



ISSUE BRIEF

How Have Municipal Bond Markets Reacted to Pension Reform?

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Foreword

Two key responsibilities of state and local governments are to adequately maintain and update the public infrastructure that underpins a high quality of life and to ensure that there continues to be an effective workforce necessary to provide essential services and programs to residents. A large majority of state and local infrastructure is financed via municipal bonds, and governments have historically used pension benefits as a core component of their compensation packages to compete for talent with other sectors.

But how are the costs of one, bond borrowing costs, impacted by the other, unfunded pension liabilities? When this question was explored in 2011, using pre-2010 figures, a statistically significant relationship was not found. But today, as the 2007-2009 recession had receded into the past, public revenues continue to experience an uneven, muted recovery and overall public benefit costs continue to increase. When 2009-2014 data sets are analyzed, it appears that things have changed.

This brief developed by Jean-Pierre Aubry, Caroline V. Crawford, and Alicia H. Munnell finds that for both state and local governments, higher unfunded pension liabilities as a percentage of government plan sponsor revenues, has a statistically valid relationship to increased municipal bond borrowing rates, relative to Treasuries. This analysis also finds that previous pre-recession findings remain the same. This work, in addition to other recent workforce research from SLGE and its partners, highlights the need for state and local officials and other stakeholders to continue to analyze both short and long-term costs, holistically, as the decisions and financial management in one priority area can clearly impact the costs in another.

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How Have Municipal Bond Markets Reacted to Pension Reform?

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Introduction

While most municipal analysts view pensions as a minor risk to the municipal debt markets, many state and local government officials express concern that poor pension finances greatly threaten their government's ability to borrow at affordable rates. Prior analysis by the Center supports the municipal analysts' view, finding that pension finances had only a slight impact on state borrowing costs over the 2005 to 2009 period.¹ Since the financial crisis, however, rating agencies have begun to explicitly account for pensions in their methodologies; New Jersey, Illinois, and the City of Dallas were downgraded, in part, due to their pension challenges.² On the flip side, just last month, Fitch Ratings revised their outlook for the City of Dallas from "negative" to "stable" based on the City's recently adopted benefit reforms.³

Given these recent developments, this *brief* revisits the earlier analysis to see if state and local borrowing costs have become more sensitive to pensions since the financial crisis. The *brief* also expands the scope of the analysis in two important ways. First, it includes local governments, whose borrowing costs may be more sensitive due to their smaller and less flexible tax bases. Second, it investigates whether the flurry of reforms made in the wake of the financial crisis have had any impact on borrowing costs.

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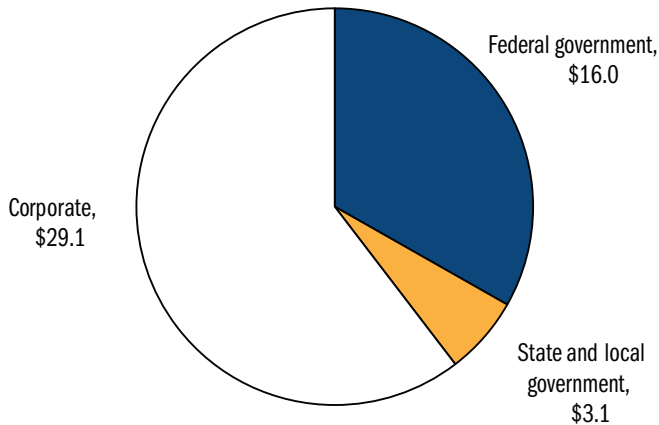
The discussion proceeds as follows. The first section describes the municipal bond market generally and examines how it has evolved from the turn of the century to today. The second section discusses the current public pension challenge in relation to government finances and the municipal bond markets. The third section presents the data and methodology for an empirical analysis relating the borrowing costs of states and localities to their pension finances and recent pension reforms. The fourth section presents the results. The final section concludes that, since the financial crisis, the funding of pensions appears to be related to borrowing costs, even when controlling for other economic and financial factors.

The Municipal Bond Market

In 2016, state and local debt amounted to \$3.1 trillion or about 6.4 percent of total non-household U.S. debt outstanding, so it excludes household debt such as mortgages and credit cards (see Figure 1). Since 2001, this share has fluctuated between 4 percent and 7 percent.

Locally-issued debt makes up the majority of state and local debt outstanding. This pattern is not surprising given that local governments (including school districts) account for the majority of state and local expenditures. Interestingly, even relative to revenue, local governments hold more debt. In 2014, state debt represented about 50 percent of state revenue, while local debt equaled just over 100 percent of local revenue.

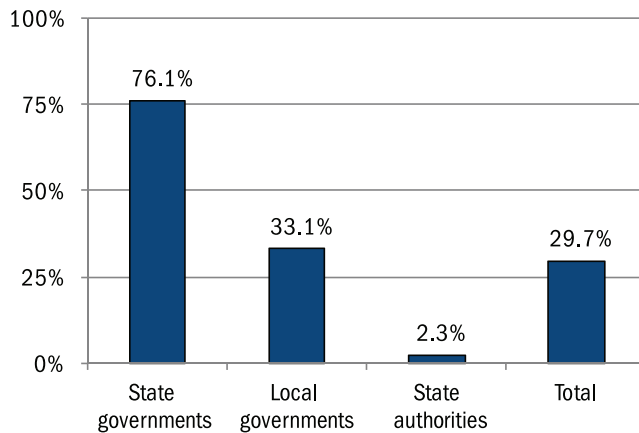
Figure 1. 2016 Distribution of Outstanding Non-Household Debt, in Trillions



Source: U.S. Board of Governors of the Federal Reserve System (2016).

In addition to having more outstanding debt than state governments, local governments also issue different types of debt. Generally, municipal debt can be grouped into two types: general obligation bonds and revenue bonds. General obligation bonds are secured by the full faith, credit, and taxing power of

Figure 2. General Obligation Bonds as a Percentage of Total Dollars of Municipal Bonds Issued by Entity, 2005-2014



Note: State authorities account for about 70 percent of the total dollar amount of bonds issued by states.

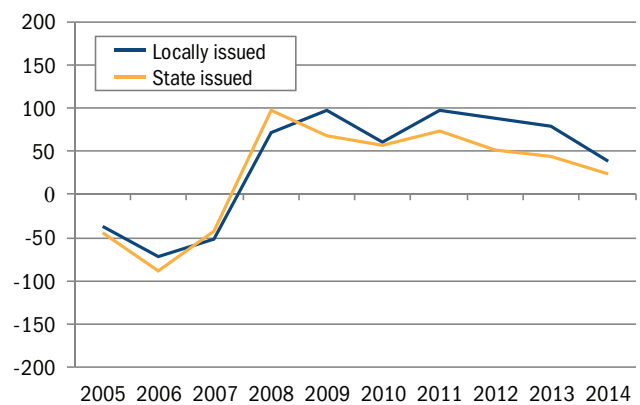
Source: Thomson Reuters SDC Municipal Bond Dataset (SDC) (2005-2014).

the issuing entity. Revenue bonds are payable from identified sources of revenue, such as tolls for roads or bridges. Between 2005 and 2014, general obligation bonds made up about three-quarters of state debt, but only about one-third of local debt (see Figure 2).

One way to assess the borrowing costs of state and local governments is relative to the rate on a Treasury bond of similar duration. Because interest on municipal debt is generally exempt from federal income tax, one would expect municipal bonds – if they were viewed as no more risky than Treasuries – to have rates below those of Treasuries. Figure 3 shows that, indeed, prior to the financial crisis, yields on municipal bonds were about 50 basis points below Treasury yields.

Since the end of the financial crisis in 2009, though, municipal rates have exceeded Treasury rates. Two main factors have contributed to the reversal. First, Treasury yields dropped precipitously during the crisis when investors rushed to safety, and have remained low, in part due to the Fed’s low interest-rate policy.⁴ Second, the required rates on municipal bonds rose slightly as the percentage of new issues with insurance

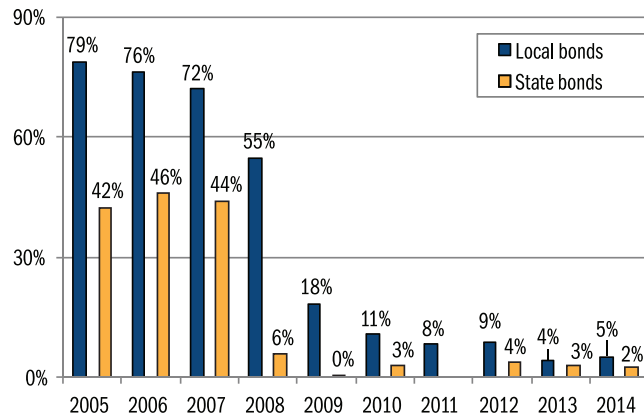
Figure 3. Spread between Yields on State and Local Government Bonds and Treasuries in Basis Points, 2005-2014



Note: See endnote 5.

Sources: SDC (2005-2014); and Federal Reserve Bank of St. Louis (2005-2014).

Figure 4. Insured Bonds as a Percentage of Total Dollars of Bonds Issued, 2005-2014



Note: State sample excludes bonds issued by state authorities. Source: SDC (2005-2014).

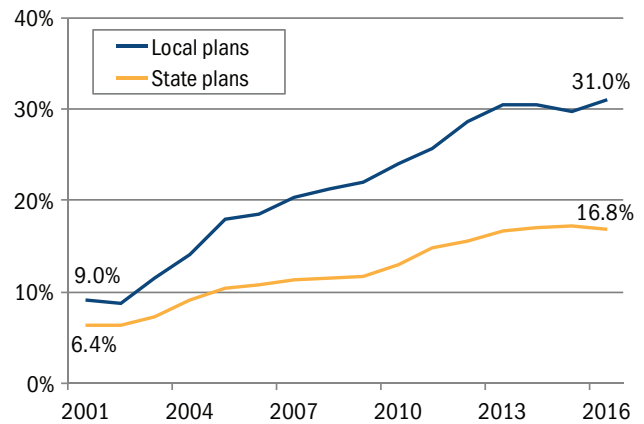
dropped sharply (see Figure 4).⁶ Finally, it is also possible that investors (both institutional and retail) who lend to state and local governments may have started to view municipal lending as relatively more risky.

Public Pensions and the Municipal Bond Market

The burden of public pensions on state and local budgets has been growing steadily (see Figure 5). Since the turn of the century, state pension costs have more than doubled from 6.4 percent of payroll in 2001 to 16.8 percent in 2016. Over the same period, the costs for local plans have more than tripled – from 9.0 percent of payroll to 31.0 percent.⁷

As a result of this cost growth, rating agencies have started to explicitly account for pensions in their credit ratings. This shift could be important because the interest cost on municipal bonds is closely related to the issuer’s credit rating or, put more plainly, when a government is downgraded, borrowing often becomes more expensive.⁸ Table 1 on the next page displays nine states and 13 localities whose bond ratings have been downgraded, in part, due to pension concerns since 2009. Of course, most of these governments

Figure 5. State and Local Employer Annual Required Contributions to Pensions as a Percentage of Payroll, 2001-2016



Source: Public Plans Database (PPD) (2001-2016).

are also burdened by other budgetary or financial stressors, which are factored into a rating agency’s decision.⁹ While prior analysis by the Center failed to find a statistically significant relationship between pension finances and the bond ratings of state and local governments, the heightened scrutiny of pensions evidenced by this recent surge of downgrades suggests that this relationship may be changing.¹⁰

Amid rising pension costs and the threat of lower ratings, state and local governments have instituted pension benefit reforms. In some cases, reforms were made explicitly to deter bond rating downgrades or bolster already declining rates.¹¹ Figure 6 shows the percentage of states and localities making changes for both new and current employees from 2009-2014. Two key points emerge. First, 74 percent of state plans made some type of reduction compared to 57 percent of local plans. Second, while the majority of plans making changes reduced benefits only for new employees, a significant portion also cut benefits for current employees or retirees. In terms of reducing employer costs and improving pension finances in the near term, cuts to current member benefits are most meaningful.

Table 1. State and Local Moody's Bond Rating Downgrades, 2009 to Present

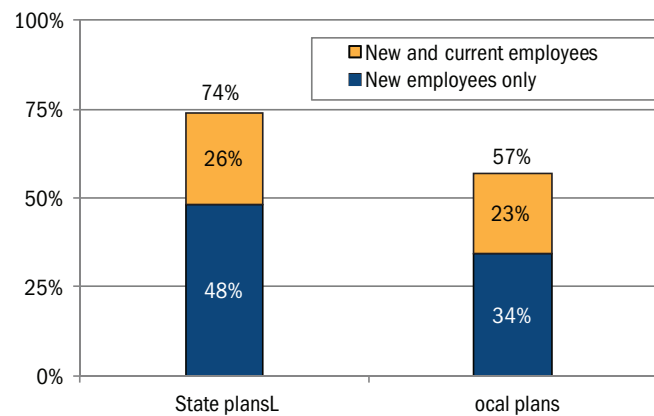
Government	Year	Old rating	New rating
State			
Alaska	2016-2017	Aaa	Aa3
Connecticut	2012-2017	Aa2	A1
Illinois	2009-2017	Aa3	Baa3
Kansas	2014	Aa1	Aa2
Kentucky	2017	Aa2	Aa3
Louisiana	2016	Aa2	Aa3
New Jersey	2011-2017	Aa2	A3
Pennsylvania	2012-2014	Aa1	Aa3
West Virginia	2017	Aa1	Aa2
Local			
Cincinnati, OH	2013	Aa1	Aa2
Chicago, IL	2013-2015	Aa3	Ba1
Dallas, TX	2015-2016	Aa1	A1
Fort Worth, TX	2017	Aa2	Aa3
Hartford, CT	2010-2016	Aa3	B2
Houston, TX	2016	Aa2	Aa3
Jackson, MS	2015-2016	Aa2	Baa2
Manchester, NH	2013-2015	Aa1	Aa3
Minneapolis, MN	2013	Aaa	Aa1
Newark, NJ	2010-2014	A2	Baa1
Omaha, NE	2012-2014	Aaa	Aa2
San Bernardino County, CA	2013	Aa3	A1
St. Louis, MO	2015-2017	Aa3	A3

Sources: Moody's Investor Services (2009-2017); and various news sources.

An Empirical Analysis

The task is to test the relationship of pensions to state and local borrowing costs, controlling for other factors that might impact these costs, such as fiscal management and finances.

The sample contains 142,214 state bonds and 54,677 local bonds that were issued from 2005-2014. The data come from the Thomson Reuters *SDC Platinum*

Figure 6. Percentage of State and Local Plans Making Benefit Changes, by New and Current Employees, 2009-2014

Source: Aubry and Crawford (2017).

Municipal Bonds dataset. For each bond, the dataset includes the issue date, duration, yield at issue, and whether the bond is taxable, has a fixed or variable rate, and is insured or credit enhanced. For ease of interpretation, the empirical analysis focuses on tax-exempt, fixed-rate, general obligation bonds issued directly by state and local governments.¹² The data are then limited to bonds issued by the 50 states and 173 major cities for which pension data are readily available. Restricting the sample in this way reduces the number of bonds to 9,839 state bonds and 7,396 local bonds.

The analysis is based on a linear regression model. The dependent variable is the spread between the interest rate on a municipal bond and a Treasury bond of the same maturity issued in the same week, which is the risk premium that state and local governments must pay to borrow. In addition to pension-related variables, the equations include a multitude of factors that would be expected to relate to the spread, such as the financial condition of each government, the economic status of the government's geographic area, the tax rate, and the maturity of the bond.¹³ The specific independent variables are detailed below.

Pensions

Unfunded actuarial liability (UAAL) as a percentage of revenue. Governments carrying relatively high levels of pension debt reflect worse fiscal management and would be expected to face higher borrowing costs.¹⁴

Benefit reforms. The analysis includes a flag for whether or not a government has cut the benefit factor or cost-of-living adjustment for current employees, or has introduced a defined contribution or hybrid plan. It is expected that such reforms would reduce borrowing costs.¹⁵

Fiscal Status

Expenditure growth. Governments with rapid five-year growth in expenditures would have many competing demands for funds and therefore would be expected to pay higher rates.

Debt as a percentage of revenue. Governments with already high levels of debt would be viewed as more risky and thereby would likely face higher interest rates.

Economic Conditions

Unemployment rate. Governments in areas with higher levels of unemployment face more financial stress and therefore would likely have to pay higher rates.

Dependency ratio. Governments with a high share of the population under 17 and over 65 would be more exposed to the budget pressures of education and Medicaid, and therefore would likely have to pay more on their debt.

Tax Rate

Marginal state income tax rate. In addition to being exempt from federal income tax, municipal bond interest is often exempt from state income tax in the state the bond is issued. This variable equals zero for states

that do not exempt interest of their own bonds and equals the marginal tax rates for those that do. Those that do exempt bond interest would be expected to pay a lower rate.

Bond Maturity

Bond maturity. Controlling for maturity ensures that the analysis is comparing the spread of similar bonds. Longer-dated bonds will exhibit a greater spread than shorter-term bonds due to increased default risk, making governments that are more reliant on long bonds more likely to pay higher interest rates.

Management of State Govt (state only)¹⁶

Economic advisors. States with a council of economic advisors might be considered better managed and therefore appear more secure to investors, thereby reducing interest costs.

Consensus forecast. States that base their revenue projections on realistic forecasts also would be viewed as more credible, reducing interest costs.

State's Credit Rating (local only)

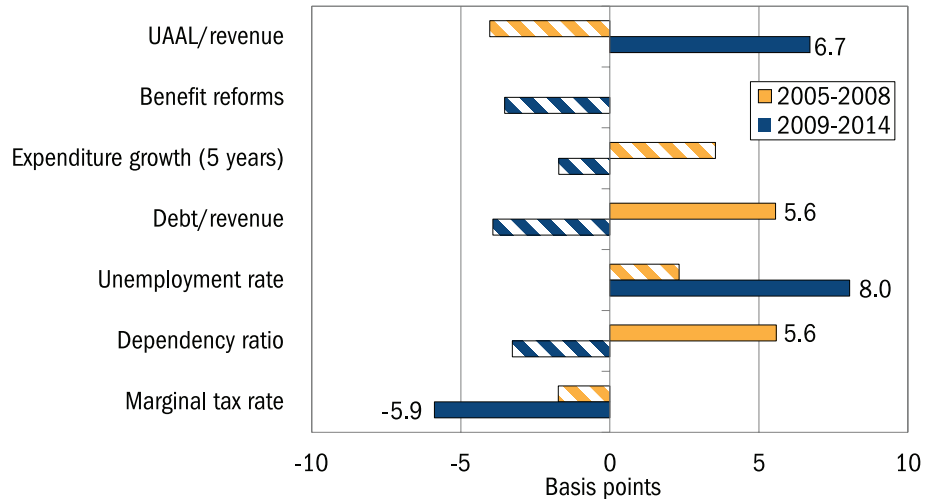
State bond rating. The borrowing costs of local governments within a state may be impacted by the perceived credit risk of the state itself. To reflect this potential impact, the analysis includes, for each city, the Standard & Poors credit rating of the state in which the city is located. Cities in states with poor bond ratings would expect to pay more

Results

Separate regressions are estimated for state and local governments spanning two distinct time periods: pre-crisis (2005-2008) and post-crisis (2009-2014).

For the state regression, the pre-crisis results align with the Center's earlier analysis: pension finances

Figure 7. *Impact of Selected Characteristics on the Yield Spread between State Bonds and Treasuries, in Basis Points, 2005-2008 and 2009-2014*



Notes: Solid bars are statistically significant at the 90-percent level or better. For continuous variables, the results shown are for a one-standard-deviation change; for dummy variables, they are for a change from zero to one.

Sources: SDC (2005-2014); U.S. Census Bureau (2000-2014); PPD (2005-2014); and Natl Assoc. of State Budget Officers (2008).

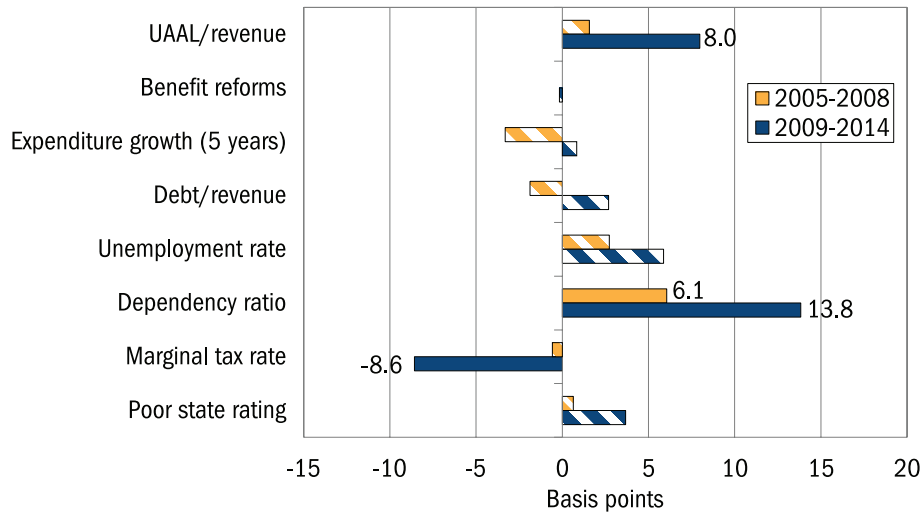
are not related to the risk premium (see Figure 7 on the next page and Appendix Table A1 for full results).¹⁷ However, since 2009, a higher UAAL as a percentage of revenue is related to higher borrowing costs for states.¹⁸ More specifically, from 2009-2014, a one-standard-deviation increase in the UAAL as a percentage of revenue (or about 31 percentage points), was associated with a 7-basis-point increase in the spread. Relative to an average spread of about 33 basis points for state-issued bonds over the same period, 7 basis points is not trivial. The coefficient on the reform variable suggests that reforms reduce costs, but the relationship is not statistically significant. This result may reflect the fact that governments initiating reforms are often in poor fiscal health and facing increasing borrowing costs. The non-pension variables that have statistically significant coefficients move in the expected directions over both time periods.

Results for the local regression are presented in Figure 8 (with full results in Appendix Table A2). In

terms of pensions, the impact of the unfunded liability on government borrowing costs is similar to that of states. Prior to the crisis, pension finances were not related to borrowing costs. After the crisis, a one-standard-deviation increase in unfunded liability as a percentage of revenue (about 75 percentage points) is associated with borrowing costs that are 8 basis points higher. Relative to an average spread of 47 basis points for localities post-crisis, this difference is also meaningful. As with the state analysis, local reforms made since the financial crisis show no statistically significant relationship with borrowing cost from 2009-2014, and the non-pension variables mostly move in the expected direction over both time periods.

For both state and local regressions, the impact of pension finances on borrowing costs is sensitive to how the pension variable is defined. Other measures of pension finances – such as the funded ratio or annual required contribution – showed a similar relationship to borrowing costs, but were less statistically significant.¹⁹

Figure 8. Impact of Selected Characteristics on the Yield Spread between Local Bonds and Treasuries, in Basis Points, 2005-2008 and 2009-2014



Note: Solid bars are statistically significant at the 95-percent level or better. For continuous variables, the results shown are for a one-standard-deviation change; for dummy variables, they are for a change from zero to one.

Sources: SDC (2005-2014); U.S. Census Bureau (2000-2014); PPD (2005-2014); and The Pew Charitable Trusts (2014).

Conclusion

A prior analysis by the Center found that pensions had no impact on state borrowing costs in the years preceding the financial crisis and only a slight impact in the years immediately following. But, rating agencies have begun to explicitly account for pensions in their methodologies, and several governments have experienced downgrades that have been attributed, in part, to their pension challenges. Given this seeming shift, this study revisits the Center’s prior analysis, expanding on it by adding local governments and analyzing the impact of pension reforms made in the wake of the crisis.

Like the prior analysis, this analysis finds that pensions had no relationship to borrowing costs pre-crisis. However, since 2009, both state and local borrowing costs have shown a meaningful sensitivity to the sponsor’s ratio of unfunded liability to revenue.

The coefficient on the benefit reform variable suggests that reforms reduce costs, but the relationship is not statistically significant for either state or local governments. It is possible that those that initiated reforms were precisely the governments facing higher borrowing costs due to poor general finances.

These results suggest that pensions have become increasingly relevant to the municipal bond markets and can have a meaningful impact on the borrowing costs of a municipality. As such, adequate funding, monitoring, and management of public pensions should continue to be an important component of fiscal management for state and local governments.

Endnotes

- 1 Munnell, Aubry, and Quinby (2011).
- 2 As of July 2017, Moody's ratings for New Jersey and Illinois stand at A3 and Baa3, while Standard & Poor's ratings stand at A- and BB+, respectively.
- 3 See Reich (2017).
- 4 In addition, regulatory changes have encouraged more institutional ownership of Treasury bonds generally. For example, in the Basel III rollout, banks subject to the new liquidity coverage ratio were strongly encouraged to buy U.S. Treasuries as they receive a top weighting as high-quality liquid assets.
- 5 The municipal bond spread equals the yield of a municipal bond minus the yield of a U.S. Treasury bond of similar duration issued during the same week. The spreads are weighted by the dollar amount of each bond issue.
- 6 As the credit ratings of bond insurers fell in the wake of the financial crisis, the value of their insurance decreased, and more governments opted to issue uninsured bonds rather than pay the extra fee. Additionally, as the role of professional municipal analysts grew in the municipal bond market, the use of bond insurance as a way to promote homogeneity (and hence liquidity) within the market became less prominent. Ultimately, the incremental increase in the spread due to issuing uninsured bonds may be less than the cost of purchasing insurance, resulting in lower overall costs for the issuer.
- 7 In some instances, reporting costs as a percentage of payroll may slightly overstate the burden of pensions after the financial crisis, because the payrolls of many state and local governments remain below their pre-recession levels.
- 8 The relationship between bond ratings and borrowing costs is not linear. Generally, downgrades only make borrowing more expensive after a series of downgrades or if the new rating crosses a threshold that indicates the issuer is no longer investment grade.
- 9 For example, Moody's assessment of Kansas stated "the downgrade reflects Kansas' relatively sluggish recovery compared with its peers, the use of non-recurring measures to balance the budget, revenue reductions (resulting from tax cuts) which have not been fully offset by recurring spending cuts, and an underfunded retirement system for which the state is not making actuarially required contributions."
- 10 See Mattoon (2006); and Munnell, Aubry, and Quinby (2011).
- 11 Houston Press (2017); The Wall Street Journal (2017).
- 12 Bonds issued by state authorities such as the New York Port Authority or the Los Angeles Water District are excluded. State authorities account for about 70 percent of the total dollar amount of bonds issued by states.
- 13 While our prior analysis included a control for whether a bond is credit-enhanced/insured, this variable was excluded from the present analysis because, by 2014, less than 5 percent of municipal bonds were credit-insured.
- 14 Information on unfunded liabilities is taken from Center-collected data on the annual pension funding and costs for the 50 states and 173 major cities.
- 15 Data on reforms are collected from plan actuarial valuations and financial reports. For the few local plans that did not publish a financial report, the reports of the sponsoring city, county, or school district are used.
- 16 A variable indicating if the state was able to carry a budget deficit from one year to the next was dropped from the regression analysis because it was strongly correlated with our key pension variable: the unfunded liability as a percentage of revenue. Many of the states that are able to carry a deficit – California, Connecticut, Illinois, and Rhode Island – are also the states most likely to have seen pension-related changes to their borrowing costs because of the more public nature of their pension challenges.
- 17 Another similar analysis by the Center found a marginal relationship between the annual required contribution paid and borrowing costs after 2009 (Munnell 2012).
- 18 The regression was also run separately for states with credit ratings of AA or higher ("good" states) and states with ratings of AA- or lower ("bad" states). The results suggest that borrowing costs are more sensitive to pension finances in states with poor ratings. For the regression on good states, the relationship between pension funding and borrowing costs was insignificant post-crisis. For the regression for bad states, the relationship was significant.
- 19 The analyses showed that both a lower funded ratio and a higher required contribution as a percentage of revenue are related to higher borrowing costs for both state and local plans, but are only statistically significant at the 15-percent level. Other studies examining the impact of pensions on borrowing costs suggest that the unfunded liability best captures the fiscal stress arising from pension finances (see Burson et al. 2014).

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Appendix

Table A1. *Impact of Selected Characteristics on Spread between Yields on State-Issued Bonds and Treasuries, Pre- and Post-Crisis, 2005-2014*

	Pre-crisis	Post-crisis
UAAL/revenue	-0.001 (0.00)	0.002* (0.00)
Benefit reforms		-0.04 (0.07)
Expenditure growth (5 years)	0.003 (0.00)	-0.002 (0.00)
Debt/revenue	0.08** (0.03)	-0.05 (0.04)
Unemployment rate	0.02 (0.03)	0.04* (0.02)
Dependency ratio	0.06* (0.03)	-0.03 (0.03)
Marginal tax rate	-0.01 (0.01)	-0.02** (0.01)
Maturity	0.04*** (0.00)	0.05*** (0.00)
Council of economic advisors	-0.17*** (0.05)	-0.16*** (0.06)
Consensus revenue forecasting	0.01 (0.06)	-0.14** (0.07)
Sample size	3,778	6,061
R-squared	0.68	0.47

Note: State bond sample only includes bonds issued by states and excludes bonds issued by state authorities. Coefficients are significant at the 1-percent level (***), 5-percent level (**), or 10-percent level (*). Standard errors have been adjusted for state-level clustering.

Sources: SDC (2005-2014); U.S. Census Bureau (2000-2014); *Public Plans Database* (2005-2014); and Natl Assoc of State Budget Officers (2008).

Table A2. *Impact of Selected Characteristics on Spread between Yields on Locally-Issued Bonds and Treasuries, Pre- and Post-Crisis, 2005-2014*

	2005–2008	2009–2014
UAAL/revenue	0.00 (0.00)	0.001** (0.00)
Benefit reforms		-0.002 (0.08)
Expenditure growth (5 years)	-0.002 (0.00)	0.001 (0.00)
Debt/revenue	0.00 (0.00)	0.00 (0.00)
Unemployment rate	0.03 (0.03)	0.04 (0.02)
Dependency ratio	0.02** (0.01)	0.05*** (0.02)
Marginal tax rate	-0.002 (0.01)	-0.02* (0.01)
Maturity	0.04*** (0.00)	0.05*** (0.00)
Poor state rating	0.01 (0.03)	0.02 (0.02)
Sample size	3,584	3,812
R-squared	0.62	0.46

Notes: Coefficients are significant at the 1-percent level (***) or 5-percent level (**). Standard errors have been adjusted for state-level clustering.

Sources: SDC (2005-2014); U.S. Census Bureau (2000-2014); *Public Plans Database* (2005-2014); and The Pew Charitable Trusts (2014).



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