

# How Do Retiree Health Benefit Promises Affect Municipal Financing?\*

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## Abstract

U.S. public sector employers have amassed \$1.2 trillion in promised retiree health and other post-employment benefits (OPEBs), reflecting a burden that rivals U.S. public pensions. About 90% of these liabilities are not funded. We find that states with higher public sector OPEB liabilities and lower funding ratios have higher municipal bond yield spreads. The effect is strongest for states with high health costs, generous OPEB plans, and a large share of public sector employees covered by collective bargaining agreements, which may make it more difficult for states to renegotiate the OPEB benefits.

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# 1. Introduction

U.S. public sector employers have promised an estimated \$1.2 trillion dollars in retiree health and other post-employment benefits, commonly known as OPEBs (Joffee, 2021). These obligations are comparable in size to U.S. public pension obligations.<sup>1</sup> Yet, while an existing body of evidence suggests public pension liabilities impact municipal finances (Novy-Marx and Rauh, 2012; Burson et al., 2014; Aubry et al., 2017; Lekniute et al., 2012; Agarwal et al., 2021), much less is known about whether OPEBs also impact the cost of municipal debt. The objective of this paper is to fill this gap and shed light on the financial market implications of future retiree health costs.

OPEBs mainly include retiree health insurance and other health benefits and sometimes also include life insurance, legal services and other miscellaneous benefits. Like public pension plans, the majority of public-sector OPEB plans are “defined benefit” plans in the sense that employers commit to paying the future health premiums for retirees. These future benefits are uncertain and fast growing. According to the Center for Medicare & Medicaid Services, national health expenditures are projected to grow 1.1 percentage points faster than gross domestic product per year on average over 2019–28.<sup>2</sup> Importantly, most of these future benefits are unfunded because public sector employers historically paid OPEBs on a pay as you go basis. Even though new accounting standards introduced in 2004 have provided incentives to establish formal funding mechanisms similar to those of public pension plans, funding ratios for OPEB plans remain under 10% for most states.<sup>3</sup>

Our analysis explores whether and how unfunded OPEB liabilities impact municipal bond offering yields. Using transaction data on municipal bond yields from 2008 to 2016 and annual data on the total value of OPEB liabilities, we investigate whether states and municipalities where public employers have higher OPEB liabilities and lower funding ratios also have higher bond yields. Our empirical strategy controls for bond and pension characteristics, state demographic variables, and state, year, and month fixed effects that capture unobserved heterogeneity driven by factors such as the political environment. To mitigate the possible reverse causality concern that financing ability drives a public employer’s decision to provide OPEBs, we use state level changes in tort reform statutes and nurse practitioner regulations that affect health insurance and health care costs as instrumental variables for the value of the OPEB liability.

We obtain four sets of empirical results. First, we document a positive and significant relationship between a state’s outstanding OPEB liabilities and municipal bond spreads. We also document a negative

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<sup>1</sup>According to the 2019 U.S. Census Bureau Annual Survey of Public Pensions, unfunded pension obligations also amounted to \$1.2 trillion. <https://www.census.gov/newsroom/press-releases/2020/public-pensions.html>

<sup>2</sup>The December 14, 2022, NHE Fact Sheet. See <https://www.cms.gov/research-statistics-data-and-systems/statistics-trends-and-reports/nationalhealthexpenddata/nhe-fact-sheet>.

<sup>3</sup><https://www.pewtrusts.org/en/research-and-analysis/issue-briefs/2023/05/do-states-have-enough-saved-for-retiree-health-care-benefits>

relationship between OPEB funding ratios and municipal bond spreads. The evidence therefore suggests that state borrowing costs increase to compensate investors for the risk to future cash flows presented by promised unfunded health benefit payments to retirees.

Second, we explore how differences in the health care costs to the population of retirees across states impact the effects of OPEBs and funding on municipal financing. The degree of heterogeneity in health care costs across states is known to be large (Skinner, 2011). We find that the positive effect of liabilities on yields and the subsequent mitigation of risk with more funding *only* arises in states with higher Medicare reimbursements per enrollee. The effect is strongest for bonds with longer time to maturity, which is when risks from long term health benefits become more salient.

Third, we use retiree health plan characteristics collected over time by the Pew Charitable Trust to explore how plan design influences the risk of future OPEBs to plan sponsors. Public sector employers can choose whether or not to contribute to the retiree health insurance premium. Conditional on contributing, employers can choose to either pay a portion of the retiree health insurance premium – a cost that fluctuates with health costs – or make a fixed contribution to the premium, which reduces a benefit plan’s exposure to the risk of rising health costs.

Our results indicate that higher OPEB liabilities and lower funding ratios lead to increased yields *only* in the sample of states with plans that provide a portion of the premium contribution – the contract with the most risk to the plan sponsor. For the sample of states where public sector employers offer contribution schemes less exposed to the risk of rising health costs, we find no statistically significant effect of OPEBs and funding. We also find that, of the states that did contribute to retiree health insurance premiums as of the beginning of our sample period, the positive relation between OPEBs and municipal offering yields exists only in the sample of states with plans that contribute more than 50% of the premium, and hence are most exposed to this risk.

Exploring an additional contracting dimension, we find similar results in states where public sector employers offer “wraparound” coverage rather than Medicare Advantage plans. These employers may offer additional benefits not covered by basic Medicare by either choosing to offer “wraparound” services determined and insured by the state or by contracting with an insurer to provide a Medicare Advantage plans. The positive relationship between OPEB liabilities and municipal offering yields and negative relationship between funding and yields occurs *only* for plans that offer the wraparound coverage that is more exposed to the risk of payouts driven uncertain future health costs.

Fourth, we study the extent to which union bargaining agreements impact yields. Unlike the majority of public pension plans which are constitutionally protected, public employers have relatively broad latitude to alter the provisions of OPEB plans, including whether to contribute to retiree health benefits at all.

However, greater representation of workers through contracts governed by collective bargaining agreements may give workers more power when employers renegotiate contracts. We find evidence that higher union coverage of public sector employees (with more generous and harder to renegotiate benefits) increases the risk of OPEB liabilities to plan sponsors.

Fifth, we analyze possible linkage between pension liabilities and OPEBs. Interestingly, there is no correlation between unfunded pension liabilities and unfunded OPEBs. Higher funding of OPEBs do, however, have an impact on municipal debt only if pension liabilities are well funded.

Our findings contribute to the literature on the size and subsequent effects of public pension obligations on financial market outcomes (Novy-Marx and Rauh, 2009, 2011, 2012; Burson et al., 2014; Aubry et al., 2017; Lekniute et al., 2012; Agarwal et al., 2021). Moreover, inadequate pension funding and retiree health benefit funding can exacerbate the negative effect of aging populations on municipal financing (Butler and Yi, 2021). We show both the size of retiree health benefit liabilities and funding levels separately affect bond yields.

Our findings contribute to the literature on health and finance that focuses on how local health conditions affect market values. Geographic regions with more opioid abuse have higher municipal bond yields (Cornaggia et al., 2022). Areas with aging populations have higher municipal bond yields (Butler and Yi, 2021). Firms in counties with higher rates of obesity have lower market to book values (Agrawal and Lim, 2018). Additionally, hospitals in states that expanded Medicaid have lower bond yields, reflecting a better ability to finance health costs when government transfers reduce credit risk (Gao et al., 2019). We contribute to the existing literature by studying how the value of the OPEB liabilities and plan features affect municipal bond yields.

Our paper also contributes to the existing literature on retiree health insurance that has explored the extent of the obligations and characteristics of plans across states. Clark and Morrill (2010) and Munnell et al. (2016) document the variation in the size of liabilities and features of retiree health insurance plans across states using estimates reported by states. Lutz and Sheiner (2014) account for the lack of uniform assumptions underlying these reported liabilities. Using the methodology of Novy-Marx and Rauh (2011) grounded in financial theory, Lutz and Sheiner (2014) calculate obligations and funding amounts that are comparable across states and allow for more precise estimates of how OPEBs affect state fiscal policy. Following additional changes to GASB regulations that became effective in 2017 with the goal of easing comparability of liabilities across states, Balass et al. (2023) document the size of OPEBs, estimate their effect on state budgets, and then extrapolate how variation in benefit characteristics across states can inform policy makers proposing changes to the federal Medicare program. Rather than focusing on the best measure of the size of the OPEB liability, we establish how information readily available to investors from published

state financial reports on the size and funding of retiree health insurance subsequently affect financial market outcomes. While some prior practitioner reports have included speculation that retiree health benefits affects municipal financing (S&P Global Ratings Research Report, 2018, 2019), we fill a gap in the literature by showing yields vary with the extent of liabilities and financing and that these effects depend on plan design and future health costs.

Our findings have several important implications for policymakers. We contribute to existing work showing that participants in financial markets price health costs, a relationship that has increased in importance after the effects of the Covid-19 health pandemic. Additionally, our results on how promising health care benefits can affect the market for government securities and how funding and contracting flexibility alters the risk profile can inform policymakers beyond the U.S. public sector. Much like the U.S., health spending is expected to grow faster than GDP in almost all OECD countries,<sup>4</sup> most of which provide health benefits for a population significantly larger than public sector retirees, potentially introducing risk to investors in sovereign debt.

The rest of the paper proceeds as follows. Section 2 provides an overview of public sector retiree health benefits. Section 3 provides details on retiree health insurance liabilities and funding data and municipal bond data. Section 4 describes our empirical framework and explores how retiree health insurance liabilities and funding choices affect state financing costs. Section 5 concludes.

## 2. Historical Background

U.S. private and public employers have long offered health benefits including health insurance to active workers. The provision of health benefits began in the early part of the twentieth century and expanded particularly in the 1940s when wage controls during the Second World War made health benefits an attractive way to increase compensation to scarce workers.

The provision of *retiree* health benefits started later in the 1960s and became more prevalent with the introduction of Medicare benefits for individuals over age 65, which made it less costly for employers to offer health benefits (Clark and Morrill, 2010). Today, most public sector employers provide OPEBs.<sup>5</sup> In the private sector, however, most OPEB plans have faded away. In 1988, about two-thirds of large private firms offered retiree health benefits, but fewer than 30 percent did so in 2013 (Fronstin, 2010; Lutz and Sheiner, 2014; Munnell et al., 2016). This decline occurred as the Financial Accounting Standard Board (FASB) introduced new reporting requirements in 1989 for the plans, and newly reported accrued liabilities reached

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<sup>4</sup>See <https://www.oecd.org/health/health-spending-set-to-outpace-gdp-growth-to-2030.htm>

<sup>5</sup>In 2009, about 80 percent of public sector employees had access to retiree health care benefits either before or after age 65. In 2014, this proportion grew to 85 percent (BLS National Compensation Surveys).

into the billions of dollars for some large companies (Clark and Morrill, 2010).

Accounting standards for public plans did not come under consideration until 2004 when the Governmental Accounting Standards Board (GASB) released Statements 43 and 45 with specific guidelines for OPEBs. Until the introduction of these standards, employers accounted for retiree health benefits on a pay-as-you-go basis when they incurred the costs, with no accounting for the promised liability. GASB 45 requires employers to shift OPEB accounting to an accrual basis and provide information about the accrued liability and the Annual Required Contribution, which is the amount of funding deemed required to adequately fund the OPEB plan.<sup>6</sup> GASB 45 also encourages employers to pre-fund the OPEB liability by establishing a two-tiered system for determining the liability's discount rate. Employers that pre-fund the OPEB liability are allowed to discount the liability at a rate equivalent to the forecasted long-term return on the invested capital, similar to what public pension plans do. In comparison, employers that do not pre-fund the liability must discount it at a rate equivalent to the forecasted rate of return on the employer's general funds, which are typically invested in money-market securities. Because the yield on money-market securities is typically lower than the expected return on OPEB assets, the valuation of the liability for non-funded plans increases.

Importantly, while the regulations require disclosure, they do not mandate funding. Employers are therefore not required to fund the plans. In addition, they are not required to adopt GASB standards. Nebraska provides retiree health benefits but does not disclose in accordance with the GASB standards. South Dakota discontinued following the standards in 2014. However, many entities have chosen to comply with GASB standards in order to maintain good standing with credit rating agencies (Shnitser, 2018).

### 3. Data and Summary Statistics

#### 3.1. OPEBs

We obtain data on public sector OPEBs from the Pew Charitable Trusts project on Public Sector Retirement Systems. The data includes all states that disclose OPEB information between 2008 and 2016.<sup>7</sup> Because Pew aggregates data from the major plans within a state,<sup>8</sup> the dataset includes information on the total liabilities, total assets, unfunded liabilities, the total annual Required Contribution, and total contributions assembled from state comprehensive annual financial reports. We end the sample in 2016 because reporting standards changed afterwards. Specifically, in 2015 GASB released Statements 74 and 75 chang-

<sup>6</sup>See <https://www.gasb.org/st/summary/gstsm45.html>

<sup>7</sup>The State Retirement Fiscal Health and Funding Discipline. Nebraska does not disclose OPEB information, and South Dakota stopped reporting in 2014.

<sup>8</sup>On average, a state has four public retiree health insurance benefit plans. For example, public sector workers in Texas may receive retiree health insurance benefits from the University of Texas System Employee Group Plan, the AM Care Health and Life Plan, the Employees Retirement System, or the Teachers Retirement System.

ing the guidance for how plans calculate and disclose OPEB liabilities to align more closely with pension reporting changes (McAllister and Spinelli, 2016). Statement 74 went into effect for fiscal years after June 2016, and Statement 75 went into effect for fiscal years after June 2017. The 2016 end date for our sample therefore maintains consistency in the reporting environment.

Table 1, Panel A, shows summary statistics of the data. The average OPEB liability for states in our sample period is \$14 billion, or about 4.89 percent of state personal income. The size of the liability varies greatly across states. As seen in Figure 1, OPEBs range from less than 0.8% of state personal income in Oklahoma and Oregon but more than 6.2% in Mississippi and New York.

Figure 2 shows the variation in funding ratios across states in 2014. On the one hand, thirteen states have no assets to finance OPEBs and therefore continue to fund OPEBs on a pay-as-you-go basis. On the other hand, six states have assets worth half or more of the estimated OPEB liability. On average over the sample, the funding ratio is 8%.

Figure 3 shows the evolution of funding ratios from 2008 to 2016. The mean funding ratio increased from 7.3 percent in 2008 to 14.9 percent in 2016. We also observe an increase in the *dispersion* of funding ratios. For example, while Arizona increased its funding ratio to almost 100 percent of liabilities, Nevada stopped funding OPEBs in 2012.<sup>9</sup> Table 2 shows summary statistics by funding status. On average, states that do not fund OPEB benefits have *higher* liabilities as a share of state personal income.

### 3.2. *Municipal bonds*

We collect data on municipal bonds from Mergent. The data include information about offering yields, promised amount at maturity, years to maturity, insurance status, callable status, and offering type at the municipal level. The sample only includes negotiated or competitive offerings, general obligation offerings, and tax exempt offerings. To screen for potential data errors, we follow Butler and Yi (2021) and drop bond observations with offering yields below zero or above 50, coupons greater than 20%, and prices either lower than 50% of the bonds' face value or greater than 150% of the face value. We focus only on bonds and therefore exclude issues with a yield to maturity less than one year. Our final sample has 409,636 bond-year observations.

Table 1, Panel B, shows bond level summary statistics. The mean raw offering yield between 2008 and 2016 is 2.574%, and the mean bond yield spread over maturity matched Treasury bonds is around 32 basis points. Around 20% of the sample bonds are insured, consistent with the decline in insured issued following the financial crisis. About half of the bonds have call provisions, and 70% are sold via competitive offering. The average rating is equivalent to S&P AA.

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<sup>9</sup>Ending the funding of benefits did not absolve Nevada of the promised liability.

### 3.3. Public pension characteristics

To analyze the possible relation between OPEB liabilities and pension liabilities across states, we collect data on public pension characteristics from the Public Pensions Database maintained by the Center for Retirement Research at Boston College. We aggregate pension liabilities and assets at the state level. The level of pension underfunding is defined as the difference between a state’s total pension liabilities and total pension assets scaled by the total assets.

Table 1, Panel C, shows summary statistics about pension assets and liabilities across states. The average degree of funding is significantly higher than for OPEB plans. Moreover, there is significant variation across states in the level of pension underfunding.

Interestingly, we find no correlation between the funding status of OPEBs and the funding status of pension liabilities. For each year of the sample, Figure 4 shows how states rank in OPEB funding and pension funding from the least funded (1) to the most funded (50). We find *no* relationship. For example, the 2016 ranking, represented by ‘X’ in the figure, shows that some states that rank low for OPEB funding also rank high for pension funding and conversely. In particular, if we focus our attention on the one-fourth of states that do not fund OPEBs, as shown by the bottom scatter at OPEB funding rank 1, the distribution of pension funding is relatively uniform. It is therefore not the case that states that have a high degree of pension underfunding also have a high degree of OPEB underfunding.

## 4. OPEB liabilities and bond yields

### 4.1. Empirical Setup

We use regression analysis to explore whether and how OPEBs affect municipal financing. We define  $OfferingYldSpread_{i,s,t,m}$  as the bond offering yield spread over the maturity matched treasury bonds for bond  $i$  for state  $s$  in year  $t$ . We also define  $OPEB_{s,t}$  as a measure of the total present value of OPEBs in state  $s$  in year  $t$ . We estimate the following regression:

$$OfferingYldSpread_{i,s,t,m} = \beta * OPEB_{s,t} + \gamma_1 * Bond_{i,s,t} + \gamma_2 * State_{s,t} + \theta_t + \mu_m + \delta_s + \epsilon_{i,s,t,m} \quad (1)$$

where  $Bond_{i,s,t}$  is a vector of bond characteristics for bond  $i$  in state  $s$  in year  $t$ ,  $State_{s,t}$  is a vector of state characteristics,  $\theta_t$  are year fixed effects,  $\mu_m$  are month fixed effects, and  $\delta_s$  are state fixed effects to control for unobserved heterogeneity. Bond characteristics that affect spreads include the log of the bond size amount, the log of the number of years to maturity, a bond insurance indicator variable, a callable bond



indicator variable, and a variable indicating the offering type is competitive rather than negotiated, similar to Butler and Yi (2021) and Painter (2020).

State-level variables that may be correlated with both bond spreads and retiree health insurance benefits and funding ratios include the pension underfunding ratio, the level of pension protection, and the log state population. We also include the number of plans as a control variable since more plans might represent a more complex contracting environment.

It is important to control for state fixed effects since much of the variation in OPEB liabilities stems from differences in the generosity of the plans rather than the number of retirees (Pew 2016 “State Retiree Health Care Liabilities.”) Moreover, existing evidence in the health insurance literature suggests that the cost of health care varies significantly across states (Skinner, 2011). We cluster standard errors at the state level as the residuals are likely to be correlated within states due to our sample selection (Abadie et al., 2023).

#### 4.2. *Baseline Results*

Table 3 reports the baseline estimation results. Column 1 shows a positive and statistically significant coefficient on OPEB liabilities. The coefficient estimate indicates that a one standard deviation increase in OPEB liabilities evaluated at the mean increases bond yield spreads by around 5 basis points, which is close to a tenth of a standard deviation change in yield spreads. The evidence therefore suggests that municipal bond investors price the risk and demand higher yields for states with more substantial OPEB obligations.

In column 2, we study the impact of the OPEB funding ratio on bond yields. The coefficient on the OPEB funding ratio is negative and statistically significant. When state plans increase funding for future promised OPEBs, bond yield spreads decrease. Bond investors face lower risk of state administrators confronting large unexpected payouts to public sector retirees for health care, as reflected in the lower spreads. Moreover, bond investors *are* pricing future health benefit payout risks. And these health benefit risks are independent of the pension risks since the specifications include controls for state pension promises.

#### 4.3. *Health care costs*

Over our sample period, the average rate of inflation for medical care services was 3.31%, which is twice the average rate of 1.65% for all items.<sup>10</sup> Importantly, health care utilization and prices vary geographically, giving rise to heterogeneity in the burden across states. This geographic variation has received much attention in both the popular press (Gawande, 2009) and academic research (Skinner, 2011). We now explore how differences in the health care costs to the population of retirees across states impact the effects of OPEBs

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<sup>10</sup>Source: 12-month percentage change, Consumer Price Index, selected categories, U.S. Bureau of Labor Statistics

and funding on municipal financing.

In areas with higher health care costs, funding future OPEBs may reduce the risk of large unanticipated payouts, reducing municipal financing costs. To test this hypothesis, we gather data on price-adjusted Medicare reimbursements per enrollee from the Dartmouth Atlas project for each state and year in the sample to characterize high and low health cost states. This measure is commonly used for comparing health care costs geographically because it compares costs for the same procedures across states. The use of Medicare data is particularly appropriate in our setting because Medicare eligibility starts at age 65.

Column 3 of Table 4 shows the distribution of states with health care costs above our sample median and states with health care costs below our sample median. Most states tend to be either high cost (above median) in all years or low cost (below median) in all years, but several states fluctuate between high and low cost.

Table 5 shows results from splitting the sample into states with high health care costs and states with low health care costs. For states with high medical costs shown in column 1, the coefficient on OPEBs is positive and statistically significant. However, for states with low health care costs shown in column 2, the coefficient is not statistically significant. Taken together, these results suggest that OPEB liabilities increase municipal financing costs *only* in states that face high health costs.

Similarly, we find in column 3 that the coefficient on the funding ratio is negative and statistically significant in states with high medical costs shown in column 3, but negative and statistically significant in states in low medical costs as shown in column 4. These results suggest that regardless of health care costs, plans that better prepare for larger OPEB payouts with more robust funding in plans face lower bond spreads.

Although the distribution across states in Table 4 indicates a high degree of persistence in high versus low health costs – that is, states with above average health costs tend to consistently rank among states with high health costs – retiree health insurance benefits largely represent future cash flow promises. To better understand how the timing of benefits affects bond yields, Table 6 shows results from splitting the sample into bonds by years to maturity. For bonds with promised maturities less than ten years shown in column 1, the coefficient on OPEB liabilities is not statistically significant. For bonds with promised maturities of ten years or more – further in the future when retirees utilize health insurance benefits – shown in column 2, the coefficient on OPEB liabilities is positive and statistically significant. A similar differential effect holds for the health benefits funding ratio. For bonds with shorter maturities in column 3, the effect is not statistically significant, but for the sample of longer maturity bonds in column 4, higher funding of OPEB liabilities has a negative and statistically significant effect on bond yield spreads. We also explore other maturity thresholds. In untabulated results, a similar finding of statistically significant effects of retiree health insurance and

funding ratio on spreads hold for the sample of bonds with maturities greater than five years. Splitting the sample of bonds by maturities of 15 years or more, however, reveals statistically significant results in both subsamples, suggesting the risk is binding between 10 and 15 years. Overall, when facing the risk of future payouts to retirees for health benefits with uncertain costs, the results suggest that bond market investors demand higher yields on bonds issued in states with higher average health costs and longer maturities to compensate for the risk.

#### 4.4. *Plan design*

OPEB agreements vary widely across public employers. Some employers pay no premium or a fixed component, while other employers pay a proportion of future healthcare premiums or the full amount. In this section, we explore how plan design characteristics change the impact of OPEBs on municipal financing.

Column 3 of Table 4 shows the distribution of premium contribution method by state in 2015 at the end of our sample, which gives conservative estimates of the effects as most states that changed plan provisions over the sample period introduced more restrictive plan features.<sup>11</sup> In approximately half of the states, public sector employers offer plans that pay a proportion of the insurance premium, while in about a quarter of states, employers offer plans that pay a fixed component of the premium. In eight states, the employer does not contribute to the premium, but workers still receive the benefit of remaining in the state health insurance risk pool, which reduces the cost of coverage to the retiree. Public sector employers bear a cost of this benefit as it may increase the cost of providing health benefits to current workers who are younger and possibly healthier.

In Table 7, we split the sample into (i) states that contribute a portion of the premium, (ii) states that contribute a fixed premium, and (iii) states that make no contribution to the premium. The first three columns show results for the liabilities. The coefficient on liabilities is only positive and statistically significant in the subsample of states that commit to paying a portion of the premium (column 1). The last three columns show results for the funding ratio. Likewise, the coefficient on the funding ratio is only negative and statistically significant in the subsample of states that tie coverage to the premium (column 4). States that contractually agree to pay a portion of the premium face the most risk because the premium will increase as health care costs increase. These results together indicate that liabilities increase yield spreads while a higher funding ratio decreases yield spreads in states where the benefit contracts expose them to the most risk of higher payouts.

In Table 8, we go one step further and use data on contribution amounts at the beginning of our sample period from Clark and Morrill (2010). We split the sample into states that pay less than half of the insurance

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<sup>11</sup>We obtain plan characteristic data from "State Retiree Health Plan Spending" by the Pew Charitable Trusts, May 2016.

premium and states that pay more than half of the insurance premium. States that pay more of the premium face higher risk from rising health care costs. We examine the effect of liabilities in the first two columns and the funding ratio in the last two columns. The coefficient on liabilities is only positive and statistically significant in column (1). Higher liabilities increase spreads more for states that commit to pay more of the premium. The coefficient on the funding ratio is negative and statistically significant for both subsamples (columns 3 and 4). Funding ratio mitigates risk regardless of how exposed public sector employers are to the risk of higher health care costs in the future, and although the magnitude of the effect is larger in the subsample of states contributing more to the premium (column 3), the difference is not significant. These results are largely consistent with the end of sample premium contributions in Table 7. Contract characteristics can exacerbate the risk that the promised retiree health benefits will increase with health care costs as reflected in the positive effect of retiree health insurance liabilities on yield spreads. Better funding mitigates the risk and lowers yield spreads for these risky plans with greater contributions from the public sector employer.

OPEB plans differ not only in the extent to which employers contribute to the plans but also in the types of services they provide. For example, all state plans require retirees to enroll in Medicare when they become eligible at age 65, but Medicare does not cover all health care services. As an additional benefit, some public employers either offer additional coverage for services not covered by Medicare through “Wraparound” coverage while other employers offer Medicare Advantage plans through traditional insurers. Some employers offer both. Table 4 shows the distribution of coverage method from Pew (2016) by state in 2015 at the end of our sample, which again gives conservative estimates of the effects.

In Table 9 we split the sample by coverage method. The first three columns show the effect of OPEB liabilities on yield spreads, and the last three columns show the effect of the funding ratio on yield spreads. The coefficient on liabilities is only positive and statistically significant in Column 1 for the subsample of plans that offer Wraparound coverage. Similarly, the coefficient on funding ratio is only negative and statistically significant in Column 4 for the Wraparound coverage subsample, indicating better funding can mitigate the risk of offering only Wraparound health coverage to public sector retirees. The risk associated with Wraparound plans, reflected in the larger spreads associated with the OPEB liability, reinforces the finding reported in Table 5 showing greater risk and subsequently yield spreads associated with higher health costs. In contrast, public sector employers can use Medicare Advantage as an effective risk management tool, eliminating the impact of retiree health insurance on yields (column 2) and the benefits of funding that liability (column 5). Unlike Wraparound plans for which the employer bears the risk of uncertain health costs, Medicare Advantage shifts the risk to an insurer, underscoring that plan design and the contracting environment is critical tools in mitigating risk. Interesting, for the sample of states with both Wraparound

coverage and Medicare Advantage plans in column 3, the coefficient on the retiree health insurance liability is negative and statistically significant. Public sector employers that manage the OPEB plans more effectively and that have more flexibility have both plans and therefore less risk. Overall, our results suggest that the contracting environment reflected in plan design moderates the effect of retiree health insurance liabilities and the funding these liabilities on municipal financing.

#### 4.5. *Collective bargaining*

The results in the previous section indicate that the effect of OPEB liabilities and subsequent funding decisions on municipal financing costs depend on features of the contracting environment. Unlike public pensions in all states, public sector employers can renegotiate or outright alter the provision and characteristics of OPEBs. However, collective bargaining agreements can influence the provision and characteristics of OPEBs. Indeed there is evidence of significant variation in OPEBs subject to collective bargaining (Shnitser, 2018). Moreover, union members may be more likely to monitor financing decisions of their employers and lobby for better funding for promised benefits.<sup>12</sup> In this section we explore how the variation in the ability to renegotiate the OPEB contract affects the relationship between liabilities and funding and yield spreads.

Union coverage provides a reasonable measure of renegotiating ability. To measure union coverage we use a state union density measure from Hirsch and Macpherson (2003). Specifically, for each state and year we gather the percentage of public sector workers who are union members and each year classify states with union coverage above our sample median as high union states and states with union coverage below our sample median as low union states. Table 4 shows the distribution of union coverage by state.

Table 10 shows regression results from splitting the sample into high union coverage states and low union coverage states. For states with union coverage above the sample median shown in column 1, the coefficient on the liability is positive and statistically significant, suggesting that in states where public employees lobby for more generous benefits that are harder to renegotiate, risk and hence yield spreads are higher. In column 2, the coefficient on the size of the liability is negative and statistically significant, suggesting that in states with less public employees to lobby renegotiation to lower benefits would be easier. For states with above-median union coverage shown in column 3, the coefficient on the funding ratio variable is negative and statistically significant. For states with below-median union coverage shown in column 4, the coefficient on the funding ratio variable is negative and not statistically significant. These results suggest in states with higher union membership, and in which they face more difficulty in renegotiating the retiree health benefits contract, a better funded plan reduces risk.

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<sup>12</sup>Gilles (2006) provides evidence on the role of information in collective bargaining.

#### 4.6. Pension underfunding

Overall our results suggest that the contracting environment presents a significant component of the risk to municipal bond investors by promising OPEBs. But the OPEB represents just a component of a labor contract that also includes a pension benefit that is much more difficult to renegotiate. The pension literature documents wide variation in the funding of these benefits. While all of our findings *control* for pension characteristics, in this section we explore how the extent of pension underfunding changes the risk of retiree health insurance.

For states with *both* above median pension underfunding (column 1) and below median pension underfunding (column 2), the coefficient on the retiree health insurance liability is positive and significant, underscoring that the risk of retiree health insurance liabilities is independent of public pension risk. The result in Column 3 suggests that having a better funding ratio for health benefits does not help states that are above median in pension under funding. When states face larger shortfalls to pension funding, the marginal effect of additional funding for health care liabilities is insignificant because pensions will drive more of the risk. When pensions are relatively well funded, however, a higher funding ratio for health benefits reduces their offering yields as indicated by the negative and statistically significant coefficient in column 4. Overall, these results suggest that for states with the largest pension shortfalls, the pension risk subsumes the benefits of funding retiree health insurance.

#### 4.7. Identification

The results suggest that large unfunded OPEB liabilities increase bond yields. Although the regressions include important control variables as well as state and year fixed effects to capture time invariant heterogeneity, identification of the estimated effect requires ruling out biases possibly attributed to omitted variables, measurement error, and simultaneity. In particular, municipal financing ability may drive decisions over providing OPEBs and the optional funding of these benefits. To mitigate endogeneity concerns, we estimate the effect of OPEBs on offering yields using instrumental variables.

We target instruments that affect the value of promised health benefits through the effect on health costs. In response to increased litigation activity, many states passed law reforming the tort environment from the 1970s into the 2000s (Deng and Zanjani, 2018). Empirical evidence suggests that tort reform lowers health costs by reducing health insurance premiums (Avraham and Schanzenbach, 2010; Avraham et al., 2012; Grace and Leverty, 2013). Using the Avraham, Database of State Tort Law Reforms (DSTLR 7th) for medical malpractice laws, we identify three sets of reforms introduced by a subset of states over our sample period. Caps on Noneconomic Damages limit the compensation awarded for pain and suffering and loss of enjoyment

and life (Avraham et al. (2012)). Two states enacted and five states struck down caps on noneconomic damages during our sample period. Caps on Punitive Damages reduce the amount that exceeds actual damages that jurists can award as additional punishment (Avraham et al., 2012). Two states enacted and two states struck down caps on punitive damages during our sample period. States reform the Joint and Several Liability statutes to limit awards in cases where more than one party is at fault (for example, the doctor and the hospital) by limiting damages in proportion to responsibility (Avraham et al., 2012). Two states enacted reforms during our sample period, one of which was an update to a previous enactment. We include indicator variables that take a value of 1 in state-years with Caps on Noneconomic Damages, Caps on Punitive Damages, and Joint and Several Liability reforms, and zero otherwise. In addition to tort reform variables that affect health costs by affecting health insurance, we include an instrumental variable that affects how people utilize health care, which affects costs. In particular, Traczynski and Udalova (2018) show that when states pass laws given greater practice and prescription authority to Nurse Practitioners – rather than limiting certain tasks exclusive to physicians – that health care utilization changes such as more regular checkups and fewer emergency room visits actually lower the indirect costs of health care. Five states introduced Nurse Practitioner independence during our sample period. Extensive lobbying efforts precede passage of these medical practice regulations (Safriet, 2002; Isaacs and Jellinek, 2013; McMichael, 2017). We include an indicator variable that takes a value of 1 for states that allow Nurse Practitioners (NPs) independent practice and prescription authority and zero otherwise. The genesis of the state laws we use to construct our instrumental variables – litigation environment for tort reform and lobbying practices for NP independence – supports our assumption that these instruments only affect yields through their affect on health costs.

Table 12 shows results from the instrumental variables regressions. Column 1 shows the first stage regression for effect of retiree health liabilities on offering yields. The coefficients on the indicator variables for Caps on Noneconomic Damages, Caps on Punitive Damages, and Nurse Practitioner authority are all negative and statistically significant, consistent with existing literature that these regulations decrease health costs and the value of promised health benefits to retirees. The coefficient on Joint and Several Liability Reform is actually positive and statistically significant, suggesting these state reforms increased health costs, but the nature of these laws is more ambiguous than statutory caps on damages. Results from the second stage regression in Column 2 show that the coefficient on retiree health insurance liability is still positive and statistically significant, consistent with our earlier OLS findings that promising public sector retiree health benefits increases municipal financing costs. Column 3 shows the first stage regression for the effect of health benefits funding ratio. The coefficients on the proposed instruments are all statistically significant but of course have the opposite sign compared to Column 1 because the denominator of the funding ratio

is the size of the health insurance liability. For example, when states allow Nurse Practitioners to have independent practice and prescription authority, the liability of promised health benefits decreases, making plans with assets better funded, and yielding a positive coefficient. Results from the second stage regression in Column 4 show that the coefficient on retiree health benefits funding ratio is still negative and statistically significant, consistent with our earlier OLS findings that better funding the promised public sector retiree health benefits mitigates risk and reduces municipal financing costs. Overall, our earlier results are robust to concerns about endogeneity that might arise due to measurement error, omitted variables, or simultaneity.

## 5. Conclusion

Public sector OPEB promises are approaching levels similar to public pension promises. Although increased disclosure about the value and funding of these promises has encouraged academics, practitioners, and policy makers to gain a better understanding of the breadth and scope of these underappreciated liabilities, no one has yet established how these obligations affect municipal financing. We fill a gap in the literature by exploring how OPEB promises affect municipal bond offering yields and what factors mitigate and exacerbate the risks to bond investors.

We show that larger OPEB liabilities increase yields for state issuers and that pre-funding these liabilities reduce yields. Unlike pension benefits which promise a specified dollar amount to retirees, OPEBs promise health care services with uncertain future costs. We find that the positive effect of liabilities on yields and the subsequent mitigation of risk with more funding only in states with higher health care costs for the population of retirees. Administrators can manage the risk of health costs and elicit different patterns of health care utilization by changing the design of the OPEB plans. Our results suggest that when the coverage is tied to the premium contribution, representing the most risk to the state, the funding ratio decreases yields and the liabilities increase yields with coverage characteristics that expose the public sector employer to more health care cost risk.

Our results have implications for academics and practitioners gauging the strength of municipal finances as well as policymakers grappling with the provision and funding of health care services for an aging population.



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Fig. 2. Funding Ratios Across the States.

This figure shows the amount assets states have to fund retiree health insurance and other nonpension benefits as a percent of the liability in 2014.

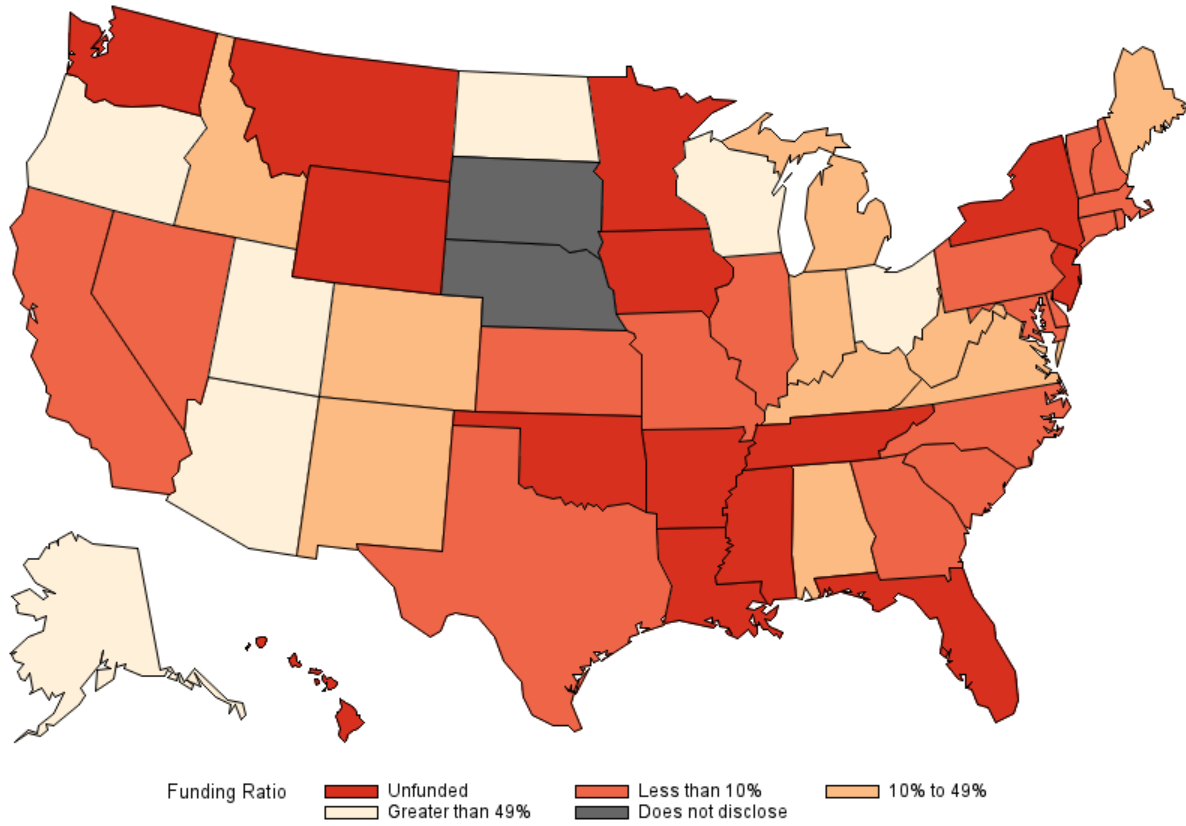


Fig. 3. Funding Ratios Across Time.

This figure shows the amount of assets states hold to fund retiree health insurance and other nonpension benefits as a percent of the liability from 2008 to 2016. For the Sample Mean, Sample Median, Nevada, and Connecticut, refer to the left axis. For Arizona and Oregon, refer to the right axis.

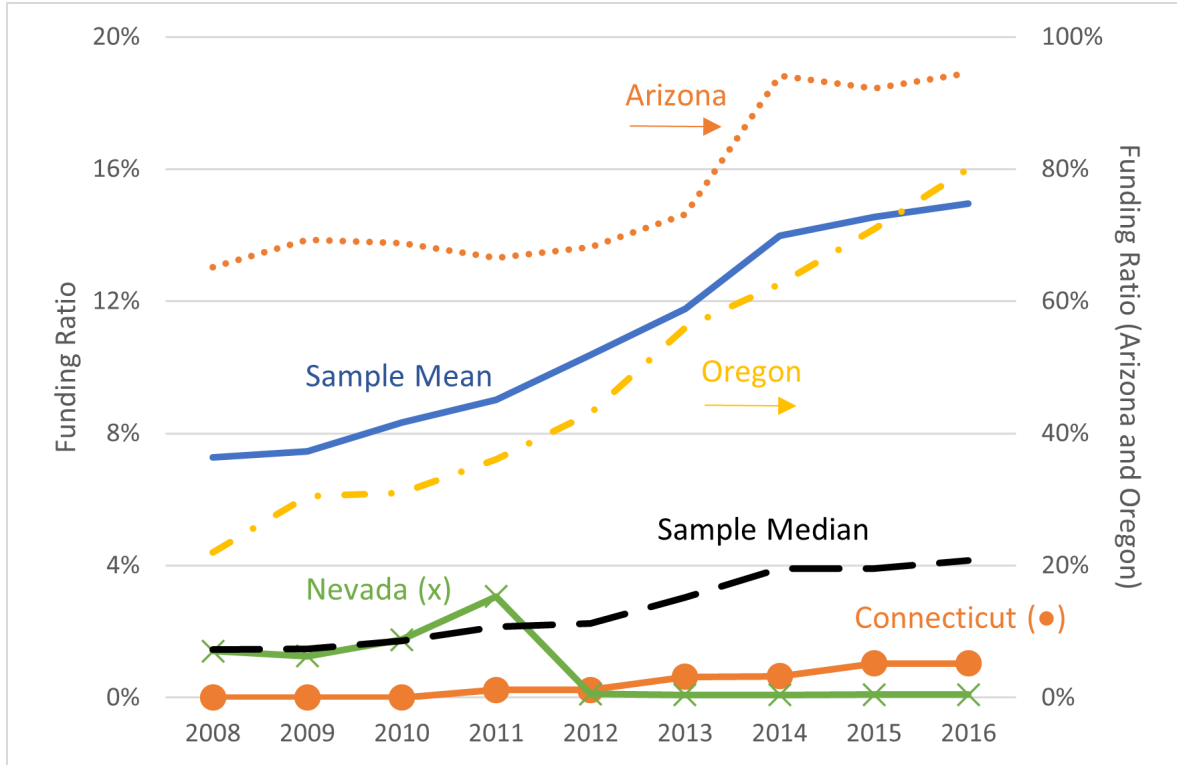


Fig. 4. **Ranking Retiree Health Insurance and Pension Funding Across the States.**

This figure shows retiree health insurance and other nonpension benefits (OPEB) funding ranked from lowest funding (1) to highest funding (50) and pension funding ranked from lowest funding (1) to highest funding (50) for 2008 to 2016. Approximately one-fourth of states do not fund retiree health insurance and other nonpension benefits at all as shown by the bottom scatter at OPEB funding rank 1. Nebraska does not disclose OPEB information, and South Dakota stopped reporting in 2014.

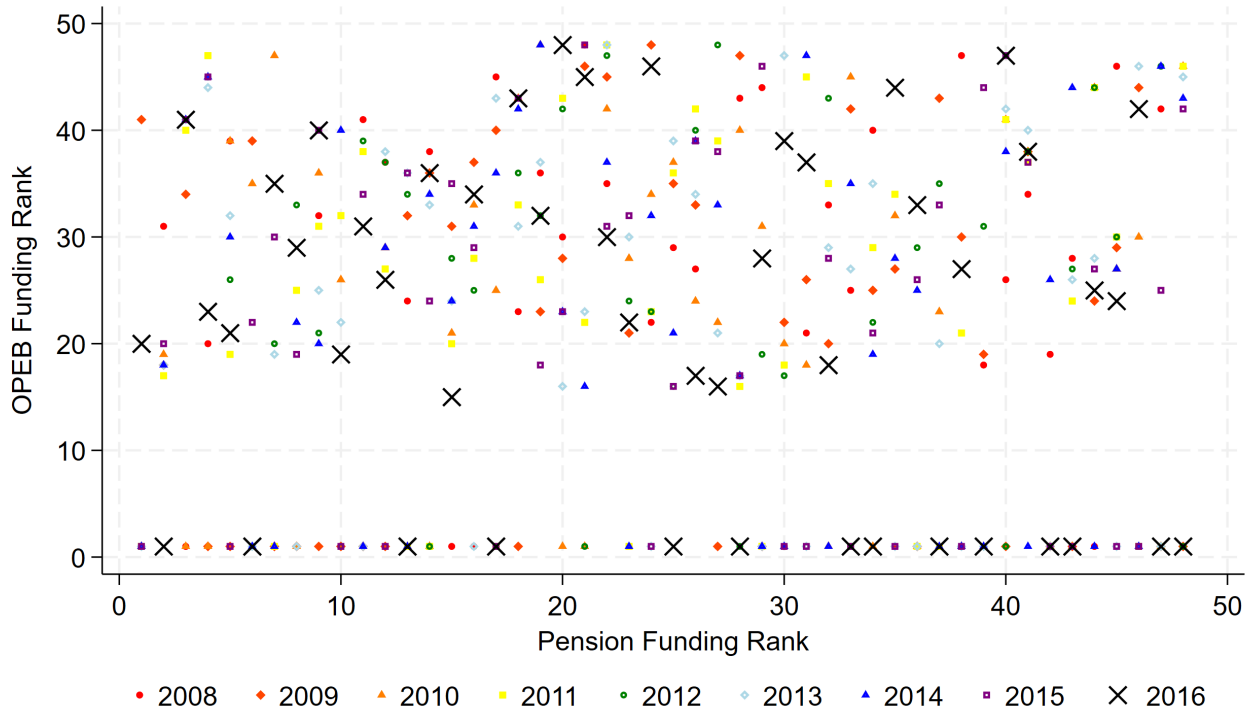


Table 1: **Full Sample Summary Statistics**

This table shows the mean, standard deviation, minimum, 25th percentile, 50th percentile, 75th percentile, and maximum for variables used in the analysis. There are 409,636 bond year observations. Panel A shows the retiree health insurance variables. Panel B shows the bond level variables, including raw offering yield, offering yield spread (the main dependent variable), and bond level controls. Panel C shows state level pension and economic controls. Variable definitions are in the Appendix. The sample period is 2008 to 2016.

	Mean	S.D.	Min	P25	P50	P75	Max
<i>Panel A: Retiree Health Insurance</i>							
Retiree Health Insurance Liability	4.888	4.103	0.002	1.622	4.642	6.431	52.705
Health Benefits Funding Ratio	0.078	0.172	-0.002	0	0.01	0.033	0.946
Health Benefits Funding Indicator	0.7	0.458	0	0	1	1	1
Number of plans	3.81	2.892	1	3	3	4	21
<i>Panel B: Bond Level</i>							
Offering yield	2.574	1.107	0.07	1.7	2.53	3.38	8.5
Offering yield spread	0.316	0.495	-3.36	-0.027	0.248	0.6	5.987
Bond size (\$ millions)	1.841	21.327	0.005	0.255	0.530	1.31	12,850
Years to maturity	10.549	5.463	1.003	6.444	9.767	14.008	40.263
Bond insurance indicator	0.222	0.416	0	0	0	0	1
Callable Indicator	0.533	0.499	0	0	1	1	1
Competitive offering indicator	0.689	0.463	0	0	1	1	1
Rating	2.893	1.404	1	2	3	4	16
<i>Panel C: State Level</i>							
Pension underfunding ratio	0.448	0.312	-0.228	0.248	0.363	0.688	1.479
Pension protection	2.675	1.327	1	2	2	4	6
State Population (millions)	13.748	10.268	0.546	5.713	9.987	20.151	39.223

Table 2: **Summary Statistics by Funding Status**

This table shows the mean, median, and standard deviation for the main regression variables for states that do not fund retiree health insurance and states that do fund retiree health insurance. The far right column shows t-statistics from a test of equal means across funding categories. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Panel A shows the retiree health insurance variables. Panel B shows the bond level variables, including raw offering yield, offering yield spread (the main dependent variable), and bond level controls. Panel C shows state level pension and economic controls. The sample period is 2008 to 2016.

	No Funding (122,848 observations)			Funding (286,788 observations)			t
	Mean	Median	S.D.	Mean	Median	S.D.	
<i>Panel A: Retiree Health Insurance</i>							
Retiree Health Insurance Liability	50.759	27.076	51.634	48.073	48.164	35.494	19.209***
Health Benefits Funding Ratio	0	0	0	0.112	0.015	0.197	
Number of plans	3.902	3	4.788	3.770	4.000	1.455	13.399***
<i>Panel B: Bond Level</i>							
Offering yield	2.506	2.480	1.070	2.603	2.550	1.121	-25.826***
Offering yield spread	0.231	0.173	0.454	0.353	0.284	0.508	-72.698***
Bond size (\$ millions)	1.487	4.517	0.460	1.993	0.565	25.315	-6.963***
Years to maturity	10.310	9.600	5.230	10.651	9.841	5.557	-18.307***
Bond insurance indicator	0.184	0	0.387	0.238	0	0.426	-38.515***
Callable Indicator	0.523	1	0.499	0.537	1	0.499	-8.626***
Competitive offering indicator	0.822	0.383	0.383	0.633	1	0.482	122.099***
Rating	3.124	3	1.329	2.794	3	1.424	69.482***
<i>Panel C: State Level</i>							
Pension underfunding ratio	0.335	0.281	0.292	0.497	0.433	0.308	-160***
Pension protection	2.956	3	1.598	2.554	2	1.171	89.607***
State Population (millions)	9.666	6.689	6.667	15.497	12.717	11.011	-170***



**Table 3: The Effect of Retiree Health Benefits on Offering Yields**

This table shows results from a regression of bond offering yield spreads on the funding level of public sector retiree benefits. In column (1) the retiree health insurance liability is the ratio of the OPEB plan liabilities to the personal income for the state. In column (2) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities. In column (3) the health benefits funding indicator variable takes a value of 1 for states that pre-fund retiree health insurance benefits and 0 otherwise. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. The sample is from 2008 to 2016. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads		
	(1)	(2)	(3)
Retiree Health Insurance Liability	0.001 <sup>*</sup> (0.001)		
Health Benefits Funding Ratio		-0.340 <sup>***</sup> (0.118)	
Health Benefits Funding Indicator			0.087 <sup>**</sup> (0.032)
Number of Plans	0.011 <sup>*</sup> (0.006)	-0.065 <sup>***</sup> (0.017)	-0.085 <sup>**</sup> (0.039)
Ln Bond Size	0.014 <sup>***</sup> (0.004)	0.014 <sup>***</sup> (0.004)	0.013 <sup>***</sup> (0.004)
Ln Years to Maturity	0.197 <sup>***</sup> (0.013)	0.197 <sup>***</sup> (0.013)	0.197 <sup>***</sup> (0.013)
Bond Insurance Indicator	0.184 <sup>***</sup> (0.023)	0.184 <sup>***</sup> (0.023)	0.185 <sup>***</sup> (0.023)
Callable Indicator	0.135 <sup>***</sup> (0.020)	0.136 <sup>***</sup> (0.020)	0.135 <sup>***</sup> (0.021)
Competitive Offering Indicator	-0.092 <sup>***</sup> (0.019)	-0.092 <sup>***</sup> (0.019)	-0.092 <sup>***</sup> (0.019)
Rating	0.096 <sup>***</sup> (0.014)	0.096 <sup>***</sup> (0.014)	0.096 <sup>***</sup> (0.014)
Pension Underfunding Ratio	0.184 <sup>***</sup> (0.068)	0.175 <sup>***</sup> (0.065)	0.204 <sup>***</sup> (0.068)
Pension Protection	0.611 <sup>***</sup> (0.227)	-0.071 <sup>***</sup> (0.016)	-0.422 <sup>**</sup> (0.177)
Ln Population	-1.131 <sup>**</sup> (0.440)	-0.990 <sup>***</sup> (0.322)	-0.712 <sup>*</sup> (0.360)
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes
Observations	409,636	409,636	409,636
R-squared	0.384	0.384	0.384

Table 4: **Distribution of Contracting Environment Characteristics**

This table shows the distribution of contracting environment characteristics across states. The Number of Plans shows the number of state retiree health plans that serve as a source for PEW data we use for the liability and funding variables. The Health Costs column shows for what fraction of the sample a state has Medicare enrollee costs above the median of all states in a given year. A value of 1 indicates that state has Medicare costs above the median for all sample years. A value of 0 indicates that state has Medicare costs below the median for all sample years. A value between 0 and 1 indicates the proportion of sample years a state had above median Medicare costs. The Contribution Method column shows a value of 1 for states that contribute a set proportion of the retiree health insurance premium; a value of 2 for states that contribute a fixed dollar amount to the retiree health insurance premium; and a value of 3 for states that do not contribute to the retiree health insurance premium as of 2015. The contribution Percent column shows a value of 1 for states that contributed more than 50% of insurance premiums and a 0 for states that contributed less than 50% as of 2007. The Health Coverage Type column shows a value of 1 for states that use a Medicare wraparound coverage policy; a value of 2 for states have a Medicare Advantage health plan; a value of 3 for states with both wraparound coverage and Medicare Advantage plans; and a value of 4 for states with no additional coverage as of 2015. The Collective Bargaining column shows for what fraction of the sample a state has above median union coverage of public sector workers. A value of 1 indicates a state with above median unionization for all sample years. A value of 0 indicates a state with below median unionization for all sample years. A value between 0 and 1 indicates the proportion of sample years a state had above median union coverage.

	Number of Plans	Health Costs	Contribution Method	Contribution Percent	Health Coverage Type	Collective Bargaining
Alabama	2	1.00	1	1	1	0.31
Alaska	4	0.00	1	1	1	1.00
Arizona	5	0.00	2	0	3	0.00
Arkansas	21	1.00	2	1	1	0.00
California	3	0.38	1	1	3	1.00
Colorado	5	0.00	2	1	3	0.00
Connecticut	2	0.53	1	1	1	1.00
Delaware	1	1.00	1	1	1	1.00
Florida	1	1.00	3	0	3	0.12
Georgia	3	1.00	1	1	2	0.00
Hawaii	2	0.00	1	1	3	1.00
Idaho	4	0.00	2	0	4	0.00
Illinois	6	1.00	1	1	2	1.00
Indiana	4	1.00	4	0	4	0.10
Iowa	1	0.00	3	0	1	1.00
Kansas	1	0.93	3	0	3	0.00
Kentucky	6	1.00	1	1	.	0.00
Louisiana	2	1.00	1	1	3	0.00
Maine	4	0.00	1	1	2	1.00
Maryland	1	0.22	1	1	1	0.77
Massachusetts	1	1.00	1	1	3	1.00
Michigan	6	1.00	1	1	1	1.00
Minnesota	3	0.00	3	0	2	1.00
Mississippi	1	1.00	3	0	1	0.00
Missouri	4	1.00	1	1	1	0.00
Montana	2	0.00	3	0	1	1.00
Nevada	1	1.00	2	1	3	1.00
New Hampshire	5	0.00	1	1	1	1.00
New Jersey	2	1.00	1	1	3	1.00
New Mexico	1	0.00	1	1	3	0.00
New York	3	1.00	1	1	1	1.00
North Carolina	2	0.00	1	1	3	0.00
North Dakota	3	0.00	2	0	1	0.00
Ohio	3	1.00	1	1	2	1.00
Oklahoma	1	1.00	2	0	1	0.00
Oregon	5	0.00	2	0	3	1.00
Pennsylvania	5	1.00	1	1	2	1.00
Rhode Island	5	0.17	1	1	1	1.00
South Carolina	4	0.65	1	1	1	0.00
Tennessee	4	1.00	2	1	1	0.00
Texas	4	1.00	1	1	2	0.00
Utah	2	0.00	3	1	1	0.00
Vermont	2	0.00	1	1	1	1.00
Virginia	5	0.00	2	0	1	0.00
Washington	3	0.00	2	1	1	1.00
West Virginia	1	1.00	1	1	2	0.00
Wisconsin	3	0.00	3	0	1	0.54
Wyoming	1	0.00	2	0	1	0.00

Table 5: **Health Care Costs and the Effect of Retiree Health Benefits on Offering Yields**

This tables shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1) and (2) the retiree health insurance liability is the ratio of the OPEB plan liabilities to the personal income for the state. Column (1) shows the sub-sample with above median health care costs. Column (2) shows the sub-sample with below median health care costs. In columns (3) and (4) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (3) shows the sub-sample with above median health care costs. Column (4) shows the sub-sample with below median health care costs. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads			
	(1) Above Median Health Costs	(2) Below Median Health Costs	(3) Above Median Health Costs	(4) Below Median Health Costs
Retiree Health Insurance Liability	0.001 <sup>***</sup> (0.001)	-0.000 (0.002)		
Health Benefits Funding Ratio			-0.349 <sup>**</sup> (0.163)	-0.330 <sup>*</sup> (0.161)
Number of Plans	-0.006 <sup>**</sup> (0.003)	-0.036 (0.066)	-0.008 <sup>*</sup> (0.004)	0.156 (0.164)
Ln Bond Size	0.013 <sup>**</sup> (0.005)	0.013 <sup>**</sup> (0.005)	0.013 <sup>**</sup> (0.005)	0.013 <sup>**</sup> (0.005)
Ln Years to Maturity	0.202 <sup>***</sup> (0.015)	0.189 <sup>***</sup> (0.020)	0.202 <sup>***</sup> (0.015)	0.189 <sup>***</sup> (0.020)
Bond Insurance Indicator	0.186 <sup>***</sup> (0.022)	0.147 <sup>***</sup> (0.040)	0.186 <sup>***</sup> (0.022)	0.146 <sup>***</sup> (0.040)
Callable Indicator	0.125 <sup>***</sup> (0.025)	0.156 <sup>***</sup> (0.030)	0.126 <sup>***</sup> (0.025)	0.157 <sup>***</sup> (0.030)
Competitive Offering Indicator	-0.099 <sup>***</sup> (0.024)	-0.090 <sup>***</sup> (0.012)	-0.099 <sup>***</sup> (0.024)	-0.090 <sup>***</sup> (0.011)
Rating	0.105 <sup>***</sup> (0.015)	0.068 <sup>***</sup> (0.011)	0.105 <sup>***</sup> (0.015)	0.069 <sup>***</sup> (0.011)
Pension Underfunding Ratio	0.198 <sup>**</sup> (0.076)	-0.070 (0.134)	0.211 <sup>**</sup> (0.083)	-0.114 (0.120)
Pension Protection	0.446 <sup>***</sup> (0.105)	0.383 (0.367)	0.362 <sup>***</sup> (0.098)	0.055 (0.296)
Ln Population	-1.094 <sup>***</sup> (0.309)	-0.794 (0.740)	-0.889 <sup>***</sup> (0.292)	-0.345 (0.824)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Observations	291,063	118,573	291,063	118,573
Adjusted R <sup>2</sup>	0.395	0.338	0.395	0.339

Table 6: **Years to Maturity and the Effect of Retiree Health Benefits on Offering Yields**

This table shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1) and (2) the retiree health insurance liability is the ratio of the OPEB plan liabilities to the personal income for the state. Column (1) shows the sub-sample of bonds with fewer than 10 years to maturity. Column (2) shows the sub-sample of bonds with greater than 10 years to maturity. In columns (3) and (4) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (3) shows the sub-sample of bonds with fewer than 10 years to maturity. Column (4) shows the sub-sample of bonds with greater than 10 years to maturity. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads			
	(1) Fewer Than 10 Years to Maturity	(2) Greater Than 10 Years to Maturity	(3) Fewer Than 10 Years to Maturity	(4) Greater Than 10 Years to Maturity
Retiree Health Insurance Liability	0.001 (0.001)	0.002** (0.001)		
Health Benefits Funding Ratio			-0.137 (0.128)	-0.453*** (0.129)
Number of Plans	0.013* (0.007)	0.097*** (0.034)	-0.054*** (0.013)	-0.089*** (0.020)
Ln Bond Size	-0.006 (0.005)	0.022*** (0.005)	-0.006 (0.005)	0.022*** (0.005)
Ln Years to Maturity	0.007 (0.014)	0.482*** (0.021)	0.007 (0.014)	0.482*** (0.021)
Bond Insurance Indicator	0.196*** (0.019)	0.168*** (0.024)	0.196*** (0.019)	0.168*** (0.024)
Callable Indicator	0.014 (0.017)	0.069*** (0.021)	0.014 (0.017)	0.069*** (0.021)
Competitive Offering Indicator	-0.093*** (0.013)	-0.098*** (0.023)	-0.093*** (0.013)	-0.098*** (0.023)
Rating	0.090*** (0.011)	0.099*** (0.017)	0.090*** (0.011)	0.100*** (0.017)
Pension Underfunding Ratio	0.188*** (0.061)	0.185*** (0.084)	0.191*** (0.061)	0.172** (0.078)
Pension Protection	0.605*** (0.171)	0.345*** (0.118)	-0.036** (0.017)	-0.106*** (0.018)
Ln Population	-1.163*** (0.305)	-1.555*** (0.513)	-0.991*** (0.256)	-1.417*** (0.376)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Observations	209,972	199,664	209,972	199,664
Adjusted R <sup>2</sup>	0.411	0.352	0.411	0.352

Table 7: **State Premium Contribution (2015) and the Effect of Retiree Health Benefits on Offering Yields**

This table shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1), (2), and (3) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (1) shows the sub-sample of states that contribute a set proportion to retiree health insurance premiums. Column (2) shows the sub-sample of states that contribute a fixed amount to retiree health premiums. Column (3) shows the sub-sample of states that do not contribute to retiree health insurance premiums. In columns (4), (5), and (6) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Sub-samples in columns (4), (5), and (6) are the same as columns (1), (2), and (3), respectively. Contractual coverage details are from 2015 plan data from PEW. We exclude Nebraska and Indiana, which do not provide coverage. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads					
	(1) Contribute Portion	(2) Contribute Fixed	(3) Do Not Contribute	(4) Contribute Portion	(5) Contribute Fixed	(6) Do Not Contribute
Retiree Health Insurance Liability	0.001** (0.001)	0.003 (0.004)	0.010 (0.009)			
Health Benefits Funding Ratio				-0.493** (0.183)	-0.146 (0.187)	-0.099 (0.153)
Number of Plans	-0.211** (0.087)	-0.130 (0.075)	-0.146 (0.652)	0.500*** (0.148)	-0.125 (0.070)	-0.047 (0.631)
Ln Bond Size	0.010** (0.004)	0.021* (0.011)	0.022*** (0.006)	0.010** (0.004)	0.021* (0.011)	0.022*** (0.006)
Ln Years to Maturity	0.205*** (0.016)	0.208*** (0.025)	0.157*** (0.012)	0.204*** (0.016)	0.208*** (0.025)	0.157*** (0.012)
Bond Insurance Indicator	0.190*** (0.022)	0.075 (0.057)	0.061*** (0.015)	0.190*** (0.022)	0.075 (0.057)	0.062*** (0.014)
Callable Indicator	0.146*** (0.027)	0.133** (0.044)	0.099*** (0.022)	0.146*** (0.027)	0.133** (0.043)	0.099*** (0.021)
Competitive Offering Indicator	-0.096*** (0.023)	-0.117*** (0.020)	-0.100*** (0.019)	-0.095*** (0.022)	-0.118*** (0.020)	-0.099*** (0.020)
Rating	0.110*** (0.013)	0.086*** (0.015)	0.040*** (0.007)	0.110*** (0.013)	0.087*** (0.015)	0.040*** (0.007)
Pension Underfunding Ratio	0.149* (0.081)	-0.087 (0.145)	-0.058 (0.112)	0.150 (0.091)	-0.066 (0.167)	-0.044 (0.093)
Pension Protection	0.254*** (0.083)	-0.181* (0.084)	0.125 (0.986)	0.059** (0.025)	-0.194* (0.090)	0.041 (0.950)
Ln Population	-1.207*** (0.368)	-2.935 (1.808)	-0.054 (1.059)	-1.131*** (0.363)	-2.775 (1.713)	0.053 (1.012)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	296,751	46,682	64,722	296,751	46,682	64,722
Adjusted R <sup>2</sup>	0.413	0.337	0.247	0.413	0.337	0.247

Table 8: **State Premium Contribution (2007) and the Effect of Retiree Health Benefits on Offering Yields**

This table shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1) and (2) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (1) shows the sub-sample of states that contribute more than 50% to retiree health insurance premiums. Column (2) shows the sub-sample of states that contribute less than 50% to retiree health premiums. In columns (3) and (4) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Sub-samples in columns (3) and (4) are the same as columns (1) and (2), respectively. Contractual coverage details are from 2007 plan data from Clark and Morrill. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads			
	(1) More Than 50% Contribution	(2) Less Than 50% Contribution	(3) More Than 50% Contribution	(4) Less Than 50% Contribution
Retiree Health Insurance Liability	0.002*** (0.001)	0.013 (0.008)		
Health Benefits Funding Ratio			-0.417** (0.157)	-0.318* (0.167)
Number of Plans	0.055*** (0.014)	0.178 (0.511)	-0.052** (0.019)	-0.491 (0.526)
Ln Bond Size	0.012*** (0.004)	0.017** (0.006)	0.011** (0.004)	0.017** (0.006)
Ln Years to Maturity	0.207*** (0.015)	0.161*** (0.012)	0.206*** (0.015)	0.161*** (0.012)
Bond Insurance Indicator	0.187*** (0.022)	0.073*** (0.021)	0.187*** (0.022)	0.074*** (0.021)
Callable Indicator	0.140*** (0.025)	0.119*** (0.021)	0.141*** (0.025)	0.120*** (0.021)
Competitive Offering Indicator	-0.097*** (0.021)	-0.093*** (0.016)	-0.096*** (0.021)	-0.093*** (0.016)
Rating	0.107*** (0.013)	0.048*** (0.008)	0.107*** (0.013)	0.048*** (0.008)
Pension Underfunding Ratio	0.125* (0.073)	-0.032 (0.083)	0.133 (0.079)	-0.015 (0.078)
Pension Protection	0.557*** (0.171)	-0.044 (0.264)	-0.420*** (0.127)	-0.158 (0.118)
Ln Population	-1.477*** (0.458)	0.340 (0.936)	-1.274*** (0.429)	0.938 (0.839)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Observations	328,776	80,860	328,776	80,860
Adjusted R <sup>2</sup>	0.402	0.281	0.402	0.283

Table 9: **Plan Coverage Type and the Effect of Health Benefit Funding on Offering Yields**

This table shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1), (2), and (3) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (1) shows the sub-sample of states that provide wraparound coverage. Column (2) shows the sub-sample of states that provide Medicare Advantage. Column (3) shows the sub-sample of states that provide wraparound coverage *and* Medicare Advantage. In columns (4), (5), and (6) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Sub-samples in columns (4), (5), and (6) are the same as columns (1), (2), and (3), respectively. Contractual coverage details are from 2015 plan data from PEW. We exclude states with no medical coverage. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads					
	(1) Wraparound Coverage	(2) Medicare Advantage	(3) Both	(4) Wraparound Coverage	(5) Medicare Advantage	(6) Both
Retiree Health Insurance Liability	0.002*** (0.001)	0.001 (0.001)	-0.003*** (0.001)			
Health Benefits Funding Ratio				-0.737** (0.325)	-0.029 (0.051)	0.062 (0.235)
Number of Plans	-0.095 (0.060)	0.239 (0.171)	0.837** (0.286)	-0.049 (0.057)	0.183 (0.153)	-1.233** (0.440)
Ln Bond Size	0.022*** (0.006)	0.009 (0.006)	0.012** (0.005)	0.022*** (0.006)	0.009 (0.006)	0.012** (0.005)
Ln Years to Maturity	0.196*** (0.015)	0.214*** (0.027)	0.185*** (0.024)	0.196*** (0.015)	0.214*** (0.027)	0.186*** (0.023)
Bond Insurance Indicator	0.097*** (0.019)	0.209*** (0.011)	0.206*** (0.045)	0.098*** (0.018)	0.209*** (0.010)	0.204*** (0.046)
Callable Indicator	0.119*** (0.023)	0.096* (0.043)	0.220*** (0.026)	0.119*** (0.023)	0.096* (0.043)	0.219*** (0.027)
Competitive Offering Indicator	-0.134*** (0.013)	-0.068* (0.032)	-0.093*** (0.009)	-0.132*** (0.014)	-0.068* (0.032)	-0.091*** (0.009)
Rating	0.067*** (0.012)	0.115*** (0.017)	0.089*** (0.011)	0.067*** (0.012)	0.115*** (0.017)	0.089*** (0.011)
Pension Underfunding Ratio	0.196 (0.123)	0.299*** (0.054)	0.303 (0.236)	0.071 (0.121)	0.322*** (0.057)	0.225 (0.231)
Pension Protection	-0.870* (0.454)	0.073 (0.048)	-0.244*** (0.066)	-0.411 (0.410)	0.053 (0.037)	-0.215*** (0.058)
Ln Population	-2.297* (1.296)	-0.459 (0.420)	-4.239** (1.418)	-1.099 (1.187)	-0.329 (0.381)	-3.827** (1.391)
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	143,847	168,024	93,056	143,847	168,024	93,056
Adjusted R <sup>2</sup>	0.336	0.401	0.422	0.335	0.401	0.420

Table 10: **Collective Bargaining and the Effect of Health Benefit Funding on Offering Yields**

This table shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1) and (2) the retiree health insurance liability is the ratio of the OPEB plan liabilities to the personal income for the state. Column (1) shows the sub-sample with above median union coverage of public sector employees. Column (2) shows the sub-sample with below median union coverage of public sector employees. The difference between the two columns is that column (1) examines the impact on states with above median unionization of public employees. Column (2) is limited to states with median or below median unionization of public employees. In columns (3) and (4) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (3) shows the sub-sample with above median union coverage of public sector employees. Column (4) shows the sub-sample with below median union coverage of public sector employees. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads			
	(1) Above Median Union Coverage	(2) Below Median Union Coverage	(3) Above Median Union Coverage	(4) Below Median Union Coverage
Retiree Health Insurance Liability	0.002** (0.001)	-0.003 (0.002)		
Health Benefits Funding Ratio			-0.434** (0.185)	-0.313 (0.202)
Number of Plans	0.989** (0.474)	-0.005 (0.015)	0.962** (0.435)	0.007 (0.012)
Ln Bond Size	0.018*** (0.003)	0.010* (0.006)	0.018*** (0.003)	0.010* (0.006)
Ln Years to Maturity	0.214*** (0.015)	0.171*** (0.013)	0.214*** (0.015)	0.171*** (0.013)
Bond Insurance Indicator	0.168*** (0.029)	0.190*** (0.013)	0.168*** (0.029)	0.191*** (0.013)
Callable Indicator	0.124*** (0.030)	0.153*** (0.018)	0.124*** (0.030)	0.153*** (0.018)
Competitive Offering Indicator	-0.117*** (0.013)	-0.051** (0.022)	-0.116*** (0.013)	-0.053** (0.023)
Rating	0.080*** (0.008)	0.115*** (0.017)	0.080*** (0.008)	0.115*** (0.017)
Pension Underfunding Ratio	0.226** (0.097)	-0.061 (0.101)	0.216** (0.090)	-0.065 (0.104)
Pension Protection	1.340** (0.604)	0.009 (0.402)	1.094** (0.515)	0.408 (0.301)
Ln Population	-2.681** (1.301)	0.063 (0.683)	-2.444** (1.171)	-0.579 (0.511)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Observations	253,692	155,944	253,692	155,944
Adjusted R <sup>2</sup>	0.388	0.395	0.388	0.395



Table 11: **Pension Underfunding and the Effect of Retiree Health Benefits on Offering Yields**

This table shows results from a regression of bond offering yield spreads on public sector retiree health benefit variables. In columns (1) and (2) the retiree health insurance liability is the ratio of the OPEB plan liabilities to the personal income for the state. Column (1) shows the sub-sample with above median pension underfunding. Column (2) shows the sub-sample with below median pension underfunding. In columns (3) and (4) the funding ratio variable is the ratio of OPEB plan assets to OPEB plan liabilities for states. Column (3) shows the sub-sample with above median pension underfunding. Column (4) shows the sub-sample with below median pension underfunding. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Standard errors clustered at the state level are in parentheses.

	Bond Offering Yield Spreads			
	(1) Above Median Pension Underfunding	(2) Below Median Pension Underfunding	(3) Above Median Pension Underfunding	(4) Below Median Pension Underfunding
Retiree Health Insurance Liability	0.002* (0.001)	0.003* (0.002)		
Health Benefits Funding Ratio			-0.444 (0.300)	-0.336** (0.131)
Number of Plans	-0.125 (0.300)	-0.113** (0.046)	-0.034 (0.320)	-0.033 (0.020)
Ln Bond Size	0.018*** (0.005)	0.011** (0.004)	0.018*** (0.005)	0.012** (0.004)
Ln Years to Maturity	0.194*** (0.021)	0.199*** (0.014)	0.192*** (0.021)	0.199*** (0.014)
Bond Insurance Indicator	0.182*** (0.019)	0.181*** (0.030)	0.183*** (0.018)	0.180*** (0.030)
Callable Indicator	0.134*** (0.034)	0.135*** (0.022)	0.135*** (0.034)	0.135*** (0.021)
Competitive Offering Indicator	-0.100*** (0.014)	-0.089*** (0.028)	-0.100*** (0.015)	-0.090*** (0.028)
Rating	0.087*** (0.009)	0.100*** (0.019)	0.087*** (0.009)	0.100*** (0.019)
Pension Underfunding Ratio	0.114 (0.120)	0.118 (0.104)	0.121 (0.138)	0.132 (0.091)
Pension Protection	-0.324 (0.752)	0.171 (0.119)	-0.113 (0.799)	-0.017 (0.045)
Ln Population	-0.766 (1.385)	-1.058** (0.484)	-0.300 (1.477)	-0.642 (0.402)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Observations	147,486	262,150	147,486	262,150
Adjusted R <sup>2</sup>	0.426	0.368	0.425	0.367

Table 12: **Instrumental Variables and the Effect of Retiree Health Benefits on Offering Yields**

This table shows results from a two stage least squares regression of bond offering yield spreads on public sector retiree health benefit variables. Columns (1) and (3) show results from a first stage regression. In column (1) the dependent variable, retiree health insurance liability, is the ratio of the OPEB plan liabilities to the personal income for the state, and in columns (3) the dependent variable, funding ratio, is the ratio of OPEB plan assets to plan liabilities. Columns (2) and (4) show results for the second stage regression of bond offer yields on the instrumented retiree health benefit variables. The sample is from 2008 to 2016. \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% level, respectively. Robust standard errors are in parentheses.

	(1) Retiree Health Insurance	(2) Offering Yield Spread	(3) Health Benefits Funding Ratio	(4) Offering Yield Spread
Caps Noneconomic Damages	-9.277*** (0.104)		0.003*** (0.000)	
Caps Punitive Damages	-1.746*** (0.090)		0.013*** (0.000)	
Joint and Several Liability Reform	11.963*** (0.154)		-0.015*** (0.000)	
NP Practice and Rx authority	-14.594*** (0.573)		-0.000 (0.001)	
Retiree Health Insurance Liability		0.004*** (0.000)		
Health Benefits Funding Ratio				-3.349*** (0.322)
Number of Plans	19.740*** (0.100)	2.096*** (0.168)	-0.054*** (0.000)	3.605*** (0.265)
Ln Bond Size	-0.058*** (0.012)	0.013*** (0.001)	0.000*** (0.000)	0.014*** (0.001)
Ln Years to Maturity	-0.100*** (0.037)	0.196*** (0.002)	-0.001*** (0.000)	0.193*** (0.002)
Bond Insurance Indicator	0.395*** (0.041)	0.181*** (0.002)	-0.001*** (0.000)	0.177*** (0.002)
Callable Indicator	-0.091** (0.047)	0.137*** (0.002)	0.002*** (0.000)	0.142*** (0.002)
Competitive Offering Indicator	-0.101** (0.044)	-0.093*** (0.002)	-0.000 (0.000)	-0.094*** (0.002)
Rating	-0.010 (0.011)	0.095*** (0.001)	0.001*** (0.000)	0.097*** (0.001)
Pension Underfunding Ratio	8.009*** (0.359)	0.129*** (0.013)	-0.080*** (0.001)	-0.104*** (0.030)
Pension Protection	32.100*** (0.242)	-0.191*** (0.011)	-0.085*** (0.001)	0.443*** (0.055)
Ln Population	316.117*** (1.541)	-1.658*** (0.137)	-0.695*** (0.007)	-2.873*** (0.215)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Month Fixed Effects	Yes	Yes	Yes	Yes
Observations	400,018	400,018	400,018	400,018
Adjusted R <sup>2</sup>	0.947	0.380	0.953	0.328
F-statistics	2973.51		828.83	

## Appendix: Variable Definitions

Variable	Definition
<i>Panel A: Retiree Health Insurance</i>	
Retiree Health Insurance Liability	The amount of the state worker retirement health benefits liability divided by the state personal income. Retiree health and other nonpension benefits, also called Other Post Employment Benefits (OPEB), are from Pew Charitable Trusts project on Public Sector Retirement Systems. Personal income is from the Bureau of Economic Analysis.
Health Benefits Funding Ratio	The amount of assets states have to fund retiree health insurance and other nonpension benefits as a percent of the liability.
Health Benefits Funding Indicator	Indicator variable takes a value one if the state funding ratio is positive and zero otherwise.
Number of Plans	The number of state retirement plans used a source for the Pew Center data as reported in Pew Center on the States, 2010, <i>The Trillion Dollar Gap</i> .
<i>Panel B: Bond Level</i>	
Offering Yield	Yield at offering date.
Offering Yield Spread	The difference between the offering yield of a municipal bond and its corresponding maturity matched Treasury bond yield. Treasury yields are linearly extrapolated when necessary to match a municipal bond yield.
Bond Size	Amount of bond issued in millions of dollars.
Years to Maturity	Time in years from offering to maturity.
Bond Insurance Indicator	Indicator variable that takes a value of one for insured bonds.
Callable Indicator	Indicator variable that takes a value of one for bonds with a call option.
Competitive offering indicator	Indicator variable takes a value of one for bonds offered through a competitive sale and zero for issues offered as a negotiated sale.
Rating	S&P bond rating when available; otherwise Moody's bond rating; 1 for AAA/Aaa, 2 for AA+/Aa1, etc.
<i>Panel C: State Level</i>	
Pension underfunding ratio	Calculated as the state's pension liability minus the state's assets under management in the pension plan at the beginning of the year all divided by the state's assets under management in the pension plan at the beginning of the year.
Pension protection	Integer values of 1 (most protected) to 6 (least protected) assigned based on information about legal basis and protected accruals from the Center for Retirement Research at Boston College and the Pew Charitable Trusts following ?.
State Population	Population of the state from the Bureau of Economic Analysis.