds suggests that investment activity may not strongly respond to cash flow shocks if there is sufficient uncertainty surrounding the permanence of those shocks.

Our study also contributes to the literature on healthcare regulation and the associated financial outcomes in the healthcare industry. A number of studies have shown that state-level Medicaid expansions have had financial benefits for hospitals in the form of reduced uncompensated care costs (Dranove et al., 2016, Finkelstein, Hendren, and Luttmer, 2018), increased revenues and profitability (Duggan et al., 2019, Lindrooth et al., 2018), and a decreased likelihood of rural hospital closures (Lindrooth et al., 2018). However, most of these studies focus on realized short-run hospital outcomes because post-ACA data have only been available since 2014. We contribute to this literature by showing that long-run expectations of hospital financial performance, as reflected by healthcare municipal bond yields, have also significantly improved but strongly depend on the type of hospital. Our empirical approach also allows improved identification of the ACA effects on healthcare markets in general because we can measure these effects against a credible control group of non-healthcare municipal bonds.

The rest of this paper is organized as follows. Section 2 provides background on the Affordable Care Act and additional motivation for our main empirical tests. Section 3 provides details about the bond- and county-level data used in this analysis and associated summary statistics. Section 4 presents our central results showing how healthcare yields were affected by the landmark ACA Supreme Court ruling and the state-level decision to expand Medicaid. Section 5 presents additional tests showing how the post-SCR effect varies

in the cross-section of bonds, hospitals, and counties. Finally, Section 6 concludes.

2. ACA Background and Empirical Approach

The ACA was signed into law by President Barack Obama in March 2010. The law is designed to provide a larger cross-section of U.S. citizens and legal residents with better access to health insurance. Two of the major ACA provisions provide health insurance subsidies to lower-income households. In particular, the two provisions originally required that: (1) households with an income between 100% and 400% of the federal poverty line are eligible to receive federal subsidies for private health insurance policies purchased on ACA exchanges; and (2) states expand the Medicaid eligibility income threshold to 138% of the federal poverty line or lose all federal Medicaid funding. In 2016, the Congressional Budget Office (CBO) estimated that approximately 12 million people in any given month are covered by insurance purchased through the ACA exchanges, 10 million of whom receive federal subsidies to purchase their coverage. The CBO also estimated that an additional 11 million people became Medicaid-eligible because of the Medicaid expansion provision of the ACA (CBO, 2016). Academic research has further shown that the uninsured rate in the U.S. has significantly decreased due to the ACA (Sommers et al., 2014, 2015; Courtemanche et al., 2017; Frean, Gruber, and Sommers, 2017; Duggan et al., 2019).

The implementation of the ACA was scheduled for January 2014, although there were significant uncertainties about whether the ACA would survive legal challenges or repeal efforts by the legislative branch of the U.S. government. However, in June 2012, much of the legal uncertainty surrounding the ACA was resolved when the U.S. Supreme Court ruled in favor of the constitutionality of the ACA in a landmark case titled *National Federation of Independent Business v. Sebelius*. As a result, U.S. Congress retained its power to enact most of the provisions associated with the ACA. In the same case, however, the Supreme Court also ruled that the Medicaid expansion provision of the ACA was "unconstitutionally coercive." Therefore, states would not lose their current levels of Medicaid funding if they decided not to participate in the Medicaid expansion. By the end of 2013, only 25 of the 50 U.S. states chose to expand their Medicaid programs and receive the associated federal funding. An additional 12 states approved Medicaid expansion between 2014 and 2018, meaning 13 states have not approved Medicaid expansion as of December 2018. The median Medicaid-

eligibility threshold for the non-expansion states remains at about 43% of the federal poverty line (KFF, 2019). For convenience, Figure 1 displays a map of the states that voted to expand Medicaid before January 2014 and the states that voted to expand Medicaid between 2014 and 2018. The figure indicates that most of the states that voted to expand Medicaid before 2014 are in the Northeastern and Western United States. Unsurprisingly, many of these states are Democratic-leaning, such as New York, California, and Massachusetts. However, there are several Republican-leaning states that voted to expand Medicaid before 2014 as well, including Arkansas, Kentucky, and North Dakota.

The ACA is mostly financed by three major cuts to government healthcare spending and additional taxes on high-income earners and health insurers. The CBO estimates that the ACA-associated cuts to healthcare spending will save the federal government approximately $700 billion over a ten-year period (CBO, 2012). The first cut involves a reduction in the regularly-scheduled annual increases in Medicare payments to hospitals and other healthcare providers over a ten-year period. The second cut is an elimination of the subsidy to private health insurers in the Medicare Advantage program, which provides Medicare beneficiaries with the choice to receive their Medicare benefits through a private insurance plan. The third cut is a reduction in Medicare Disproportionate Share Hospital (DSH) payments to hospitals that provide services to uninsured and low-income patients, with the expectation that increased insurance coverage under the ACA would reduce uncompensated care costs for hospitals.[3] Individuals earning more than $200,000 per year are also now subject to an additional Medicare tax of 0.9%. A second Medicare tax of 3.8% was implemented in a companion piece of legislation titled the *Health Care and Education Reconciliation Act of 2010* and is applicable to the lesser of net investment income or the excess of modified gross adjusted income above $200,000 for individuals.

Extant research shows that short-run hospital financial performance has improved following the implementation of the ACA in January 2014. In particular, Dranove et al. (2016) show that there was a significant decrease in the uncompensated care burden for hospitals, while Duggan et al. (2019) show that there was a significant increase in healthcare service demand on the extensive margin from newly-insured patients. Even prior to the implemen-

[3]There are two types of DSH payments: Medicaid DSH payments and Medicare DSH supplemental payments. Both payments are made to hospitals that serve a high number of low-income patients to offset their uncompensated care costs. The ACA reduces both Medicare and Medicaid DSH payments (Morgan, 2013).

tation of the ACA, healthcare issuers noted these anticipated economic benefits to potential lenders. In 2013, for example, Northwestern Memorial HealthCare, a not-for-profit corporation that operates hospitals in the Chicago metropolitan area, stated the following in its municipal bond prospectus: "An increase in utilization of health care services by those currently avoiding or rationing their health care can be expected and bad debt expenses and/or charity care provided may be reduced" (MSRB, 2013).

The improvements in hospital financial performance may not persist in the long run, however. Young et al. (2019) note that the reduction in uncompensated care costs documented in other studies has been partially offset by a reduction in Medicaid payments from the federal government. Shatto and Clemens (2018) warn that the ongoing ACA-associated cuts to reimbursement rates by the federal government may not be sustainable for hospitals in the long run, even with the reduction in uncompensated care. Theoretical studies also underline these concerns. For example, Hult and Philipson (2012) note that the increased market power held by the federal government through a large federal healthcare program like the ACA may lead to additional reimbursement cuts to hospitals over time. Koijen et al. (2016) further note that expected profits for hospitals may be discounted more heavily because of the "disaster risk" that the federal government will cut reimbursements to hospitals and thus shrink their profit margins. From a finance perspective, the expected reimbursement cuts and risk of additional cuts may depress the prices of hospital-related securities if the positive demand effect stemming from newly-insured patients is not sufficiently large.

We use the healthcare municipal bond market to test the net effect of the ACA on hospital credit risk. Approximately 80% of the yield spread between municipal bonds and the U.S. Treasuries is attributable to default risk (Schwert, 2017), and default risk is strongly related to long-run expectations about the profitability of the underlying project. We largely focus on changes in municipal bond yields around two important events in this study: (1) the Supreme Court ruling about the constitutionality of the ACA in June 2012, and (2) the state-level decisions to expand Medicaid. The Supreme Court ruling represents a large and positive shock to the probability that the ACA provisions would remain in place. The staggered adoption of Medicaid at the state level is also useful for identifying the demand-driven ACA effect on long-term hospital cash flows. Finally, an important advantage of focusing on municipal bond markets is that these markets are largely segmented into 50 different U.S. states because of the preferential tax treatment given to investors who purchase municipal

bonds issued in their home state (Schultz, 2012; Babina et al., 2020). Thus, we can test the heterogeneous effect of the state-level ACA Medicaid expansion decisions on municipal bond yields across these segmented markets.

3. Data and Summary Statistics

3.1. Bond-Level Data and Summary Statistics

We construct U.S. municipal bond issuance data from 2009 to 2015 using two data sources. The offering yield and characteristics of each bond are collected from the Mergent Municipal Bond Securities Database. Specifically, for each bond, the Mergent database provides information about the state of issuance, issue series, issuance date, maturity date, coupon rate, bond size, as well as bond ratings from Moody's and Standard and Poor's (if the bond is rated). The bond characteristics also include whether the bond is general obligation, insured, and callable.[4] The database contains information on the use of proceeds from each bond issuance, which we use to identify the healthcare municipal bonds in our sample. We collect the county locations of municipal issuers from Bloomberg and match each bond to its issuance county. We exclude municipal bonds with a maturity of more than 100 years or a variable coupon rate. We also exclude bonds that are pre-refunded, subject to federal taxes, or do not have county location information. Finally, we only include bonds that are issued in U.S. states in our sample. Bonds issued in U.S. territories are excluded because the issuance rates are very low and the residents are not subject to most of the provisions of the ACA.

Table 1 presents summary statistics for the healthcare and non-healthcare municipal bonds issued during our sample period. Healthcare municipal bonds are issued to finance hospitals and healthcare facilities, and non-healthcare municipal bonds are used to finance other projects in many other sectors, including education, transportation, waterworks, and public housing. There were about 19,000 healthcare municipal bonds issued during our sample period, representing about $130 billion in dollar volume. The size of the average healthcare issue ($95.6 million) is about 2.5 times larger than the size of the average non-healthcare

[4]A general obligation bond is backed by the tax base of the issuing municipality. If a bond is not general obligation, then it is a revenue bond, meaning that it is backed by the revenues generated by the underlying project.

bond ($37.6 million), which is reflective of the healthcare sector being more equipment- and labor-intensive than other sectors. The healthcare sector also has the second-largest average issuance size, with the transportation sector being the largest.

The summary statistics in Table 1 also indicate that healthcare municipal bonds are riskier than their non-healthcare counterparts. In particular, the average healthcare offering yield (3.22%) is about one-third higher than the average non-healthcare offering yield (2.39%), suggesting that investors demand additional risk compensation for investing in the healthcare sector. Similarly, the average credit rating for healthcare municipal bonds is about 1.7 notches higher than the average non-healthcare municipal bond rating, where a higher notch represents a riskier bond. Part of the reason that healthcare municipal bond yields are higher and credit ratings are lower is that a much smaller proportion of healthcare bonds are general obligation (11.3%) than non-healthcare bonds (59.4%). General obligation bonds are generally perceived as safer than revenue bonds because they are backed by the tax base of the municipality instead of the revenues specific to the underlying project. However, even when we condition on whether or not the bond is general obligation, we find that healthcare yields are 47 basis points higher in the general obligation category and 63 basis points in the revenue category. (Similar differences are observed if we further condition on whether the bond is insured by a third party.) Reflecting these observations, Gao, Lee, and Murphy (2019) show that 20% of all municipal bond defaults from 1999 to 2010 occurred in the healthcare sector, which is second only to the industrial development sector at 26%. The higher yields and lower credit ratings in the healthcare sector are likely reflective of hospitals' reliance on government programs such as Medicaid and Medicare for their revenue streams, in addition to uncertainties surrounding possible changes to the healthcare market and insurance laws.

3.2. County-Level Data and Summary Statistics

Thirty-seven states approved the expansion of Medicaid during our sample period, and 25 of these states approved before the ACA went into effect in January 2014. We collect these expansion dates from healthinsurance.org and the Kaiser Family Foundation website. We also collect the 2013 rural-urban continuum codes for individual counties from the United States Department of Agriculture (USDA) website to classify each county as urban or rural.

In particular, each county is assigned a rural-urban continuum code from one to nine, and a county is in a metropolitan area if it was assigned a code of three or less. Thus, we define a county as urban if it was assigned a code of three or less, and rural otherwise. Annual county population and income per capita data are collected from the U.S. Bureau of Economic Analysis (BEA). Finally, for each county-year, we collect the number of hospitals and number of hospital employees from the Area Health Resources Files (AHRF) database, which is provided by the U.S. Department of Health and Human Services (DHHS).

Table 2 reports summary statistics for the 25 states that voted to expand Medicaid before 2014 and the remaining 25 states that did not. There are 1,179 counties in the Medicaid expansion states, 62% of which are considered rural counties. The average county per capita income is $36,251 and the median county population is 30,526. In comparison, there are 1,949 counties in the non-Medicaid expansion states, 64% of which are considered rural. The average per capita income is $34,339 and the median population is 23,433, indicating that these counties are less populated and have slightly lower per capita incomes than counties in Medicaid expansion states. We make sure to account for these differences between the two groups of counties by including controls for county-level per capita income and population in our regression tests.

Table 2 also shows that healthcare demographics in Medicaid and non-Medicaid expansion states were slightly different at the beginning of our sample period. In 2009, 15% of the population was uninsured in the non-Medicaid expansion states, compared to 13% in the Medicaid-expansion states. The difference in 2009 is likely attributable to the higher fraction of low-income residents in non-Medicaid expansion states who cannot afford private insurance coverage and do not meet the federal requirements for Medicaid eligibility (KFF, 2018). Counties in non-Medicaid expansion states also have more hospitals per 100,000 people compared to Medicaid expansion states (6.3 versus 4.7), which likely reflects the sparser county populations for the former group. For both state types, we find that there is more than three times the number of hospitals per 100,000 people in rural areas compared to urban areas, indicating the prevalence of smaller hospitals in rural areas and larger hospital complexes in urban areas. Finally, for both state types, we find that the number of healthcare personnel per 100,000 people is fairly similar at approximately 1,400, regardless of whether the county is located in an urban or rural area.

4. Post-ACA Healthcare Yield Spreads

4.1. Baseline Results

The purpose of this study is to test the net effect of the ACA on hospital credit risk. The main dependent variable analyzed in this study is the municipal bond offering yield spread, which is defined as the difference between the municipal bond offering yield and the yield on a coupon-equivalent U.S. Treasury bond.[5] This is a standard measure of the risk premium on fixed income securities that is used in other fixed income studies such as Longstaff et al. (2005).

In Figure 2, we present a time-series graph of the spread between the average secondary yields for healthcare municipal bonds and non-healthcare municipal bonds. To maintain a balanced sample, we focus on local revenue bonds that have an investment-grade rating and have traded at least 100 times during our sample period. First, we find that the spread significantly narrowed by about 23 basis points after June 2012, when the Supreme Court upheld the constitutionality of the ACA in *National Federation of Independent Business v. Sebelius*. Prior to this Supreme Court decision, the average spread was about 85 basis points, indicating that the spread narrowed by about 27%. Second, we find that the spread did not significantly change after the ACA was signed into law in March 2010, remaining fairly constant at about 85 basis points until June 2012. The lack of change around March 2010 is consistent with a credit rating report from Moody's stating that the outlook for U.S. healthcare had largely remained unchanged because of major uncertainties surrounding healthcare reform (e.g. Moody's, 2011). Taken together, our graphical evidence indicates that the ACA had a significant impact on healthcare yields, but only after the major legal issues surrounding the ACA were resolved.

Next, we test the post-SCR effect on healthcare municipal bond offering yield spreads

[5]We calculate the yield on the coupon-equivalent risk-free bond as follows. For each municipal bond, we calculate the present value of its coupon payments and face value using the off-the-run U.S. Treasury yield curve, which is based on the zero-coupon yield curve estimated in Gürkaynak, Sack, and Wright (2007). This gives us the price of the coupon-equivalent risk-free bond. The risk-free yield-to-maturity is then calculated using this price and the payout schedule for the bond. The yield spread is calculated as the difference between the municipal bond yield and the risk-free yield-to-maturity. This is similar to the yield spread calculation in Longstaff, Mithal, and Neis (2005).

(y) using the following ordinary least squares (OLS) regression model:

$$y_{ijt} = \beta_1 \cdot PostSCR_t \times Health_i + \beta_2 \cdot Health_i + \gamma' X_{it} + \phi' Z_{jt} + \delta_s + \delta_t + \varepsilon_{ijt}, \quad (1)$$

where i, j, and t denote the bond, county, and year-month, respectively. We also include state and year-month fixed effects (δ_s and δ_t) to ensure that our tests are not influenced by state-specific differences (such as state taxes) or time trends in municipal bond yield spreads. The main independent variables in this model are $Health$, an indicator variable that equals one if the municipal bond was issued to finance a project in the healthcare sector, and $PostSCR \times Health$. $PostSCR$ is an indicator variable that equals one if the bond was issued after June 2012, the month that the Supreme Court ruled that the ACA was constitutional. The coefficient on $PostSCR \times Health$ represents the $PostSCR$ effect on healthcare bonds relative to non-healthcare bonds.[6]

We include the following vector of control variables X that are known to affect municipal bond yield spreads: (1) the number of years until maturity and its inverse; (2) the natural log of the issuance size of the bond; (3) indicator variables for whether the bond is general obligation and insured; (4) indicator variables for whether the bond has a credit rating and, conditional on being rated, each possible credit rating; and (5) an indicator variable for whether the bond is callable and, conditional on being callable, the number of years until the first call date and its inverse. These are standard control variables used in other studies of municipal bond yields such as Butler, Fauver, and Mortal (2009), Bergstresser, Cohen, and Shenai (2013), and Schultz (2013). Z is a vector of county- and state-level characteristic control variables that is meant to control for local economic conditions and includes the following: (1) the county population level; (2) the county per capita income level; (3) the growth rate in the county population level in the previous year; (4) the growth rate in the county employment level in the previous year; (5) the previous three-month growth rate in the state coincident index; and (6) the state-level pension funding ratio. Standard errors are double-clustered by state and year-month.

The results of the regression test in equation (1) are reported in column (1) of Table 3.

[6]The $PostSCR$ variable is not included as a standalone control variable because it is subsumed by δ_t. If we include this variable and exclude δ_t in our main regression test, then we find that the coefficient on $PostSCR$ has a near-zero point estimate and a t-statistic of 0.38, indicating that $PostSCR$ did not have an effect on the average yield spread for non-healthcare municipal bonds.

First, we find that the coefficient on $Health$ equals 52.5 basis points, indicating that healthcare municipal bonds have a higher yield premium than non-healthcare municipal bonds. Second, and most importantly, we find that the coefficient on $PostSCR \times Health$ equals -38.8 basis points and is highly statistically significant, suggesting that the ACA significantly affected the offering yield spreads of healthcare bonds after the associated legal issues were resolved in June 2012. The 38.8 basis point effect is economically significant and represents about 28.9 percent of the average default spread between Aaa-rated and Baa-rated grade bonds of 134.2 basis points during our sample period. In dollar terms, the 38.8 basis point effect corresponds to interest savings of about $3.0 million for the average healthcare municipal bond issue and aggregate interest savings of $1.7 billion for all healthcare municipal bonds issued from mid-2012 to 2015.[7]

The last three columns of Table 3 indicate that our baseline results are robust to alternative specifications. In column (2), we directly test the $PostSCR$ effect on municipal bond offering yields and include the coupon-equivalent U.S. Treasury yield in the set of control variables. We similarly find a strong $PostSCR$ effect on healthcare offering yields which equals about -39.7 basis points. This regression also indicates that the average municipal bond yield is about 71% of the average yield on a coupon-equivalent U.S. Treasury bond. This yield discount is likely due to the differential tax treatments for these bonds, as U.S. Treasuries are taxable at the federal level while most municipal bonds are not. In column (3), we use the tax-adjusted yield spread as the dependent variable. In particular, when calculating the yield spread, we make the following tax adjustments: (i) multiply the coupon-equivalent U.S. Treasury yield by one minus the top marginal federal tax rate; and (ii) multiply the municipal bond offering yield by one minus the top marginal state tax rate if the bond was issued in any of the four states that tax all municipal bond interest income.[8] The evidence in this column indicates that the $PostSCR \times Health$ effect on tax-adjusted yield spreads is nearly identical at -38.7 basis points. Finally, in column (4), we adjust the

[7]The $3.0 million figure is calculated as 38.8 basis points × $96 million × 8 years, where $96 million is approximately the average size of a healthcare municipal bond issue and 8 years is approximately the average duration of a healthcare municipal bond. The $1.74 billion figure is calculated as 38.8 basis points × $56 billion × 8 years, where $56 billion is the total size of all healthcare municipal bonds issued between mid-2012 and 2015.

[8]The states that tax interest income on municipal bonds issued in-state or out-of-state are Illinois, Iowa, Oklahoma, and Wisconsin. The remaining states only tax interest income on municipal bonds issued out-of-state.

municipal bond offering yield spread for any embedded call options using the methodology in Novy-Marx and Rauh (2012), which in turn is based on the Black (1976) model for pricing options on futures. In this case, we find that the coefficient on $PostSCR \times Health$ is again similar at -36.2 basis points.

The bond characteristic control variables (X) in the regressions reported in Table 3 provide further insight into the drivers of municipal bond yields. According to column (1), yields are about 8.8 basis points higher for bonds that are insured, which is consistent with the evidence in Cornaggia, Hund, and Nguyen (2019) that the decline in insurer credit ratings during the 2008 financial crisis significantly eroded the value of municipal bond insurance for borrowers with higher credit ratings. Bonds with longer times to maturity have higher yields, as these bonds are subject to greater interest rate and inflation risk. Larger-sized bonds generally have lower yields in our sample because they tend to be issued in more liquid markets (Bergstresser et al., 2013). The yields on general obligation bonds, which are generally perceived as safer because they are backed by the tax base of the municipality instead of revenues generated by a single project, are about 18 basis points lower than the yields on revenue bonds. Finally, in unreported results, we find that yields are higher for unrated bonds compared to the average rated bond, monotonically decreasing in credit rating quality, and higher for callable bonds compared to non-callable bonds.

One potential concern with our baseline results is that the post-SCR decrease in healthcare municipal bond yields is being driven by endogeneity in the issuance decisions of high-quality issuers. To address this concern, we examine healthcare municipal bond yields in the secondary market. Many of the bonds traded in the secondary market during our sample period were issued prior to the introduction of the ACA, and thus are not subject to the self-selection issues in the primary market. We retest our baseline regression model using secondary yield spreads instead of offering yield spreads. Secondary yields were collected from the Municipal Securities Rulemaking Board (MSRB) database for the period 2009 to 2015. Secondary yields are measured at the bond-month level; if multiple transactions occur in the same bond-month, then we take the size-weighted average secondary yield across those transactions. Secondary yield spreads are then calculated as the difference between the secondary yield and the yield on the coupon-equivalent U.S. Treasury bond using the methodology in Longstaff et al. (2005).

The results of our secondary yield test are reported in column (1) of Table 4. We find

that post-SCR healthcare secondary yield spreads decreased by 45.9 basis points relative to non-healthcare secondary yield spreads, which is somewhat larger in magnitude than the post-SCR effect in the primary market. In columns (2) and (3), we focus on the subsamples of seasoned bonds that were issued more than 60 days ago and more than one year ago, respectively, and obtain similar results. Finally, in column (4), we focus on the subsample of bonds issued prior to the introduction of the ACA, which we define as bonds issued before 2009. Again, we find results that are similar in magnitude to our baseline regressions. Hence, the results in Table 4 indicate that the post-SCR decrease in healthcare municipal bond yields is not being driven by endogenous healthcare issuance decisions in the post-SCR period.

4.2. Identification using Cross-State Medicaid Expansion

Our baseline results rely on changes in the average yield for healthcare bonds versus non-healthcare bonds around a single event date. Identification may be an issue if some other unobservable event around June 2012 affected yields on healthcare bonds. To address this issue, we analyze the differential change in healthcare offering yields for states that voted to expand Medicaid as part of the ACA versus the states that did not. Many states also voted to expand Medicaid at different times during our sample period. New York, for example, approved the expansion of Medicaid in mid-2012, while Indiana approved in early 2015. Thus, we can exploit both cross-sectional and time-series variation in the state-level Medicaid expansion decision.

In the top panel of Figure 3, we show the time-series evolution of insurance rates in the Medicaid-expansion states. The Medicaid-insured rate increased from 16.1% in 2009 to 21.5% in 2017, for a difference of 5.4 percentage points. The largest increase occurs in 2014 (1.9%), the year that most of the ACA provisions, including subsidies for state-level Medicaid expansions, went into effect. As a comparison, we also graph the percentage of the Medicare-insured population and find that it steadily increases over time from about 11.7% in 2009 to 14.3% in 2017, for a difference of 2.6 percentage points. The upward trend in the Medicare-insured rate is mostly due to the concurrent upward trend in the percentage of the U.S. population over the age of 65. Finally, we find that the percentage of the uninsured population decreases from about 13.2% in 2009 to 6.9% in 2017, for a difference of 6.3

percentage points. The largest annual decrease in the uninsured rate also occurs in 2014 (3.0%), the year that most of the ACA provisions went into effect.

The bottom panel of Figure 3 shows the time-series evolution of insurance rates in non-Medicaid expansion states. The Medicaid-insured rate increases from 14.9% to 16.7%, for a difference of 1.9 percentage points. This change is significantly lower than the 5.4 percentage point change for Medicaid-expansion states, suggesting that the ACA Medicaid expansion provision had a significant effect on insurance rates. The Medicare-insured rate for the non-expansion states increases by 2.5 percentage points, which is fairly similar to the increase for expansion states and further reflects the changing age demographics in the U.S. Finally, the uninsured rate in the non-Medicaid expansion states decreased by 5.0 percentage points from 2009 to 2017, which is lower than the 6.3 percentage point decrease for the Medicaid-expansion states.[9]

In Figure 4, we provide graphical evidence of the difference in healthcare municipal bond yields for the states that voted to expand Medicaid before January 2014 versus the remaining states. For this figure, we also rely on the same data filters used in Figure 2. Prior to the Supreme Court ruling in June 2012, the yield difference was statistically close to zero, indicating that the average credit risk for healthcare issuers across the two state types were about similar. However, starting in about late 2012, when it started becoming clearer which states would expand Medicaid and which would not, we find that the yield difference significantly decreased to about -12.1 basis points. This evidence suggests that the ACA significantly improved the credit quality outlook of healthcare municipal bonds issued in Medicaid-expansion states. Also, recent research has shown that low-income households in Medicaid-expansion states were less likely to default on rent and mortgage payments after they qualified for Medicaid due to a state-level expansion of Medicaid (Gallagher, Gopalan, and Grinstein-Weiss, 2019). Furthermore, low-income households experiencing financial hardships were more likely to increase their savings rates and repay outstanding debts (Gallagher et al., 2020).[10] Our results suggest that the improvements in credit quality

[9]The decrease in the uninsured rate is not fully explained by the increases in the Medicaid- and Medicare-insured rates. We find that the excess change in the uninsured rate is due to an increase in private non-group health insurance, which was also partially subsidized by the ACA.

[10]Also related is evidence in Goldsmith-Pinkham, Pinkovskiy, and Wallace (2020) showing that the forecasted reductions in collections debt for near-elderly uninsured residents due to the ACA was significantly weaker in non-expansion states.

for low-income households due to Medicaid-expansion had positive spillover effects to public and non-profit hospitals in the form of lower hospital credit risk and therefore lower interest rates on healthcare municipal bond issuances.

Next, we jointly test the effects of the Supreme Court ruling in June 2012 and the state-level decisions to expand Medicaid on offering yields in a multivariate regression framework. Unlike the previous figure, we can rely on the exact month that each state votes to expand Medicaid to directly test the effect of the state-level Medicaid-expansion decision on local offering yields. In particular, we test the following regression model:

$$\begin{aligned} y_{ijt} &= \beta_1 \cdot PostSCR_t \times Health_i + \beta_2 \cdot Health_i + \beta_3 \cdot PostMed_{i,t} \times Health_i \\ &+ \beta_4 \cdot PostMed_{i,t} + \gamma' X_{it} + \phi' Z_{jt} + \delta_s + \delta_t + \varepsilon_{ijt}, \end{aligned} \tag{2}$$

where $PostMed$ is an indicator variable that equals one if the municipal bond was issued after its state voted to expand Medicaid. All other variables are defined as before. The benefit of this approach is that we can jointly observe the effect of the Supreme Court decision in June 2012 and the incremental effect of the state-level decision to expand Medicaid.

The results of this test are reported in column (1) of Table 5. Our first observation is that the post-SCR effect on healthcare yields was about -33.2 basis points, indicating that the combination of non-Medicaid ACA provisions and forward-looking expectations of state-level Medicaid expansions were instrumental in reducing healthcare yields. Importantly, our second observation is that $PostMed$ yields decreased by an additional 16.5 basis points in the states that voted to expand Medicaid compared to the remaining states. That is, the overall effect of the ACA on healthcare offering yields in Medicaid-expansion states was about -49.7 basis points, which is about 50% larger than the overall effect for the non-expansion states. The incremental effect in the Medicaid-expansion states corresponds to additional aggregate interest savings of about $320 million on the healthcare municipal bonds issued after the state-level decision to expand Medicaid and before the end of our sample period.[11] Although the changes are fairly substantial for both state groups, the results suggest that the Medicaid-expansion provision incrementally contributed to the reduction in credit risk for healthcare municipal bonds.

[11]The $320 million figure is calculated as 16.5 basis points × $24.2 billion × 8 years, where $24.2 billion is the total issuance of healthcare municipal bonds during our sample period after the state voted to expand Medicaid, and 8 years is the average duration of a healthcare municipal bond.

It is possible that the $PostMed \times Health$ results in column (1) can be explained by a downward trend in healthcare yields between the Supreme Court decision in mid-2012 and the state-level Medicaid-expansion decisions, many of which occurred at some point in 2013. A post-SCR downward trend is possible if investors continued to adjust to new ACA-relevant information during that period. To account for the potential trend in healthcare yields during this interim period, we retest the previous regression model with separate year-month fixed effects for healthcare bonds ($\delta_{t\times h}$) and non-healthcare bonds ($\delta_{t\times nh}$). (We also exclude $PostSCR \times Health$ and $Health$ because these variables are absorbed by the fixed effects.) The results of this regression are reported in column (2) of Table 5. We find that healthcare offering yields decrease by 11.1 basis points after the state votes to expand Medicaid. The 11.1 basis point effect is slightly weaker in magnitude than the 16.5 basis point effect reported in column (1), suggesting that pre-expansion trends in healthcare yields partially explain the initial results. However, the 11.1 basis point effect is economically significant and further suggests that the Medicaid-expansion provision was important for reducing hospital credit risk.

Another possibility is that our results are influenced by potential endogeneity in the state-level decision to expand Medicaid. Officials from North Carolina, for example, argued against expanding Medicaid because the state was already overburdened with high Medicaid costs (Leonard, 2015). On the other hand, research has shown that most of the non-expansion decisions were driven by political considerations which are independent of municipal bond yields (Badger, 2013; Pew Charitable Trusts, 2015). To address this potential endogeneity issue, we examine healthcare municipal bond yields in states that immediately expanded Medicaid versus the states that later expanded Medicaid during our sample period. The late-expansion states had similar concerns about expanding Medicaid and thus provide an approximation of the average change in hospital credit risk that would occur in the non-expansion states. We retest the regression model in column (2) of Table 5 with the inclusion of the following interaction variables: $Late \times PostMed$, where $Late$ is an indicator variable that equals one if the state expanded Medicaid after January 2014, and $Late \times PostMed \times Health$. The results are reported in column (3) of Table 5. We find that the average healthcare yield change in late-expansion states was not significantly different from the change in early-expansion states. Therefore, our results suggest that endogeneity in the Medicaid expansion decision is unlikely to be a significant determinant of post-expansion

healthcare yield changes.[12]

Finally, in column (4), we retest the regression model in column (2) using the secondary yields for municipal bonds issued before 2009. We find that healthcare secondary yields also significantly decrease following the state-level expansion of Medicaid (19.0 basis points). The decrease is somewhat larger than that observed for offering yields, suggesting that currently existing healthcare projects benefited more from the expansion of Medicaid. Our results for the secondary market also indicate that the post-expansion decrease in healthcare yields is not attributable to potential endogeneity in the timing of higher-quality issuances.

4.3. The Real Effects Underlying Hospital Credit Risk

Our evidence indicates that the ACA reduced healthcare municipal bond yields through the hospital credit risk channel. Our proposed mechanism is that the positive demand effect from newly-insured patients outweighs the negative supply effect stemming from anticipated hospital reimbursement cuts by the federal government. In this section, we provide further evidence in support of this mechanism by showing how the ACA affected real hospital outcomes. Using data from the Healthcare Costs and Utilization Project (HCUP), particularly the HCUP State Emergency Department (SED) and State Inpatient (SI) databases, we analyze the makeup of hospital payer types who are admitted to the hospital for urgent emergency room (ER) procedures or longer-term inpatient procedures which require hospitalization for at least one night. From a credit risk perspective, the separation of procedures is important because hospitals are generally required to admit patients who require costly emergency care, regardless of their insurance status.

We first examine ER patient statistics across all Medicaid-expansion states, where pre-2014 uninsured residents were more likely to qualify for Medicaid after the implementation of the ACA in January of that year. As in Figure 4, we define Medicaid-expansion states as the states that voted to expand Medicaid before the ACA implementation date of January 2014.[13] For each year-quarter from 2009 to 2017, we separately calculate the total

[12]In an additional test, we find that the average yield reduction for Medicaid-expansion counties in the lower quartile of the per-capita income distribution is not significantly different from the average yield reduction for Medicaid-expansion counties in the remaining quartiles, further suggesting that areas with greater Medicaid burdens ultimately benefit from an expansion of Medicaid.

[13]Twenty-seven states did not report inpatient and ER data for the HCUP database across the 2009-2017 sample period. The following 12 Medicaid-expansion states provided inpatient and ER data during

number of admitted ER patients who are Medicaid-insured, privately insured, or uninsured. The results are reported graphically in the top-left panel of Figure 5 and numerically in the top panel of Table 6. We find that the time-series average number of uninsured ER patients decreases by about 0.57 million residents after January 2014, while the average number of Medicaid-insured ER patients increases by about 1.12 million residents. The number of privately-insured ER patients, however, remains about the same. The asymmetric change for uninsured and Medicaid-insured ER patients corroborates evidence in Nikpay et al. (2017), Garthwaite et al. (2017), and Duggan et al. (2019), and suggests that some residents were more likely use ER services after becoming Medicaid-insured. We also find that the percentage of ER patients who were uninsured decreased from 25% to 13% after January 2014, for a statistically significant change of -12 percentage points. In contrast, according to the top-right panel of Figure 5 and second panel of Table 6, the number of longer-term inpatient procedures for uninsured patients and Medicaid-insured patients were relatively unaffected. Overall, our evidence suggests that the ACA-induced reduction in hospital credit risk for Medicaid-expansion states was strongly associated with an increase in ER usage by Medicaid-insured patients and a decrease in ER usage by uninsured patients.

Next, we examine ER patient statistics for non-expansion states, where residents continued to face the same income thresholds to qualify for Medicaid. We define non-expansion states as those states which did not vote to expand Medicaid by the end of 2017.[14] Similar to the Medicaid-expansion states, for each year-quarter from 2009 to 2017, we separately calculate the total number of admitted ER patients who are Medicaid-insured, privately insured, or uninsured. In the bottom-left panel of Figure 5 and third panel of Table 6, we show that there is a significant increase in ER usage by privately-insured residents. This evidence suggests that residents in these states were more likely to purchase subsidized private insurance on ACA exchanges because Medicaid subsidies were still not an option. The small decrease in uninsured ER usage further suggests that many uninsured residents avoided using ER services until they became privately-insured through ACA exchanges. Altogether, we find that there was a five percentage point decrease in uninsured ER visits after January 2014,

this period: Arizona, California, Iowa, Illinois, Kentucky, Massachusetts, Maryland, Minnesota, New Jersey, New York, Rhode Island, and Vermont.

[14]The following 11 non-expansion states provided inpatient and ER data during this period: Florida, Georgia, Kansas, Missouri, North Carolina, Nebraska, South Carolina, South Dakota, Tennessee, Utah, and Wisconsin.

which is economically significant although not as large as the 12 percentage point decrease for Medicaid-expansion states. Finally, in the bottom-right panel of Figure 5 and fourth panel of Table 6, we show that there were no economically significant changes in longer-term inpatient visits in the non-expansion states. Overall, our evidence suggests that the reduction in hospital credit risk in non-expansion states was more associated with an increase in privately-insured ER visits. Given that several states voted to expand Medicaid after January 2014, it is likely that the reductions in hospital credit risk and healthcare yields in non-expansion states are also due to forward-looking expectations about an eventual vote in favor of Medicaid expansion.

5. Cross-Sectional Variation in the Post-SCR Effect

In this section, we provide further insight into the mechanism underlying the changes in healthcare municipal bond yields after the ACA Supreme Court decision in 2012 by exploiting cross-sectional differences in geographical areas, hospital types, and bond attributes. In particular, we focus on the post-SCR effect on healthcare bonds issued in urban versus rural counties, healthcare bonds issued by public hospitals versus private non-profit hospitals, and healthcare bonds with long versus short maturities.

5.1. Post-SCR Yields for Urban versus Rural Counties

Our baseline results suggest that the increased demand for medical care generated by ACA subsidies has improved hospital credit risk, even with the anticipated cuts to reimbursement rates from the federal government. In this section, we further identify the demand-driven effect on hospital credit risk by focusing on hospitals in urban versus rural counties. A report by the Urban Institute indicates that residents in rural counties were less likely to benefit from the ACA due to a lack of insurance competition in those counties (Wengle, Blumberg, and Holahan, 2018). Households with an income between 100% and 400% of the federal poverty line are eligible to receive subsidies for private health insurance purchased on ACA exchanges. However, due to a lack of insurance competition in rural areas, insurance premiums were approximately 10% higher in rural counties, with significant variation across states. In Colorado, for example, monthly insurance premiums in rural areas ($402) were about 43% higher than those in urban areas ($282) in 2016. As a result,

many rural residents purchased cheaper insurance packages with lower premiums and higher deductibles, typically denoted "bronze plans", on ACA exchanges. The report further indicates that hospitals continued to provide high rates of uncompensated care in rural counties, even after the ACA went into effect, because rural residents could not afford to pay these high deductibles.[15] Therefore, the ACA-associated increase in demand for medical care by insured residents was weaker in rural areas.

We test our baseline regression model for the subsamples of bonds issued in urban and rural counties. The results are reported in columns (1) and (2) of Table 7. We find that post-SCR decrease in healthcare yields in urban counties (42.2 basis points) was 83% larger than the decrease for rural counties (23.1 basis points). In column (3), we test the post-SCR effect on bonds issued in rural counties relative to urban counties using our full sample of bonds. In this case, we find that the post-SCR effect in rural counties was 17.2 basis points weaker, which is statistically significant at the 5% level. Finally, in column (4), we test the post-SCR effect on healthcare yields as a function of the county population (measured in millions of residents). The results from this test indicate that the post-SCR effect is about 5.5 basis points larger for every additional one million people residing in the county. The post-SCR effect on healthcare yields in a county with 100,000 residents, for example, is about -35.3 basis points ($34.7 + 5.5 \times 0.1$), while the effect in a county with one million residents is about -40.2 basis points ($34.7 + 5.5 \times 1$). Overall, our results indicate that the ACA was particularly beneficial to hospitals located in high population areas, where competition to provide cheaper insurance packages on the ACA exchanges was greater.

5.2. Post-SCR Yields for Public versus Private Healthcare Issuers

There are two types of healthcare issuers in the municipal bond market: public issuers and private not-for-profit issuers. Public issuers consist of local governments and their agencies in charge of public hospitals and healthcare facilities. An example of a public issuer in our sample is the Tulsa County Industrial Authority in Oklahoma, which issued health facility revenue bonds in February 2010 to construct the North Regional Center, a health

[15] In addition, insured patients requiring emergency care in rural areas are typically stabilized at a rural hospital and then transported to a larger urban facility. The bills at the urban facility are often completely covered by the patient's insurance because the patient meets the deductible at the rural hospital. Thus, rural hospitals are more exposed to the risk that the patient defaults on the deductible payment (Johnson, 2017).

and wellness center that provides primary clinical care and community health programs. Private not-for-profit issuers are nonprofit corporations that operate healthcare facilities themselves and through their affiliates. An example of a private issuer in our sample is Arkansas Children's Hospital, located in Pulaski County, Arkansas, which issued hospital revenue bonds in May 2009 to finance the costs of equipping and improving the hospital and its related facilities.

In this section, we examine the post-SCR effect on the borrowing costs of public hospitals relative to private hospitals. In this case, we can partially identify how the supply-driven reimbursement cuts affected hospital credit risk because public hospitals were more subject to these cuts. In particular, over $40 billion in cuts to DSH subsidies were scheduled to go in effect over the course of six years starting in October 2019 (King, 2019). Many public hospitals are safety-net hospitals that provide healthcare for low-income and uninsured individuals and rely on supplemental DSH payments (Garthwaite et al., 2018). Public hospital credit risk may have been less affected by the ACA because the new Medicaid subsidies partially replaced the DSH subsidies.

We classify issuers as public or private based on the ultimate borrower information from Bloomberg. If the ultimate borrower of a healthcare municipal bond is a government or government agency, then we identify the issuer as a public issuer. If not, we identify the issuer as a private issuer. Then, we test our baseline regression model for the subsamples of public and private healthcare bonds. The results are reported in columns (1) and (2) of Table 8. We find that the average post-SCR yield for private healthcare bonds decreased by 36.8 basis points, which is 77% higher than the decrease of 20.8 basis points for public healthcare bonds. Column (3) focuses on the subsample of healthcare bonds and indicates that post-SCR yields for private healthcare bonds decreased by 16.5 basis points relative to public healthcare bonds ($t = -2.31$). The coefficient on $Health \times Private$ further indicates that yields on private healthcare bonds are 28.4 basis points higher than yields for public healthcare bonds, suggesting that the pre-ACA DSH subsidies mitigated credit risk for public hospitals. This evidence is also consistent with the observation in Kornai (1980) that local governments provide subsidies to public hospitals when their expenditures exceed their revenues, thus reducing default risk for those hospitals. Finally, in column (4), we focus on our entire sample of municipal bonds and find that the post-SCR effect on yields for private and public healthcare bonds were 42.9 basis points and 26.6 basis points, respectively, for a statistically

significant difference of 16.3 basis points ($t = -2.17$). Overall, our evidence indicates that the ACA decreased credit risk decreased for both types of hospitals, although the effect was weaker for public hospitals because the ACA subsidies partially replaced the DSH subsidies.

5.3. Post-SCR Uncertainty and Issuance Activity

In this last section, we examine how ACA-associated uncertainties have affected healthcare municipal bond yields and issuance activity since the Supreme Court ruling in June 2012. Koijen et al. (2016) show that the risk of reimbursement cuts to hospitals from the federal government is priced in healthcare equity markets. In a similar sense, the ACA may also increase healthcare municipal bond yields due to the possibility of future reimbursement cuts by the federal government. Another possibility is that the ACA subsidies are repealed in the future through political channels while the existing reimbursement cuts remain in place. Although most repeal efforts have failed due to misalignments between the legislative and executive branches, it is not guaranteed that these misalignments will persist in the future. Recognizing these risks, MunicipalBonds.com, a major municipal bond investment advisory firm for retail and institutional investors, stated in March 2017 that risk-averse investors may want to explore other investment alternatives if "an issuer is heavily dependent on Obamacare to generate its revenue streams" (Sangha, 2017). Thus, ACA-associated uncertainties may have a larger effect on the borrowing costs of long-term healthcare projects.

We test the post-SCR effect on healthcare offering yield spreads by bond maturity to identify the effect of ACA uncertainty. First, we separate the municipal bonds in our sample into maturity terciles. Bonds in the lowest maturity tercile (short-term bonds) have a maturity of less than 5 years, and bonds in the highest maturity tercile (long-term bonds) have a maturity of more than 10 years. Then, we test our baseline regression in equation (1) for each of these maturity subsamples. The results of these tests are reported in columns (1) to (3) of Table 9. According to columns (1) and (2), the post-SCR effect on healthcare offering yield spreads for short-term and medium-term bonds is fairly similar at about 46.0 basis points and 44.5 basis points, respectively. In contrast, the post-SCR effect for long-term bonds is about 34.8 basis points, which is about 22% to 24% lower than the previous effects. In column (4), we test the differential effect of $PostSCR$ on healthcare offering yield spreads for the different maturity terciles using our full sample of municipal bonds. This involves

the addition of the following interaction variables to the regression model in equation (1): $PostSCR \times Health \times \mathbf{1}_g$ and $Health \times \mathbf{1}_g$, where $g \in \{M, L\}$ and $\mathbf{1}_M$ and $\mathbf{1}_L$ represent indicator variables for medium-term bonds and long-term bonds, respectively. Similar to the first three regressions, we find that the $PostSCR$ effect for long-term healthcare bonds is about 20% to 26% weaker than the effects for short-term and medium-term healthcare bonds. This last regression also confirms that the long-term effect is highly statistically significant from the short-term and medium-term effects.

The evidence from Table 9 can be used to determine the yield change for cash flows payable in more than ten years, allowing us to determine the net effect of $PostSCR$ on healthcare cash flows in the long run. Consider a pre-SCR, long-term healthcare municipal bond with 15 years until maturity, an annual coupon payment of \$5.00, a face value payment of \$100, and a yield of 4.27%.[16] A simple present value calculation indicates that the price of this bond is \$107.93. We can then determine the pre-SCR yield-to-maturity on the cash flows payable in more than ten years ($y_{L,PRE}$) using the following present value equation:

$$\begin{aligned} \$107.93 \;=\; & \$5.00 \times \frac{(1-(1/1.0407)^{10})}{0.0407} + \$5.00 \times \frac{(1-(1/(1+y_{L,PRE}))^{5})}{y_{L,PRE}} \times \frac{1}{(1.0407)^{10}} \\ & + \frac{\$100}{(1+y_{L,PRE})^{5} \times (1.0407)^{10}}, \end{aligned} \tag{3}$$

where 4.07% represents the average yield on a pre-SCR healthcare municipal bond with ten years until maturity. The analytical solution to this equation is $y_{L,PRE} = 4.85\%$. For the post-SCR period, the average yields for the 15-year and 10-year healthcare municipal bonds are $4.27\% - 0.35\% = 3.92\%$ and $4.07\% - 0.44\% = 3.63\%$, where 0.35% and 0.44% are based on the post-SCR yield changes reported in column (4) of Table 9. Repeating the same calculations used for the pre-SCR period, we find that $y_{L,POST} = 4.75\%$. Thus, the average yield on long-term healthcare cash flows decreased by only 10 basis points ($4.85\% - 4.75\%$) in the post-SCR period. This evidence suggests that the long-run risks associated with the ACA remain a significant obstacle to cheaper long-term borrowing in the healthcare

[16] Fifteen years is the median time to maturity for a long-term healthcare municipal bond. Five percent is the modal coupon rate for a healthcare municipal bond, with about 35% of all healthcare municipal bonds having a coupon rate of 5%. Pre-SCR, the average yield on a healthcare municipal bond with a coupon rate of 5% and a maturity of approximately 15 years is 4.27%.

municipal bond market.[17]

6. Conclusion

Local hospitals have benefited from the expanded insured customer base since the ACA went into effect in 2014, even with the associated cuts to Medicare and DSH reimbursement rates. However, hospitals may be worse off in the long run if the federal government continues to cut hospital reimbursement rates for treating publicly-insured patients, or if lawmakers repeal the ACA subsidies and leave the associated cuts in place. Given these additional policy risks, it is unclear whether the ACA improved local hospitals' overall credit quality and thus their ability to cheaply borrow capital to finance new healthcare infrastructure.

In this study, we provide novel evidence that the ACA significantly improved credit risk for hospitals. In particular, we show that the ACA reduced healthcare municipal bond yields by 39 basis points, but only after the Supreme Court ruled in favor of the constitutionality of the ACA in June 2012. The reduction represents about $1.74 billion in interest savings for healthcare bonds issued after the Supreme Court ruling. For states that voted to expand Medicaid under the ACA, the yield reduction was about 50% larger than the non-expansion states, representing an additional $320 million in interest savings for healthcare bonds issued in those states after their expansion. Supporting evidence from hospital admissions records indicates that the overall reduction in healthcare yields was strongly related to an increase in emergency room usage by newly-insured patients. Therefore, the ACA-associated improvements to hospital credit risk were largely demand-driven, but only after a sufficient resolution of legal uncertainty surrounding the ACA.

Our results also indicate that the ACA-associated improvements in hospital credit risk were much weaker for certain hospitals, suggesting additional opportunities for policy improvements. For example, we find that the yield reduction was about 50% weaker for hospitals in rural areas, where premiums remained relatively high due to a lack of insurance competition on ACA exchanges. Policymakers in Alaska, a largely rural state, responded to this issue in 2016 by introducing a reinsurance program in which the state would cover claims

[17] In an unreported test, we find that there was no statistically significant change in state-level municipal bond issuance activity as a percentage of total municipal bond issuance activity, further suggesting that long-run ACA uncertainty has discouraged municipalities from issuing municipal bonds to finance more healthcare projects, even with the lower yields.

for residents with high-cost medical conditions. As a result, overall insurance premiums in Alaska have remained fairly low compared to other states. Our evidence suggests that other states could take a targeted approach and introduce reinsurance programs in rural areas where the number of insurers is below some competitive threshold. Of course, additional policy changes that build upon the ACA would be ineffective if the ACA were eventually repealed. Indeed, the weaker changes on the far end of the healthcare yield curve documented in this study suggest that repeal risk is still significantly priced in healthcare municipal bond markets. Our results suggest that a resolution of the political uncertainty surrounding the ACA, which remains fairly persistent to this day, would further reduce the yield premium on long-term healthcare municipal bonds and thus promote long-term economic growth in the healthcare sector.

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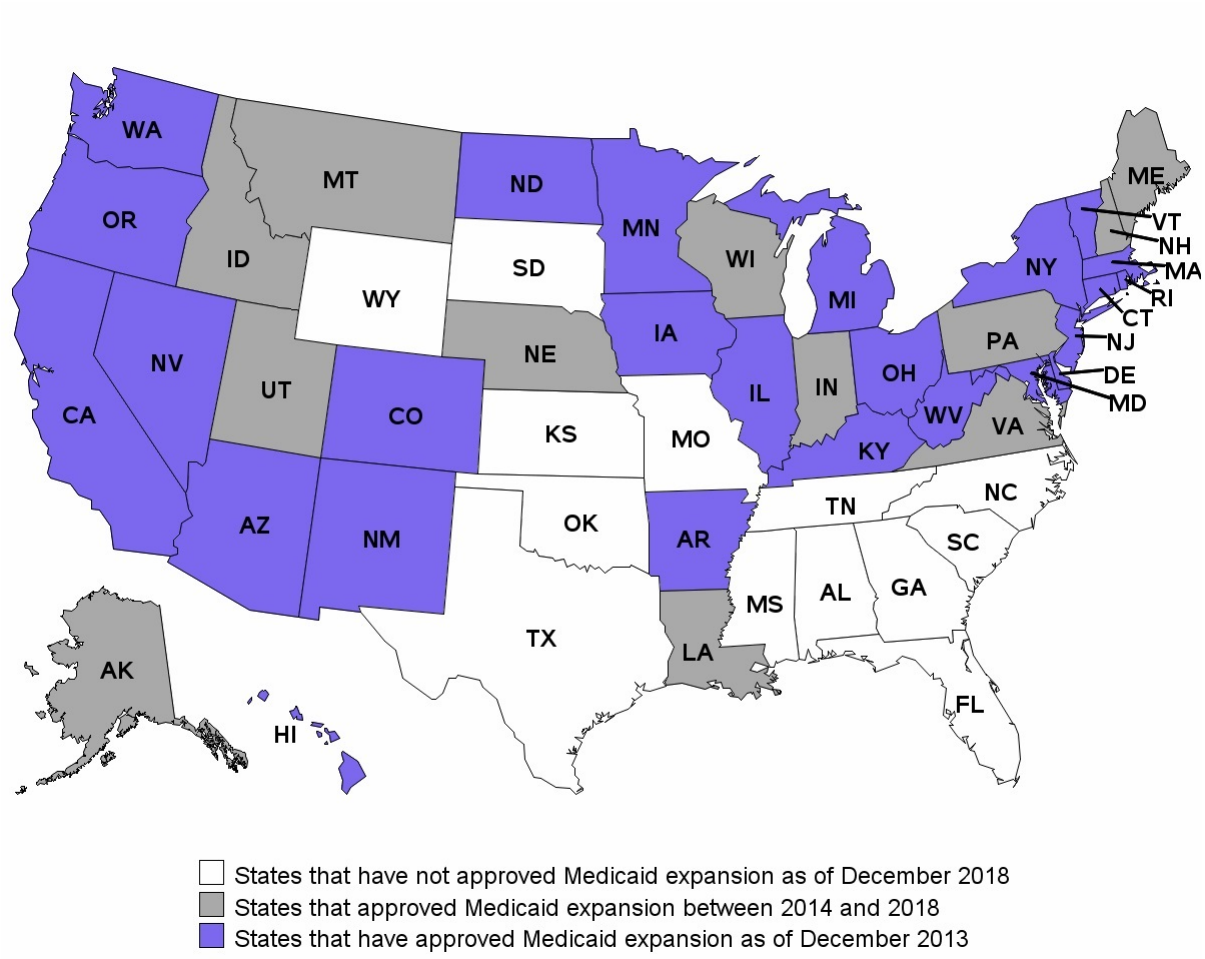

Fig. 1. Medicaid expansion in the United States. This map identifies the states that have not approved Medicaid expansion as of December 2018, the states that approved Medicaid expansion between 2014 and 2018, and the states that have approved Medicaid expansion as of December 2013.

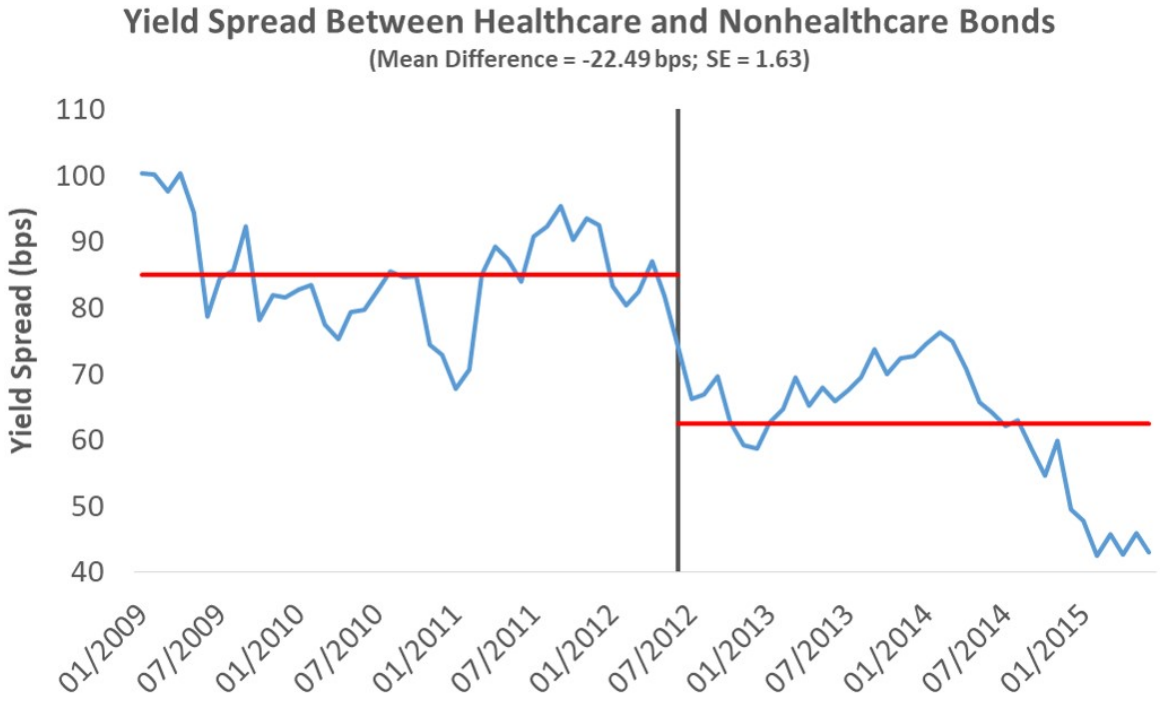

Fig. 2. Yield Spread between Healthcare and Non-healthcare Municipal Bonds. This graph reports the difference between the average healthcare municipal bond yield and the average non-healthcare municipal bond yield on the secondary market for each year-month in our sample period. The solid vertical line represents the date that the Supreme Court ruled that the ACA was constitutional.

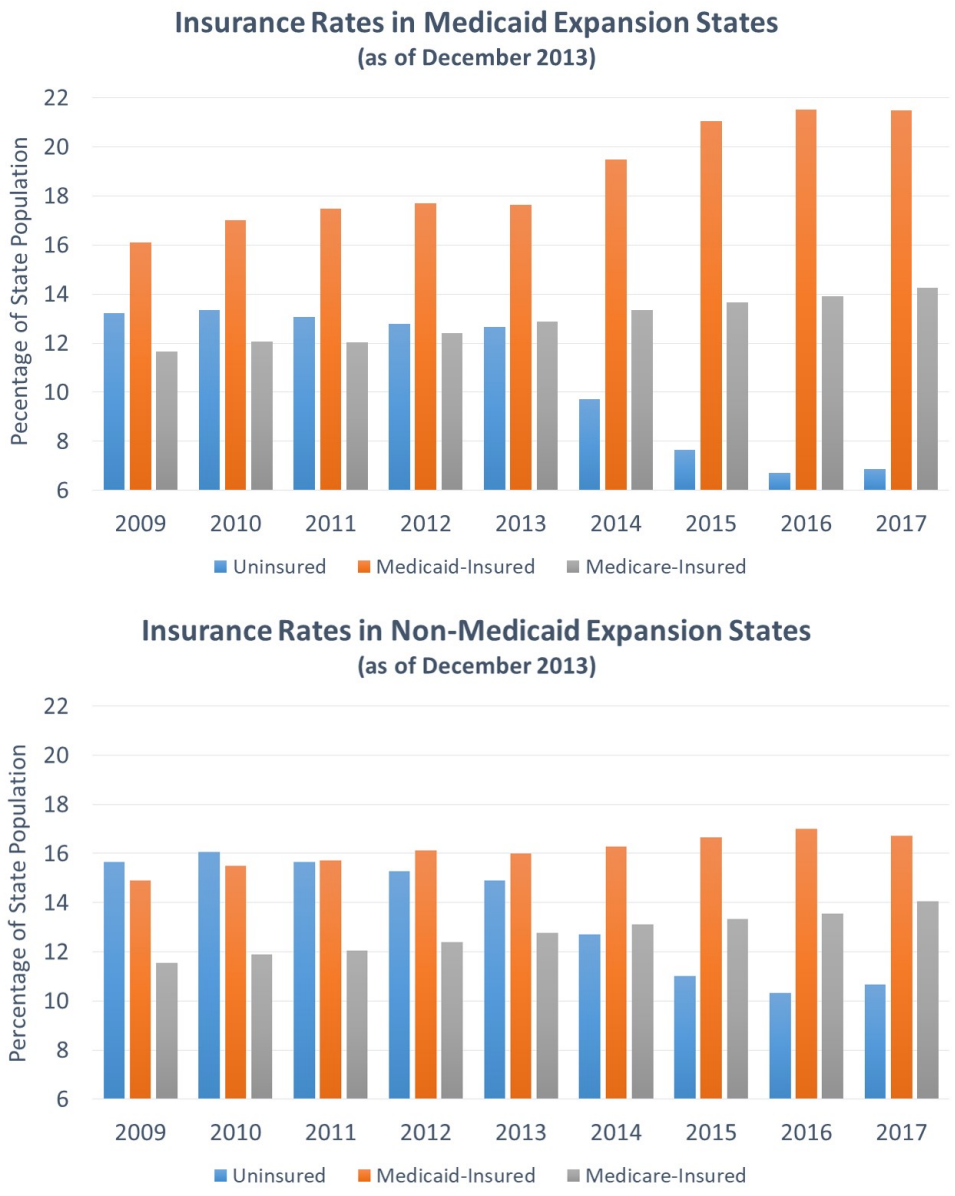

Fig. 3. State-level insured rates. The top panel reports the cross-state average percentage of the population that is uninsured, Medicaid-insured, and Medicare-insured for the states that approved Medicaid expansion as of December 2013. The bottom panel reports the same statistics for the states that did not approve Medicaid expansion as of December 2013.

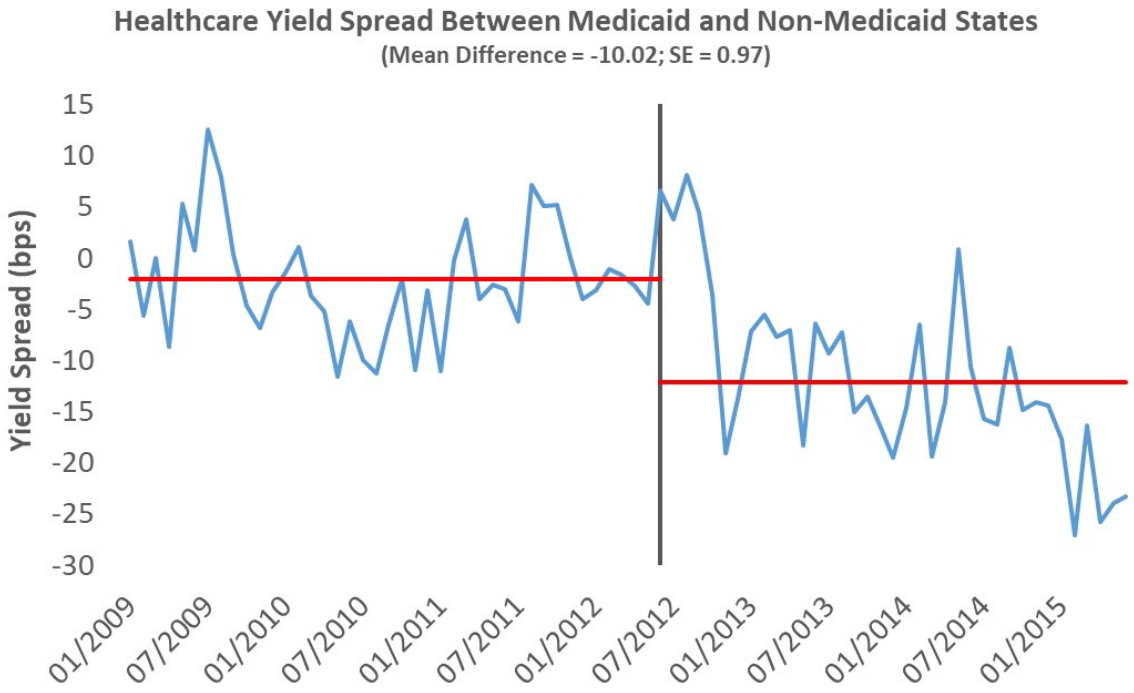

Fig. 4. Healthcare Yield Spread between Medicaid States and Non-Medicaid States. This graph reports the difference between the average healthcare municipal bond yield in Medicaid-expansion states and the average healthcare municipal bond yield in non-Medicaid expansion states on the secondary market for each year-month in our sample period. For this graph, Medicaid-expansion states are the states which voted to expand Medicaid before the ACA provisions were implemented in January 2014. The non-Medicaid expansion states are the remaining states. The solid vertical line represents the date that the Supreme Court ruled that the ACA was constitutional.

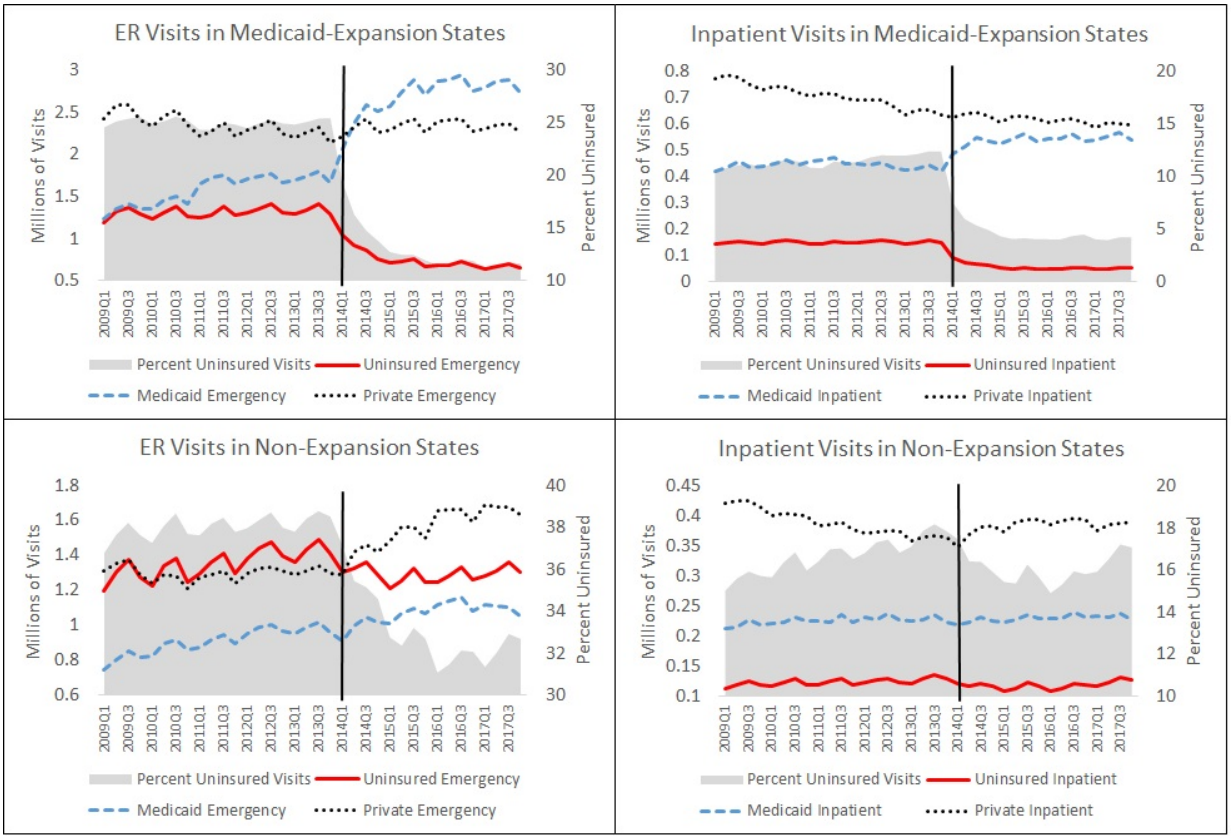

Fig. 5. Total Emergency Visits and Inpatient Visits by State Type. The top two panels report the total number (in millions) of emergency room visits and inpatient visits, respectively, for each year-quarter across all states in the HCUP sample that voted to expand Medicaid before January 2014. The bottom two panels report the total number of emergency room visits and inpatient visits, respectively, for each year-quarter across all states in the HCUP sample that did not vote to expand Medicaid by the end of 2017. The right axis of each panel reports the percentage of visits by uninsured patients relative to the sum of uninsured patients, Medicaid patients, and private insurance patients. The vertical solid line in each panel represents the date that the ACA provisions went into effect.

Table 1
Municipal bond summary statistics.
This table reports summary statistics for the healthcare and non-healthcare bonds issued during our sample period of 2009 to 2015.

	Healthcare Bonds	Non-Healthcare Bonds
Number of Bonds	18,900	687,693
Number of Issues	793	25,244
Bond Size ($M)	6.9	2.7
Issue Size ($M)	95.6	37.6
Offering Yield (%)	3.22	2.39
Years to Maturity	10.3	8.7
Insured (%)	4.9	15.6
Rating Number	4.4	2.7
Investment Grade (%)	81.0	80.5
Non-Investment Grade (%)	1.1	0.1
Unrated (%)	17.9	19.5
General Obligation (%)	11.3	59.4
Callable (%)	43.5	40.6

Table 2
County-level summary statistics.
This table provides county-level summary statistics for Medicaid-expansion states and non-Medicaid expansion states. For the purposes of these summary statistics calculations, if a state voted to expand Medicaid prior to 2014, then the state is defined as a Medicaid-expansion state; otherwise, the state is defined as a non-Medicaid expansion state.

	Medicaid Expansion States	Non-Medicaid Expansion States
Number of states	25	25
Number of counties	1,179	1,949
Rural counties (%)	0.62	0.64
Per capita income ($)	36,251	34,339
Median population	30,526	23,433
Mean uninsured rate	0.13	0.15
Mean Medicaid-insured rate	0.16	0.15
Mean Medicare-insured rate	0.12	0.12
Hospitals/100K people	4.7	6.3
Hospitals/100K people (urban)	2.0	2.5
Hospitals/100K people (rural)	6.4	8.4
Healthcare personnel/100K people	1,402	1,391
Healthcare personnel/100K people (urban)	1,446	1,359
Healthcare personnel/100K people (rural)	1,376	1,409

Table 3
Post-SCR healthcare offering yield spreads.
This table displays the results of OLS regressions of municipal bond yield spreads on PostSCR and PostSCR × Health, where PostSCR is an indicator variable that equals one if the bond was issued after June 2012, the date that the Supreme Court ruled that the ACA was constitutional. Health is an indicator variable that equals one if the bond was issued to finance a municipal project in the healthcare sector. In columns (1) and (2), the dependent variable is the municipal bond offering yield spread and offering yield, respectively. In columns (3) and (4), the offering yield spread is adjusted for taxes and any call options embedded in the municipal bond, respectively. Standard errors are double-clustered by state and year-month. *t*-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable			
	Yield Spread	Offering Yield	Tax-Adj. Spr.	Call-Adj. Spr.
	(1)	(2)	(3)	(4)
PostSCR × Health	-0.388***	-0.397***	-0.387***	-0.362***
	(-8.85)	(-8.76)	(-8.57)	(-8.82)
Health	0.525***	0.530***	0.523***	0.533***
	(10.94)	(10.87)	(10.81)	(10.90)
Treasury Yield		0.713***		
		(32.96)		
Time to Mat. (TTM)	0.0294***	0.0633***	0.0737***	0.0464***
	(11.29)	(23.02)	(34.07)	(17.27)
Inverse TTM	-0.0383**	-0.111***	-0.136***	-0.0118
	(-2.25)	(-6.43)	(-6.73)	(-0.66)
General Obligation	-0.182***	-0.187***	-0.185***	-0.199***
	(-5.74)	(-5.84)	(-5.82)	(-5.83)
Insured	0.0878***	0.0814***	0.0810***	0.0876***
	(11.24)	(9.36)	(9.04)	(11.19)
Log(Bond Size)	-0.0154**	-0.0261***	-0.0284***	0.000397
	(-2.47)	(-4.38)	(-4.40)	(0.06)
Population (M)	0.00697	0.00772	0.00762	0.00651
	(0.62)	(0.68)	(0.68)	(0.58)
Per Capita Income ($K)	-0.000734	-0.000772	-0.000735	-0.000573
	(-1.27)	(-1.37)	(-1.27)	(-0.92)
Population Growth	0.0362***	0.0372***	0.0374***	0.0370***
	(3.67)	(3.71)	(3.70)	(3.66)

Employment Growth	-0.00216	-0.00258*	-0.00255*	-0.00160
	(-1.58)	(-1.89)	(-1.91)	(-1.17)
Coincident Index	0.00513	0.00346	0.00385	0.00438
	(0.58)	(0.40)	(0.47)	(0.42)
Pension Funding Ratio	-0.119	-0.0725	-0.0204	-0.232
	(-0.59)	(-0.36)	(-0.11)	(-1.02)
SE Clustering	State-YM	State-YM	State-YM	State-YM
Fixed Effects	State, YM	State, YM	State, YM	State, YM
Rating Controls	Yes	Yes	Yes	Yes
Callable Controls	Yes	Yes	Yes	No
N	703,735	703,735	703,735	703,389
Adj. R^2	0.522	0.896	0.680	0.480
Within Adj. R^2	0.182	0.867	0.582	0.165

Table 4
Post-SCR healthcare secondary yield spreads.
This table displays the results of OLS regressions of municipal bond secondary yield spreads on PostSCR and PostSCR × Health, where PostSCR is an indicator variable that equals one if the bond was issued on or after June 2012, the date that the Supreme Court ruled that the ACA was constitutional. Health is an indicator variable that equals one if the bond was issued to finance a municipal project in the healthcare sector. Secondary yield spreads are measured at the bond-month level. If multiple transactions take place in the same bond-month, then we take the size-weighted average of the transactions in that bond month. In column (1), we use the full sample of bond-months. In columns (2) and (3), we focus on the subsample of seasoned bonds that were issued more than 60 days ago and more than one year ago, respectively. In column (4), we only focus on bonds traded during our sample period that were issued prior to 2009. Bond Controls represents the bond-level control variables used in the baseline regression model. Standard errors are double-clustered by state and year-month. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Secondary Yield Spread			
	All Trades	Seasoned Bonds (60 days)	Seasoned Bonds (1 year)	Pre-2009 Issuances
	(1)	(2)	(3)	(4)
PostSCR × Health	-0.459***	-0.459***	-0.463***	-0.399***
	(-9.07)	(-9.05)	(-8.91)	(-6.52)
Health	0.537***	0.537***	0.536***	0.511***
	(10.27)	(10.19)	(9.87)	(9.67)
SE Clustering	State-YM	State-YM	State-YM	State-YM
Fixed Effects	State, YM	State, YM	State, YM	State, YM
Bond Controls	Yes	Yes	Yes	Yes
County Controls	Yes	Yes	Yes	Yes
N	5,455,104	5,267,088	4,830,487	3,460,169
Adj. R^2	0.383	0.384	0.386	0.401
Within Adj. R^2	0.0734	0.0736	0.0726	0.0523

Table 5
Post-Medicaid expansion municipal bond yield spreads.
This table reports the effect of state-level Medicaid expansion on yield spreads. PostMed is an indicator that equals one if the bond was issued after the state voted to expand Medicaid. PostSCR is an indicator that equals one if the bond was issued on or after June 2012, the date that the Supreme Court ruled that the ACA was constitutional. Health is an indicator that equals one if the bond was issued to finance a healthcare project. Late is an indicator that equals one if the state voted to expand Medicaid after January 2014 and during our sample period. In columns (2) to (4), YM × H/N denotes separate year-month fixed effects for healthcare and non-healthcare bonds. In column (4), we examine secondary yield spreads for bonds that were issued before 2009. Standard errors are double-clustered by state and year-month. *t*-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Offering Yield Spread			Secondary Yield Spread
	(1)	(2)	(3)	(4)
PostMed × Health	-0.165**	-0.111**	-0.110***	-0.190**
	(-3.85)	(-2.32)	(-2.30)	(-2.66)
PostMed	0.0196	0.0181	0.0181	-0.00238
	(0.74)	(0.68)	(0.62)	(-0.03)
PostSCR × Health	-0.332***			
	(-7.34)			
Health	0.526***			
	(10.92)			
PostMed × Health × Late			-0.026	
			(-0.54)	
Late × Health			0.0011	
			(0.02)	
SE Clustering	State-YM	State-YM	State-YM	State-YM
Fixed Effects	State, YM	State, YM × H/N	State, YM × H/N	State, YM × H/N
Bond Controls	Yes	Yes	Yes	Yes
County Controls	Yes	Yes	Yes	Yes
N	703,735	703,735	703,735	3,460,169
Adj. R^2	0.522	0.524	0.524	0.402
Within Adj. R^2	0.182	0.162	0.162	0.0445

Table 6

Emergency visits and inpatient visits before and after ACA implementation.
Panel A reports hospital visit summary statistics for states which voted to expand Medicaid before the ACA implementation date of January 2014. Panel B reports hospital visit summary statistics for states which did not vote to expand Medicaid by the end of 2017. Each panel reports the number of emergency room visits and inpatient visits by uninsured patients, Medicaid patients, and private insurance patients (in millions). The percentage of uninsured patients relative to these three patient categories is also reported. All statistics are reported for the periods before January 2014 and after January 2014. Hospital visit data is obtained for all reporting states from the Healthcare Cost and Utilization Project website for the period 2009 to 2017.

	Panel A: Medicaid-Expansion States		
	Pre-2014 Q1	Post-2014 Q1	Difference
N(Uninsured Emergency Visits)	1.314	0.744	-0.570***
N(Medicaid Emergency Visits)	1.583	2.702	1.119***
N(Private Insurance Emergency Visits)	2.351	2.336	-0.015
Percent Uninsured Emergency Visits	25.04	12.92	-12.12***
N(Uninsured Inpatient Visits)	0.148	0.055	-0.093***
N(Medicaid Inpatient Visits)	0.443	0.539	0.096***
N(Private Insurance Inpatient Visits)	0.707	0.615	-0.092***
Percent Uninsured Inpatient Visits	11.44	4.57	-6.87***

	Panel B: Non-Expansion States		
	Pre-2014 Q1	Post-2014 Q1	Difference
N(Uninsured Emergency Visits)	1.355	1.294	-0.061**
N(Medicaid Emergency Visits)	0.909	1.068	0.159***
N(Private Insurance Emergency Visits)	1.298	1.558	0.260***
Percent Uninsured Emergency Visits	38.02	33.07	-4.95***
N(Uninsured Inpatient Visits)	0.123	0.118	-0.005***
N(Medicaid Inpatient Visits)	0.226	0.230	0.004*
N(Private Insurance Inpatient Visits)	0.389	0.383	-0.006
Percent Uninsured Inpatient Visits	16.67	16.10	-0.57**

Table 7

Post-SCR effect in urban versus rural counties.

The OLS regressions in the first two columns test the post-SCR effect on the offering yield spreads of healthcare bonds for the subsamples of municipal bonds issues in urban and rural counties, respectively. Column (3) tests the PostSCR effect on healthcare offering yields spreads in urban versus rural counties using the pooled sample of bonds. Column (4) tests the PostSCR effect on healthcare offering yield spreads as a function of the population (Pop.) in the county of issuance. In the first three regression columns, YM × U/R denotes separate year-month fixed effects for rural and urban counties. Standard errors are double-clustered by state and year-month. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Offering Yield Spread			
	Urban Sample	Rural Sample	Pooled Sample	
	(1)	(2)	(3)	(4)
PostSCR × Health	-0.422***	-0.231***	-0.424***	-0.347***
	(-10.43)	(-2.91)	(-10.68)	(-7.06)
Health	0.515***	0.564***	0.518***	0.536***
	(11.04)	(6.37)	(11.60)	(9.48)
PostSCR × Health × Rural			0.172**	
			(2.12)	
Health × Rural			0.0407	
			(0.47)	
PostSCR × Health × Pop				-0.0546***
				(-2.97)
PostSCR × Pop				-0.00811
				(-1.59)
Health × Pop				-0.0161
				(-0.91)
SE Clustering	State-YM	State-YM	State-YM	State-YM
Fixed Effects	State, YM	State, YM	State, YM × U/R	State, YM
Bond Controls	Yes	Yes	Yes	Yes
County Controls	Yes	Yes	Yes	Yes
N	570,054	133,681	703,735	703,735
Adj. R^2	0.535	0.518	0.525	0.522
Within Adj. R^2	0.189	0.167	0.181	0.182

Table 8

Post-SCR effect on public and private healthcare municipal bonds.

This table reports the PostSCR effect on public and private municipal bond offering yield spreads. Private bonds are sold by local governments on behalf of nongovernmental third parties; the bonds are backed by the revenues generated by the nongovernmental project. Public bonds are issued by local governments to finance public projects. The first and second columns focus on the subsamples of public and private healthcare bonds. The third and fourth columns examine the ACA effect on public versus private healthcare bonds using the subsample of healthcare bonds and the entire sample of bonds, respectively. Standard errors are double-clustered by state and year-month. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dep. Variable: Offering Yield Spread			
	Public Health Bonds	Private Health Bonds	Health Bonds	Pooled Sample
	(1)	(2)	(3)	(4)
PostSCR × Health	-0.208**			-0.266***
	(-2.17)			(-4.41)
PostSCR × Health × Private		-0.368***	-0.165**	-0.163**
		(-4.49)	(-2.31)	(-2.17)
Health × Private			0.284***	0.247***
			(4.48)	(3.34)
Health				0.345***
				(4.55)
SE Clustering	State-YM	State-YM	State-YM	State-YM
Fixed Effects	State	State	State, YM	State, YM
Bond Controls	Yes	Yes	Yes	Yes
County Controls	Yes	Yes	Yes	Yes
N	5,205	13,546	18,754	703,735
Adj. R^2	0.489	0.433	0.577	0.523
Within Adj. R^2	0.238	0.275	0.197	0.183

Table 9

Post-SCR effect by bond maturity.

The OLS regressions in the first three columns test the post-SCR effect on the offering yield spreads of healthcare bonds for different time-to-maturity terciles. Short-term bonds, medium-term bonds ($\mathbf{1}_M$), and long-term bonds ($\mathbf{1}_L$) are defined as the bonds with less than five years to maturity, between five and ten years until maturity, and more than ten years until maturity, respectively. Column (4) tests the PostSCR effect by time-to-maturity using the pooled sample of bonds, and YM × T3 represents the cross-product of the year-month and time-to-maturity tercile. Standard errors are double-clustered by state and year-month. t-statistics are reported below the regression coefficients. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

	Dependent Variable: Offering Yield Spread			
	Short-Term Bonds	Med-Term Bonds	Long-Term Bonds	Pooled Sample
	(1)	(2)	(3)	(4)
PostSCR × Health	-0.460***	-0.445***	-0.348***	-0.474***
	(-8.91)	(-8.99)	(-7.29)	(-9.44)
Health	0.546***	0.566***	0.448***	0.485***
	(10.91)	(11.03)	(9.78)	(10.25)
PostSCR × Health × $\mathbf{1}_M$				0.0385*
				(1.87)
Health × $\mathbf{1}_M$				0.110***
				(6.87)
PostSCR × Health × $\mathbf{1}_L$				0.124***
				(4.37)
Health × $\mathbf{1}_L$				0.0246
				(0.86)
SE Clustering	State-YM	State-YM	State-YM	State-YM
Fixed Effects	State, YM	State, YM	State, YM	State, YM × T3
Bond Controls	Yes	Yes	Yes	Yes
County Controls	Yes	Yes	Yes	Yes
N	222,479	223,906	257,347	703,734
Adj. R^2	0.465	0.640	0.642	0.583
Within Adj. R^2	0.0960	0.121	0.204	0.143