Is There a Public Sector Union Premium on State Debt?[*]

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Abstract

Significant attention became focused on public sector unions as a potential causal factor of state fiscal woes during the 'Great Recession.' In this paper, we exploit the variation in state union density, coverage, and collective bargaining laws to explore the relationship between unionization and state government borrowing costs. If investors perceive public sector unions to be barrier to a state's ability to make future debt payments, they may require a premium to hold debt. Using data from 1983-2008, we find that states with right-to-work laws for government employees, states that prohibit collective bargaining, and states that are not required to bargain with public sector unions pay significantly less in long-term borrowing costs than states without such laws. Overall, our results indicate that public sector collective bargaining laws may be responsible for an up to 50 basis point differential in borrowing costs across states, which translates to economically significant interest cost-savings.

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1. Introduction

There is little disagreement that the 'Great Recession' thrust state governments into their worst fiscal positions since the Great Depression. Moreover, with the fairly sluggish recovery following the recession's end, many states may not return to their pre-recession fiscal balances for a number of years to come. In fact, according to *The Fiscal Survey of the States*, aggregate state expenditures are expected to be 4.32 percent of GDP by the end of 2012, which is both well below the pre-recession peak of 4.67 percent and only marginally above the trough year of 2010 when spending equaled 4.29 percent of GDP.[1]

During a typical downturn, declining revenues and overall economic conditions typically attract the lion's share of attention by policymakers and the general public. However, the Great Recession was somewhat unique from the perspective of states in that significant attention became focused toward public sector unions and their collective bargaining agreements as a potential contributing factor for state fiscal woes (Allegretto *et al.*, 2011). This attention has manifested itself into nearly a dozen states enacting or changing their existing public sector collective bargaining agreements since 2011, with legislation to do so under consideration in numerous additional states (Allegretto *et al.*, 2011). Two of the most high-profile and politically-charged cases – Wisconsin and Ohio – involved newly elected conservative Governors who supported, and ultimately enacted, sweeping cuts to the public sector collective bargaining rights that had long been in place in these traditional union strongholds. Given that Ohio voters opted to overturn the legislation limiting bargaining rights at the polls in November 2011, it seems likely that public sector bargaining rights will remain in flux for at least the short-term.

While the literature on the effects of private and public sector unions is quite extensive, and reviewed in more detail in Section 2 of this paper, previous studies on public sector unions suggest that unions generate a wage premium for union members, create little if any productivity gains, and raise

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[1] This information was obtained from the fall 2011 issue of *The Fiscal Survey of the States*, jointly published by the National Governors Association and the National Association of State Budget Officers. The full report is available at: http://www.nga.org/files/live/sites/NGA/files/pdf/FSS1111.PDF.

employment levels above the competitive level (Hirsch, 1991a; DiNardo and Lee, 2004; Hirsch 2007b; Benecki, 1978; Valletta, 1989; Trejo, 1991). Given the poor performance of union firms relative to non-union firms, Hirsch (2007a) has argued that unions act like a tax on firm profits.

In this paper, we update the National Bureau of Economic Research (NBER) Public Sector Collective Bargaining Law Data Set and exploit the variation in state union density, coverage, and collective bargaining laws to explore the relationship between public sector unions and state borrowing costs. If investors perceive, whether justified or not, that public sector unions act as a barrier or restriction to a state's ability to make future debt payments, they may require a premium to hold state debt. Using data from the Chubb Relative Value Study on the relative yields of state 20-year general obligation bonds over the period from 1983-2008, we find very strong evidence to support this hypothesis. Specifically, we find that states that have enacted "right-to-work" laws for public sector employees are rewarded by investors with long-term borrowing costs that are roughly 10 to 21 basis points lower than states without the laws. In addition, borrowing costs are lower (13 to 16 basis points) for states that explicitly prohibit collective bargaining and for those states that have no requirement to engage in collective bargaining with public employees. We also find that states with a larger share of their public sector employees being unionized pay significantly more to borrow, but the magnitude is quite small (0.25 basis points). Overall, our results indicate that the structure of states' public sector collective bargaining laws may be responsible for an up to 50 basis point differential in long-term borrowing costs across states, which translates to economically significant interest cost-savings when issuing debt.

2. **Previous Literature**

The organized labor movements in the public and the private sectors differ substantially in their origins, histories, and heterogeneity across U.S. states. Private sector unions in the U.S. flourished after Congress enacted the National Labor Relations Act of 1935 (29 U.S.C. §151–169) which, among other things, established a national, unified legal framework that encouraged collective bargaining between employers and employees. Private sector union density increased from the 1930s through the 1950s,

reaching a peak density of 36 percent of all private sector employees in 1953 (Hirsch, 2007a). Union density then stagnated in the 1960s and began a dramatic decrease in the 1970s that continues to the present, where only 6.9 percent of all private sector workers were members of a union in 2010 (Bureau of Labor Statistics, 2011). Cited reasons for the decrease in private sector unionization starting in the 1950s are shifts in public support away from unions; the Taft-Harley Act of 1947 which outlawed certain union practices and gave the federal government the power to block strikes; and increasing competition in the global marketplace that has made it harder for unionized firms to survive (Hirsh, 2007a).

Public sector unionization began in the 1960s largely as a result of several executive orders that were favorable for the development of public sector unions and the collective bargaining of public employees at both the national and state levels (Freeman, 1986). While private sector union membership began to decline in the 1960s, this period marked the start of the growth in public sector union membership at both the federal and state levels. In 2010, roughly 36 percent of all public sector employees were union members compared to 6.9 percent of private sector workers (Bureau of Labor Statistics, 2011). Differences in public and private union membership across U.S. states are shown in Table 1. Clearly, unlike 50 years ago, union membership is now a greater characterization of public sector labor markets than it is of private sector labor markets.

[Table 1]

While the collective bargaining activities of private sector employees and firms are dictated by national laws that apply uniformly across states, the rules governing public sector unionization vary dramatically across states and can change over time by often controversial (e.g., the recent actions in Wisconsin and Ohio) state legislative actions. In addition to yes-or-no type rules, there are large differences across the states in term of the strictness of each rule and the obligations of public employers and employees under certain rules. Table 2 highlights some of these differences in collective bargaining and public sector labor laws (which we exploit in this paper) in U.S. states. In 2008, for example, 13 states either prohibited public employee collective bargaining or had no provision for collective bargaining. The right of public employees to strike was permitted in only eight states. Twenty-one states

had "right-to-work" laws that prohibit mandatory membership in public sector unions as a condition for employment. Finally, six states also had laws that prohibit secret ballots of union voting activities ("card check" laws).[2]

[Table 2]

The impact of unions on various economic outcomes has been studied extensively, as outlined by Hirsch (2007a). Most attention has focused on the link between unions and wages, employment, firm productivity, and investment. Unions, both in the private sector and in the public sector, use their bargaining power to increase wages above the competitive equilibrium. Estimates of this union wage premium range from roughly 10 to 30 percent, depending upon the study (Freeman and Medoff, 1984; Blanchflower and Bryson, 2004; Hirsch and Schumacher, 2004; Bahrami *et al.*, 2009). A more efficient outcome would still exist, however, if the union wage premium was met with an equal increase in productivity. Studies have examined the productivity of unionized firms in the private sector and have shown that unions have at most a very small, if any, positive effect on firm productivity (Hirsch, 1991a; DiNardo and Lee, 2004; Hirsch 2007b). Thus, to the extent that union wages are not offset by greater productivity, the gains to unions through higher wages can be considered a tax on firm profits (Hirsch, 2007a).[3] As a result of this implicit tax, union firms were shown to have lower investment, higher debt, and lower growth than non-union firms (Hirsch, 1991a, 1991b, 2007b).

While unions in the both the private and public sectors can increase wages above the competitive equilibrium, public sector unions are unique in that they can also use political influence to increase their employer's demand curve for labor. This notion has received empirical support in several studies that have found a positive relationship between public sector unionization and employment (Benecki, 1978; Valletta, 1989; Trejo, 1991). Valletta (1989) claims that the evidence suggests that the effect of

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[2] The collective bargaining laws in Table 2 apply only to state-level public sector employees. Many states have different collective bargaining rules for other occupational groups such as teachers, firefighters, and police officers. The NBER Public Sector Collective Bargaining Data Set also reports bargaining rights for these occupations.

[3] This assumes that unionization does not result in an increase in product prices. Hirsch (2007a) suggests firms have little, if any, ability to raise product prices in response to union wage increases.

unionization on municipal employment is larger (in percentage terms) than the effect of unionization on wages.

The literature has established that public sector unions generate a wage premium for union members, they create little if any productivity gains, and they raise employment levels above the competitive levels. We argue that investors may view public sector unions as an additional barrier (or tax, in the case of the wage premium) that might restrict a state's ability to make future debt payments given greater uncertainty over union compensation and imposed costs on government through collective bargaining and work stoppages. These costs (both certain and uncertain) associated with public union presence and strength could raise the relative risk of investing in state bonds.

Conceptual support for our argument is based on Merton (1974), who argues through the use of a structural credit model that variation in a firm's profit and perceived value caused by unions may affect the value of debt-holders claims, and therefore also affect the firm's credit risk. An assessment of a firm's overall credit risk, and thus the yield on its bonds, is based on a firm's asset returns, its asset volatility, and bondholders' recovery rate. Unions generate additional costs to firms which reduce asset returns through lower profitability and productivity (Lewis, 1986). These higher costs imposed by unions, mostly reflected by higher union wages, result in higher obligatory payments prior to payment to bond holders, and therefore decrease bondholders' recovery rate. Unions also generate uncertainty in firm performance and reductions in research and development, which leads to greater volatility in a firm's assets (Becker and Olson, 1986). Chen, Chen, and Liao (2011) provide the most recent empirical evidence that private sector labor unions, through the channels described above, increase corporate bond yields.

We argue that the effects of public sector unions on state bond yields are analogous to the effects of private sector unions on corporate bond yields – public sector unionization should increase state bond yields. Of course, the impact of public sector unionization on a state's borrowing costs depends upon the breadth of public sector union membership and the bargaining strength the state legally provides to unions. As was shown in Table 2, collective bargaining laws and powers granted to public unions are

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quite different across the states. It is these large differences in collective bargaining and employment laws we wish to exploit in order to test our hypothesis that borrowing costs across the states are directly related to the breadth and strength of public sector unionization in each state.

The idea that institutional factors influence state borrowing costs is not new. A body of research has shown that, in addition to economic conditions and liquidity constraints, institutional factors play an important role in explaining the cross-sectional variation in state borrowing costs. For example, studies by Bayoumi *et al.* (1995), Poterba and Rueben (1999), and Lowry and Alt (2001) find consistent evidence that states with strong balanced budget rules (BBRs) – ones that explicitly restrict deficit carryovers – face long-term borrowing costs that are between 5 and 15 basis points lower than states with other types of BBRs. The impact of state expenditure-limit laws, tax limit laws, and debt restricts on state bond yields was explored by Poterba and Rueben (1999). They find that states having strict tax limit laws face higher borrowing costs, but states with strict expenditure limit laws have significantly lower borrowing costs. Wagner (2004) argues that states having budget stabilization funds ('rainy day funds') are less exposed to periods of financial stress, and thus investors may have a preference to invest in states with budget stabilization funds. He finds that the adoption of a state budget stabilization fund results in a modest decrease in borrowing costs, but the largest reduction in bond yields occurs in states having budget stabilization funds governed by strict withdrawal and deposit rules.

3. Theoretical Framework and Empirical Specification

3.1 Theoretical framework

Our basic theoretical framework follows directly from Poterba and Rueben (1999). Their model of state tax-exempt debt has served as the basic theoretical structure for several previous studies investigating the effect of fiscal institutions on borrowing costs, including Poterba and Rueben (2001) and Wagner (2004).

An individual state's tax-exempt bond market is assumed to clear when the risk-adjusted return on a taxable asset (such as a Treasury bond) is equal to the after-tax return on a tax-exempt bond for the marginal investor. Formally, this may be expressed as:

$$R_i^M = [\, 1 - T^F(B) - T_i^S(B_i) \,]\, R^T + \sigma_i(\mathbf{Z}_i,\, \mathbf{X}_i,\, B_i,\, \mathbf{U}_i), \tag{1}$$

where R_i^M represents the yield on a tax-exempt bond issued by state i, T_i^S and T^F are the marginal state and Federal income tax rates, respectively, on interest income facing the equilibrium (or marginal) investor in state i, σ_i is the risk premium for state i, R^T denotes the yield on the risk-free (taxable) asset, B_i is state i's stock of outstanding tax-exempt debt, and B is the aggregate stock of outstanding tax-exempt debt.

As Poterba and Rueben (1999) note, an increase in state i's stock of outstanding debt (B_i) results in a lower marginal state income tax rate (T_i^S) for the equilibrium investor because the higher level of debt increases the state's tax-exempt return, which makes holding the debt incrementally more attractive for lower marginal tax rate investors. Moreover, an increase in state i's stock of tax-exempt debt also increases the equilibrium after-tax return by directly increasing the state's risk premium.[4]

The state's risk premium, σ_i, is assumed to be a function of the state's stock of outstanding debt, a vector of state-specific economic factors ($\mathbf{X}_i$), and a vector of state-specific fiscal institutions ($\mathbf{Z}_i$) that may affect a state's ability to make future debt payments. Examples of economic factors include measures of a state's general economic climate such as the unemployment rate, as well as factors related to a state's fiscal capacity such as the level of real per capita income, revenue as a share of personal income, and government surplus/deficit. In terms of fiscal institutions, expenditure limitation laws, revenue limitation

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[4] It is also worth noting that the level of a state's stock of outstanding debt will not influence after-tax returns on tax-exempt debt through changes in the marginal income tax rate if the state has a proportional income tax structure; in such cases, debt will only increase returns only through its direct effect on the state's risk premium (Poterba and Rueben, 1999). As Poterba and Ruben (1999) note, the model also assumes that changes in state i's stock of outstanding debt tax-exempt debt are too small to influence the marginal federal income tax rate at which the tax-exempt bond market clears, that bonds issued by state i are held only by the residents of the issuing state, and that there is no source of capital outside the 50 states.

laws, balanced budget (anti-deficit) rules, and borrowing restrictions may either enhance, or diminish, a

state's ability to meet future obligations depending on the particular institution. For example, rules that

restrict the quantity of debt (or make it more difficult to issue new debt) should lower the probability of

default and result in lower after-tax returns. In contrast, a revenue limitation law, which restricts the

growth in revenue or makes it more difficult to increases taxes, may increase the probability of default in

the eyes of the marginal investor and therefore increase the state's risk premium.

We extend the framework of Poterba and Rueben (1999) by incorporating a vector of public

sector union factors (U_i) into equation (1). While the complete set of union factors we include in our

empirical specifications to assess public sector union size and strength are described in detail in the next

section of the paper, factors such as the existence of a "right-to-work" and "card-check" law for public

sector employees would be part of U_i. If investors perceive that more public sector union members and/or

a stronger public sector union restricts or reduces the probability that a state will be able to make future

debt payments, the investors may require greater returns to offset the additional risk. On the other hand, if

investors believe that rules that explicitly limit public sector union growth/strength (such as right-to-work

laws) increase the likelihood that a state will meet its future obligations, this would be expected to reduce

a state's risk premium and result in lower yields.

3.2 Empirical specification and data description

Since our goal is to estimate the role, if any, that public sector union factors play in explaining the

cross-sectional variation in state tax-exempt bond yields, we measure state tax-exempt yields using data

from the Chubb Corporation's Relative Value Study.[5] This study, which began in 1973, is a biannual

survey of 20-25 supply-side bond traders in which they are asked to estimate, for all 38 states that issue

general obligation debt, the yield for each state's (hypothetical) 20-year general obligation (GO) bond that

would be issued today *relative* to an identical 20-year general obligation bond issued today by New

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[5] See Poterba and Rueben (1999) and Bayoumi, Goldstein, and Woglom (1995) for a more detailed description of
the Chubb data. We are also grateful to Thomas Swartz III from the Chubb Corporation for providing us with these
data.

Jersey.[6] A positive survey value indicates that traders believe a state issuing an identical GO bond is more risky than New Jersey, while a negative value implies the traders believe the state is less risky. So, for example, Alabama had a survey value of 4.15 in 2008, which indicates that traders believe an identical 20-year GO bond issued by Alabama should trade 4.15 basis points higher than an identical 20-year GO bond issued by New Jersey.

While the Chubb data are survey-based rather than market yields, Swartz (1989) notes that the survey yields track market yields very closely and, if anything, have a tendency to lead changes in market returns. The Chubb survey data also offer several distinct advantages over market yields and have been used in numerous previous studies exploring state borrowing costs, including Eichengreen (1992), Goldstein and Woglom (1992), Eichengreen and Bayoumi (1994), Bayoumi *et al.* (1995), Poterba and Rueben (1999, 2001), and Wagner (2004). One concern with market yields, as Bayoumi *et al.* (1995) note, is that only a small fraction of state general obligation bonds are actively traded, which may limit the availability and accuracy of timely pricing data. Second, state and local governments collectively issued more than 10,000 long-term general obligation bonds in 2011.[7] Given that there is considerable variation in the characteristics of each issuance (such as a competitive versus negotiated sale, call provisions, disclosure requirements, insured versus uninsured, etc.) and that previous research has found these characteristics to be important determinants of yields, failing to carefully control for all of the relevant issue characteristics or using some "average yield" as the measure of borrowing costs is problematic.[8] The comparability problem across issuances is eliminated when using the Chubb Relative

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[6] There are 39 states that issue general obligation debt, including New Jersey. However, since New Jersey is the benchmark in the Chubb data all of its values are equal to zero and relative yields are available for the remaining 38 states. The excluded states are: Arizona, Arkansas, Colorado, Idaho, Indiana, Iowa, Kansas, Kentucky, Nebraska, South Dakota, or Wyoming.

[7] This information was obtained from The Bond Buyer's *2011 in Statistics*, which is available online at http://www.bondbuyer.com/pdfs/2012_bb_stats_supp.pdf.

[8] See Wilcoff (2011) for work on the role municipal bond insurance plays in determining yields. Spivey (1989) explores the impact of call provisions on yields, while Fairchild and Koch (1998) investigate how state disclosure requirements impact municipal borrowing costs. The role that competitive or negotiated sales play in affecting municipal interest costs has been widely studied. See Robbins and Simonsen (2007) for a recent overview of this topic.

Value Study data because traders are estimating the relative yields on hypothetical and identical bonds between the states.

Although the mean relative yield in the Chubb data over our sample period (1983-2008) is just over 8 basis points, there is considerable variation in relative yields across states and over time. The relative yield spreads between the most risky and least risky states, for instance, range from a high of 132 basis points in 1983 to a low of 17 basis points in 2001. Furthermore, the state estimated by traders to be the most risky relative to New Jersey during our sample period was Michigan in 1983 (with a relative yield of 113.89), while the least risky state relative to New Jersey was Oklahoma in 1983 (with a relative yield of -18.56). Using each state's mean relative yield over the sample period, Table 3 reports the 10 most risky and least risky states relative to New Jersey. As the table indicates, while investors viewed Virginia and North Carolina as having the lowest probability of default over our sample period, only 8 states who issue general obligation debt were deemed to be less risky, on average, than New Jersey.

[Table 3 here]

In terms of our empirical specifications, since the Chubb data measures yields relative to New Jersey, we must transform equation (1) to be consistent with these data. Thus, differencing equation (1) for two states i and j (where j denotes New Jersey) gives us:

$$R_i^M - R_j^M = [T_i^S(B_i) - T_j^S(B_j)] R^T + \sigma_i(\mathbf{Z}_i, \mathbf{X}_i, B_i, \mathbf{U}_i) - \sigma_j(\mathbf{Z}_j, \mathbf{X}_j, B_j, \mathbf{U}_j). \qquad (2)$$

If we linearize equation (2) and add a time subscript t, then our estimating equation is given by:

$$R_{it}^M - R_{jt}^M = \alpha + (B_{it} - B_{jt})\delta + (\mathbf{X}_{it} - \mathbf{X}_{jt})\varphi + (\mathbf{Z}_{it} - \mathbf{Z}_{jt})\gamma + (\mathbf{U}_{it} - \mathbf{U}_{jt})\omega + (T_{it}^S - T_{jt}^S)\lambda + \theta_t + \varepsilon_{it}, \quad (3)$$

where $(B_{it} - B_{jt})$ and $(T_{it}^S - T_{jt}^S)$ denote state i's stock of outstanding debt at time t and marginal income tax rate at time t relative to New Jersey's outstanding debt and marginal tax rate at time t. In addition, all of the variables for state i that are included in vectors of economic factors ($\mathbf{X}_{it}$), institutional factors ($\mathbf{Z}_{it}$), and public sector union factors ($\mathbf{U}_{it}$) are also transformed into their respective deviation from New Jersey. Finally, ε_{it} denotes the error term, i and t denote the N state and T time periods respectively, and θ_t are

the fixed time effects, which will control for aggregate shocks to tax-exempt yields that are common to all states.[9]

We apply the model to 38 states over the period from 1983 to 2008, resulting in 988 observations. The starting period of our sample is determined by the fact that state-level union membership and coverage data (described in more detail later in the paper) are not available prior to 1983.

The basic economic and institutional control variables that we include in equation (3) are based on the previous studies of Poterba and Rueben (1999) and Wagner (2004). We include the state's unemployment rate, level of real per capita income, general fund revenue (as a share of personal income), and any government savings (as a share of expenditures) to control for general economic conditions and the state's fiscal capacity. Consistent with the findings of Poterba and Rueben (1999) and Wagner (2004), we expect relative yields to increase as the unemployment rate increases, and we expect yields to be lower in states with greater fiscal capacity, *ceteris paribus*.

Complete descriptions, summary statistics, and sources for all of the variables in the empirical model are provided below in Table 4. Since the variables are transformed into the deviation from New Jersey, Table 4 reports both the mean and standard deviation of each variable excluding New Jersey, as well as New Jersey's mean and standard deviation for each variable. The difference between the two means produces the mean value for the variable as it appears in our regressions.

[Table 4 here]

Since Poterba and Rueben (1999) and Bayoumi *et al.* (1995) found that higher debt-to-income ratios are associated with higher after-tax returns, we include the ratio of outstanding debt to personal income as a control variable. In addition, we also include the state's highest marginal income tax rate on wage and interest income (from TAXSIM) as a control variable. We expect, consistent with the theoretical framework, increases in a state's marginal income tax rate to lead to a lower after-tax return, other factors constant.

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[9] Since many of the fiscal institutions and union characteristics often do not vary at all within individual states over our sample period, there is insufficient variation in our sample to include state-specific fixed effects.

In terms of fiscal institutions ($\boldsymbol{Z}_{it}$), a number of studies, including Eichengreen (1992), Goldstein and Woglom (1992), Bayoumi *et al.* (1995), Lowry and Alt (2001), and Poterba and Rueben (1999, 2001), and Wagner (2004), have found that state fiscal structures are an important determinant of the cross-sectional variation in tax-exempt bond yields. As a result, our regressions include indicator variables for the existence of an expenditure limitation law, a revenue limitation law, a balanced budget rule that precludes deficit carryover, and a debt restriction law. While previous studies have found revenue limitation laws to be correlated with a roughly 5 to 15 basis point increase in borrowing costs, balanced budget rules, expenditure limitation laws, and debt restriction laws are expected, consistent with previous work, to lower the probability of default and reduce yields in the range of 5 to 20 basis points, *ceteris paribus*.

Given that a state's political environment and tastes may affect fiscal outcomes, we also include several control variables to capture these potential effects. These include indicator variables that equal unity if both houses and the Governorship of the state are controlled by Democrats and Republicans respectively, and the government and citizen ideology indices developed by Berry *et al.* (1998). The ideology government and citizen ideology measures, which both vary by state and year, take on a value of 0 to 100, with 100 being the most liberal value and 0 being the most conservative value. Including the ideology measures aids us in controlling for unobservable government and citizen tastes that could serve as a source of potential endogeneity between any of the regressors and the unexplained variation in after-tax returns.

We also control for the potential effects of political corruption by including the total number of convicted federal, state, and local government officials in a state (per 100,000 residents) as a regressor. Using each state's annual average bond rating over the period from 1995 to 2000, Depken and Lafountain (2006) find an inverse relationship between a state's bond rating and corruption convictions, implying that states with more corrupt public officials may pay more to borrow.

Finally, we include a number of public sector union control variables in equation (3) to assess the potential influence of union size and strength on tax-exempt yields. Ideally, we would like to know the

total number of state government employees, the number of state government union members, the number of state government employees covered by a collective bargaining agreement, and the wages and benefits of state government union and non-union members. However, such specific data are simply not available. As a result, our union membership and coverage data are from Hirsch and Macpherson's (2003) Union Membership and Coverage Database constructed from the Current Population Survey (CPS). These data, which are available annually at the state level beginning in 1983, include the total number of public sector employees, the total number of public sector union members (federal, state, and local employees), and the total number of public sector employees that are covered by a collective bargaining agreement. In our regressions we include: (i) the fraction of total employment in the public sector to control for the size of government relative to the state's economy, and (ii) the fraction of public sector employees that are either unionized or covered by a collective bargaining agreement to capture union presence. In some specifications, we alternatively measure the size of government relative to the economy using total state government wages as a share of personal income from the Bureau of Economic Analysis.

In addition to the union membership and coverage variables, we also assess the strength of public sector unions by updating the National Bureau of Economic Research's (NBER) Public Sector Collective Bargaining Law Dataset, which contains detailed information on the existence and structure of state public sector collective bargaining laws for state government employees, fire fighters, police officers, teachers, and other local government employees dating back to 1955.[10] Since the focus of this paper is to explore the potential union effects on state-level yields rather than state *and* local yields, we updated the database for state government employees through 2008 and include only variables reflecting state government employees in the regressions.

We include seven indicator variables measuring the rights and authority of public sector unions. First, we include an indicator variable that equals unity if the state has an explicit right-to-work law in place that covers public sector unions. Since right-to-work laws are a barrier to union formation, investors

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[10] The original NBER dataset covers the period from 1955-1998 and was updated through 1996 by Rueben (1997). See Valletta and Freeman (1988) for a detailed description of the dataset as well as a description of how a state's classifications are determined.

may view such provisions as a rule that may enhance (or at least not harm) a state's ability to repay future obligations, which could lower yields, *ceteris paribus*. Next, we consider the classifications of collective bargaining rights available in the NBER dataset (see Table 2) to control for the nature of a state's collective bargaining laws. These three indicator variables include: (i) collective bargaining is prohibited for public sector employees, (ii) the state is authorized but not required to bargain, employees have the right to meet and confer, or employees have the right to present proposals, and (iii) the state has an implied or an explicit duty to come to an agreement with a union. Another two indicator variables from NBER's dataset that we include pertain to the rights of public sector union members to strike. Specifically, the variables are: (i) the state prohibits strikes by public sector employees (with or without penalties) and (ii) the state explicitly permits public sector employees to strike. Our final public sector union variable is an indicator variable for whether the state has a "card-check" law in place for public sector employees. According to Chandler and Gely (2011), card-check authorization effectively reduces a barrier to union formation and has increased union membership in the public sector relative to states that do not have the authorization in place. The majority of states with the card-check provision have enacted the law after 2000 (Chandler and Gely, 2011). In our sample, six states have a card-check law place that applies to all or most state government employees. These states are: California (2002), Illinois (2003), Massachusetts (2007), New Hampshire (2007), New Jersey (2004), and Oregon (2007).

4. Empirical results

We estimate 8 variations of equation (3) to assess the robustness of our results. Diagnostic tests indicated the presence of both serial correlation and heteroskedasticity. To correct these problems, we followed a two-step procedure. First, we estimated state-specific, first-order correlation coefficients using the OLS residuals and then transformed our data accordingly. The first observation for each state was retained via the Prais-Winston transformation. Second, we estimated equation (3) by feasible generalized least squares using our transformed data and allowed for both state-specific heteroskedasticity and cross-

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state correlation. We report the standard adjusted coefficient of determination and report it as the (pseudo) adjusted R^2 even though it is not bounded in the unit interval.

The results in Table 5, which are reported below, include our baseline specification that excludes any public sector union factors and three specifications that incorporate our measures of union density and coverage. The results in Table 6 extend the specifications by including the right-to-work, card-check, collective bargaining, and strike indicator variables.

[Table 5 here]

With the respect to the independent variables, the results are consistent across regressions and are, for the most part, consistent with previous work. For instance, we find, across all specifications in Table 5, that state bond yields increase between 4.1 and 4.4 basis points with every 1 percentage point increase in the state's unemployment rate, other factors constant. This is consistent with the view that investors view states as more likely to default during difficult economic times.

Consistent with both Poterba and Rueben (1999) and Wagner (2004), we find very strong evidence that state fiscal institutions play a major role in explaining cross-state variation in long-term borrowing costs. For example, the presence of a constitutional balanced budget rule that precludes deficit carryover is correlated with a 30 to 34 basis point reduction in yields, *ceteris paribus*. Given the volume of debt that states issue, this is not a trivial result. In addition, we find the presence of a borrowing restriction to be correlated with lower borrowing costs (13 to 22 basis points), and the existence of a revenue limitation law to be correlated with a 2 to 8 basis point increase in after-tax returns, other factors constant. The institution variables are statistically significant at least at the 5 percent level in each specification.

While we find no consistent evidence that unified political control affects borrowing costs, the dynamic citizen ideology measure is significant at the 5 percent level in each regression, indicating that states with more liberal citizens pay more to borrow, other factors constant. Unlike Depken and Lafountain (2006), we also find no evidence that public corruption convictions influence long-term state borrowing costs.

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Turning our attention to the union membership and coverage variables, neither of our two measures of state government size – state government wages as a share of personal income and the number of public sector employees as a share of aggregate employment – is statistically different from zero in any of the specifications in Table 5. This suggests that investors do not perceive the cross-state variation in the size of state governments to be related to the state's default risk. On the other hand, we do find some evidence that investors may not view public sector unions favorably. Specifically, our results show that states pay incrementally more to borrow when a larger fraction of their public sector employees are unionized or if a larger fraction of their public sector employees are covered by collective bargaining agreements. These findings, which are Models C and D, are statistically significant at the 1 percent level, however the coefficient magnitudes are small. For example, while the estimated coefficient on the fraction of public sector employees that belong to a union is seemingly large (26.16 from Model C), an increase in the fraction of unionized members by 1 percentage point (.01) would only lead to 0.26 basis point increase in borrowing costs. Since the average state has approximately 370,000 federal, state, and local government employees and around 137,000 are union members, a 1 percentage point increase in the number of union members is roughly 4,000 individuals. Thus, while the result is statistically significant it is not economically meaningful.

[Table 6 here]

While the results in Table 5 seem to imply that investors do not require a 'union premium' to hold state debt, the results in Table 6 suggest otherwise. The specifications in Table 6, Models E, F, G, and H, incorporate the right-to-work, card-check, collective bargaining, and strike indicator variables into the model. We find that states with a right-to-work law in place for public sector employees are rewarded by investors with borrowing costs that are 10 to 21 basis points lower than states without a law in place, *ceteris paribus*. This result is statistically significant at the 1 percent level in each specification and is of roughly the same magnitude as having a constitutional balanced budget rule or borrowing restriction in place. The economic significance of right-to-work laws is shown in the first row of Table 7 — assuming a baseline interest rate of 3 percent, if two (otherwise) identical states were to issue a $10 million 20-year

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general obligation bond, then the state with a right-to-work law will pay $353,819 to $726,935 less in interest payments over the life of that bond. The values imply an interest cost savings of between 4.4 percent and 9.0 percent, respectively.

[Table 7]

In addition to right-to-work laws, the results in Table 6 indicate that, relative to states that have no provision for collective bargaining by public sector employees, tax-exempt yields are significantly lower in states that prohibit collective bargaining (14 to 16 basis points) and in states in which collective bargaining is allowed but the states are not required to engage in collective bargaining with public employees (10 to 14.8 basis points). As shown in the last two rows of Table 7, states that prohibit collective bargaining will pay $487,803 to $558,229 (6.1 percent to 6.9 percent, respectively) less in interest payments on a $10 million 20-year general obligation bond; and states that do not require bargaining with public sector employees will pay $450,829 to $513,685 (5.6 percent to 6.4 percent, respectively) less in interest payments.[11]

5. Conclusion

State (and local) governments issue a substantial volume of debt and this volume has grown considerably in the post-World War II era. According to the U.S. Census Bureau, state governments had accumulated outstanding debt of more than $1 trillion, or nearly $4,000 per person, at the end of 2009. If

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[11] In the case of fiscal institutions, for instance, a fiscally conservative state may be more likely to adopt stringent institutions and also be more prudent when borrowing, which could serve as a potential source of empirical bias. Poterba and Rueben (1999) and Wagner (2004) both utilized instrumental variables estimators and modeled outstanding debt, TELs, debt limitation laws, and balanced budget rules as endogenously determined with borrowing costs. In our context, the structure of each state's public sector collective bargaining rights seems more likely to be a function of the state's private sector union structure at the time the state enacted the laws for government employees rather than on some underlying fiscal preference. In other words, it seems reasonable to assume that Pennsylvania has strong public sector collective bargaining rights because the state was a union stronghold for private sector employees at the time the public sector laws were enacted. If this is the case, then the union variables will not be endogenously determined with borrowing costs and their estimated coefficients will only be impacted if the union variables are correlated with a potentially endogenous regressor. Since the fiscal institution variables are not our coefficients of interest and it seems unlikely that our union variables are endogenous, we do not pursue an IV strategy. To explore the robustness of our findings, we could model the fiscal institutions as endogenous and re-estimate our models using the IV approaches of Poterba and Rueben (1999) and Wagner (2004).

local governments are also taken into account, the volume of outstanding debt swells to $2.6 trillion, or almost $8,600 per person. Moreover, in 2009 alone, state and local governments issued more than $152 and $216 billion in new long-term debt, respectively. Given this volume of debt, understanding the role that various factors play in affecting borrowing costs is non-trivial.

Using data from the Chubb Relative Value Study on state 20-year general obligation bond yields over the period from 1983-2008, we investigate the relationship between state union density, coverage, and collective bargaining laws and state borrowing costs. We find robust evidence that states with "right-to-work" laws in place pay substantially less to borrow, roughly 10 to 21 basis points, than states without the laws, other factors constant. We also find strong evidence that states which prohibit collective bargaining pay about 14 to 16 basis points less to borrow; and that states that have no duty to bargain with public sector employees pay 13 to 15 basis points less to borrow. These basis-point reductions translate, based on a hypothetical bond issuance, to interest-cost savings ranging from 4 percent to 9 percent. Given the size of state debt issuance in recent years, these percentages suggest cost-savings to state government equal to tens-of-millions of dollars. In general, our results seem to suggest that investors reward states that explicitly restrict unionization more than they punish states with stronger/larger public sectors unions. Given the widespread diffusion of unionization throughout local governments, it would also be interesting to explore to what extent local union size and strength explain differences in local tax-exempt returns.

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Table 1: States with Highest and Lowest Public Sector Union Density, 1983-2008

Highest Density	Public Sector Union Employees (share of public sector employment)	Private Sector Union Employees (share of private sector employment)	Lowest	Public Sector Union Employees (share of public sector employment)	Private Sector Union Employees (share of private sector employment)
New York	69.24%	14.90%	South Carolina	9.31%	3.06%
Rhode Island	66.06%	9.45%	Mississippi	10.50%	5.78%
Connecticut	63.34%	9.75%	North Carolina	12.77%	2.96%
New Jersey	59.92%	12.91%	Virginia	13.60%	5.25%
Massachusetts	57.12%	9.04%	Arkansas	14.70%	5.82%
Michigan	55.86%	15.52%	Georgia	15.04%	5.56%
Hawaii	54.90%	15.50%	New Mexico	15.72%	5.59%
Minnesota	54.74%	11.51%	Texas	16.46%	4.15%
Oregon	51.70%	10.40%	Louisiana	17.14%	5.53%
Pennsylvania	51.46%	11.92%	Kansas	17.54%	7.52%

Notes: Over the entire sample period (1983-2008), union membership as a share of employment averaged 33.4% in the public sector compared to 8.5% in the private sector. Michigan averaged the highest percentage of private-sector union employees (15.52%) of all states over our sample period, while North Carolina averaged the lowest (2.96%).

Table 2: Public Sector Collective Bargaining and Employment Laws, 2008

Rule	Classification (#)	Number of States
Collective Bargaining	No provision for state employees (0)	5
	Prohibited (1)	8
	Employer authorized, not required to bargain (2)	6
	Right to present proposals (3)	1
	Right to meet and confer (4)	2
	State has duty to bargain, implicit (5)	18
	State has duty to bargain, explicit (6)	10
Right-to-Work Laws	Law exists for public employees (0)	21
	Law does not exist for public employees (1)	29
Right-to-Strike Laws	No provision (0)	9
	Prohibited with penalties (1)	14
	Prohibited with no penalties (2)	19
	Permitted (3)	8
"Card Check" Law	No Law in place (0)	44
	Law in place for public employees (1)	6

Source: Author updates to the NBER Public Sector Collective Bargaining Law Data Set (www.nber.org/publaw) and Rueben (1997). See Valletta and Freeman (1988) for more details (http://www.nber.org/publaw/publaw.pdf) as well as a description of how a state's classifications are determined. The requirement for a written agreement is the key difference in explicit versus implicit duties to bargain. Information on "card check" laws is from Chandler and Gely (2011).

Table 3: Least and Most Risky States Based on Chubb Relative Value Survey, 1983-2008

Least Risky States	Mean Relative Yield	Most Risky States	Mean Relative Yield
Virginia	-9.14	Louisiana	32.67
North Carolina	-9.02	Washington	23.14
Missouri	-7.49	Massachusetts	20.81
South Carolina	-6.33	Michigan	18.72
Maryland	-5.53	Alaska	17.55
Georgia	-4.99	West Virginia	16.85
Tennessee	-3.40	Nevada	15.56
Utah	-1.57	New York	15.53
Connecticut	0.65	Illinois	15.14
Oklahoma	2.57	Rhode Island	14.13

Notes: Figures are the mean of each state's yield on a (hypothetical) 20-year general obligation bond relative to New Jersey over the period from 1983 to 2008. Relative yield data are from the Chubb Relative Value Study, Chubb Corporation, Inc. The mean over the entire sample for all states is 8.01.

Table 4: Descriptive Statistics and Data Sources, 1983-2008

	Sample Mean (Std. Dev.)	NJ Mean (Std. Dev.)	Description	Source(s)
Interest rate on GO Bonds relative to NJ	8.017 (15.014)	0.000 (0.000)	Average annual yield on state *i*'s 20-year GO bond relative to New Jersey's yield	Chubb Insurance Company
Unemployment rate	5.672 (1.904)	5.469 (1.305)	Average annual unemployment rate [rate * 100]	Bureau of Labor Statistics
Real per capita personal income	15430.684 (2884.751)	19952.185 (2606.880)	1982-1984 = 100	Bureau of Economic Analysis (BEA)
General fund revenue / Personal income	0.132 (0.053)	0.104 (0.006)	General fund revenue as a share of personal income	Statistical Abstract of the US and BEA
Debt outstanding / Personal income	0.149 (0.801)	0.102 (0.009)	Outstanding debt level as a share of personal income	Statistical Abstract of the US and BEA
Top individual marginal income tax rate	5.319 (3.304)	5.578 (1.427)	State's top individual marginal income tax rate [rate *100]	NBER Taxsim
Democratic control	0.373 (0.483)	0.269 (0.452)	=1 if state Legislature and Governorship are controlled by Democrats, =0 otherwise	Book of States
Republican control	0.060 (0.238)	0.307 (0.470)	=1 if state Legislature and Governorship are controlled by Republicans, =0 otherwise	Book of States
Government ideology index	54.583 (24.479)	59.991 (23.415)	Measure of government ideology [100=liberal; 0=conservative]	Berry et al (1998)
Citizen ideology index	52.379 (15.347)	63.857 (5.662)	Measure of citizen ideology [100=liberal; 0=conservative]	Berry et al (1998)
Government savings	3.976 (9.391)	6.680 (6.635)	General fund surplus/deficit plus rainy day fund balance as a share of spending	Statistical Abstract of the US and individual states
Balanced budget rule	0.447 (0.497)	1.000 (0.000)	=1 if state has a constitutional BBR that precludes deficit carryover, =0 otherwise	ACIR (1987)
Expenditure limitation	0.351 (0.477)	0.730 (0.452)	=1 if state has a binding expenditure limit, =0 otherwise	Mitchell (2010)
Revenue limitation	0.161 (0.368)	0.000 (0.000)	=1 if state has a binding tax limit, =0 otherwise	Mitchell (2010)
Debt limitation	0.473 (0.499)	1.000 (0.000)	=1 if state has a constitutional prohibition or requires referendum approval to issue debt, =0 otherwise	Kiewiet and Szakaly (1996)
Corruption convictions of public officials	0.341 (0.313)	0.334 (0.201)	Total number of federal, state, and local government officials convicted in federal court of corruption per 100,000 residents	US Department of Justice, Public Integrity Section
State government employee wages / Personal income	0.0260 (0.010)	0.019 (0.001)	wage and salary disbursements for state government employees as a share of personal income	BEA
Public sector employees / Total employment	0.177 (0.042)	0.158 (0.007)	Federal, state, and local government employees as a share of total employment	Union Membership and Coverage Database (unionstats.com). Description in Hirsch and Macpherson (2003).
Public sector union members / Public sector employees	0.361 (0.174)	0.599 (0.029)	Federal, state, and local government union members as a share of public sector employees	Union Membership and Coverage Database
Public sector collective bargaining coverage / Public sector employees	0.417 (0.171)	0.646 (0.020)	Federal, state, and local government employees covered by a collective bargaining agreement as a share of public sector employees	Union Membership and Coverage Database
Right-to-work law for public sector employees	0.342 (0.474)	0.000 (0.000)	=1 if state has a right-to-work in place for public sector employees, =0 otherwise	NBER Public Sector Collective Bargaining Law Data set (nber.org/publaw)
Card check law for public sector employees	0.019 (0.137)	0.192 (0.401)	=1 if state has a "card-check" law in place for public sector employees, =0 otherwise	Chandler and Gely (2011)
Collective bargaining prohibited	0.184 (0.387)	0.000 (0.000)	=1 if state prohibits collective bargaining by public sector employees, =0 otherwise	NBER Public Sector Collective Bargaining Law Data set
Employer authorized to bargain	0.140 (0.347)	0.000 (0.000)	=1 if state is authorized but not required to bargain, =0 otherwise	NBER Public Sector Collective Bargaining Law Data set
Employer has duty to bargain	0.576 (0.494)	1.000 (0.000)	=1 if state has a duty to bargain with union, =0 otherwise	NBER Public Sector Collective Bargaining Law Data set
Strike prohibited	0.458 (0.498)	1.000 (0.000)	=1 if state allows public sector collective bargaining and prohibits public sector strikes, =0 otherwise	NBER Public Sector Collective Bargaining Law Data set
Strike permitted	0.206 (0.404)	0.000 (0.000)	=1 if state allows public sector collective bargaining and permits public sector strikes, =0 otherwise	NBER Public Sector Collective Bargaining Law Data set

Notes: The Chubb Relative Value Study, which is the source of our dependent variable, excludes the following states: Arizona, Arkansas, Colorado, Idaho, Indiana, Iowa, Kansas, Kentucky, Nebraska, South Dakota, and Wyoming. After transforming the data into deviations from New Jersey, the sample includes 988 observations (38 states and 26 years).

Table 5: Effect of Public Sector Union Membership on State Bond Yields

	Model A	*Model B*	*Model C*	*Model D*
Constant	-46.793***	-41.948***	-35.436***	-35.213***
	(7.444)	(7.554)	(7.317)	(7.240)
Unemployment rate (rate *100)	4.184***	4.119***	4.382***	4.409***
	(0.354)	(0.367)	(0.346)	(0.344)
Real per capita personal income	-0.001	-0.001	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
General fund revenue / Personal income	69.828***	80.913***	67.611***	63.784***
	(22.119)	(26.788)	(23.243)	(22.732)
Debt outstanding / Personal income	-0.062	-0.028	-0.081	-0.046
	(0.355)	(0.366)	(0.391)	(0.368)
Top individual marginal income tax rate	1.081***	1.130***	0.653**	0.564*
	(0.286)	(0.286)	(0.290)	(0.288)
Unified Democrat control	-0.086	0.188	1.222	0.886
	(0.770)	(0.805)	(0.821)	(0.816)
Unified Republican control	-1.169	-0.792	-1.887	-1.456
	(1.475)	(1.604)	(1.613)	(1.619)
Government ideology	-0.029	-0.024	-0.052**	-0.047**
	(0.021)	(0.022)	(0.022)	(0.022)
Citizen ideology	0.087**	0.110**	0.060	0.070*
	(0.042)	(0.043)	(0.041)	(0.041)
Government savings	-0.048	-0.056	-0.088**	-0.079**
	(0.040)	(0.045)	(0.039)	(0.038)
Balanced budget rule	-34.467***	-33.186***	-31.558***	-30.659***
	(3.417)	(3.655)	(3.463)	(3.474)
Expenditure limitation law	0.037	-1.799	-0.863	-0.382
	(1.568)	(1.768)	(1.445)	(1.466)
Revenue limitation law	6.228***	2.724	8.218***	7.959***
	(2.184)	(2.055)	(2.242)	(2.274)
Debt limit law	-13.692***	-21.817***	-19.450***	-18.414***
	(2.886)	(3.077)	(2.977)	(2.973)
Corruption convictions of public officials	-0.762	-0.384	-1.150*	-1.001
	(0.626)	(0.618)	(0.650)	(0.645)
State government employee wages / Personal income		-249.509		
		(194.947)		
Public sector employees / Total employment			-46.187***	-44.140***
			(16.909)	(16.784)
Public sector union members / Public sector employees			25.807***	
			(5.633)	
Public sector collective bargaining coverage / Public sector employees				28.379***
				(5.124)
(Pseudo) Adjusted R-Squared	0.371	0.368	0.384	0.386
Overall F-statistic	15.183***	14.719***	15.350***	15.415***
F-statistic for joint significance of fixed time effects	36.347***	36.313***	36.270***	36.271***

Notes: Standard errors reported in parentheses. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level. Each model includes fixed year effects that are not reported. Models were corrected for state-specific, first-order serial correlation, state-specific heteroskedasticity, and cross-state correlation. Estimation was by feasible generalized least squares.

Table 6: Effect of Public Sector Collective Bargaining Laws on State Bond Yields

	Model E	Model F	Model G	Model H
Constant	-21.025***	-18.668**	-17.426**	-22.232***
	(7.411)	(7.318)	(7.246)	(7.398)
Unemployment rate (rate *100)	3.538***	3.393***	3.409***	3.504***
	(0.356)	(0.347)	(0.344)	(0.364)
Real per capita personal income	-0.002**	-0.002***	-0.002***	-0.002***
	(0.001)	(0.001)	(0.001)	(0.001)
General fund revenue / Personal income	31.228	39.346*	37.524*	63.779**
	(21.162)	(22.004)	(21.506)	(24.801)
Debt outstanding / Personal income	-0.078	-0.110	-0.092	-0.050
	(0.415)	(0.396)	(0.381)	(0.392)
Top individual marginal income tax rate	0.665**	0.486*	0.457	0.486
	(0.301)	(0.287)	(0.286)	(0.298)
Unified Democrat control	1.076	0.895	0.648	1.054
	(0.792)	(0.754)	(0.756)	(0.789)
Unified Republican control	-2.025	-2.227	-2.000	-1.667
	(1.597)	(1.482)	(1.495)	(1.629)
Government ideology	-0.047**	-0.048**	-0.045**	-0.036*
	(0.021)	(0.021)	(0.021)	(0.021)
Citizen ideology	0.011	-0.007	-0.002	0.019
	(0.040)	(0.038)	(0.038)	(0.040)
Government savings	-0.016	-0.049	-0.047	-0.050
	(0.036)	(0.036)	(0.035)	(0.040)
Balanced budget rule	-22.733***	-17.471***	-16.203***	-24.363***
	(3.405)	(3.367)	(3.376)	(3.513)
Expenditure limitation law	2.151	1.744	1.947	2.040
	(1.382)	(1.248)	(1.241)	(1.519)
Revenue limitation law	5.788***	7.123***	7.028***	4.444**
	(2.209)	(2.314)	(2.364)	(2.110)
Debt limit law	-9.761***	-4.210	-4.312	-16.727***
	(3.066)	(2.867)	(2.863)	(3.208)
Corruption convictions of public officials	-0.941	-0.918	-0.903	-0.639
	(0.586)	(0.586)	(0.586)	(0.577)
State government employee wages / Personal income				-394.614**
				(184.630)
Public sector employees / Total employment		-58.242***	-56.600***	
		(15.527)	(15.413)	
Public sector union members / Public sector employees		16.388***		
		(5.344)		
Public sector collective bargaining coverage / Public sector employees			20.556***	
			(4.822)	
Right-to-work law for public sector employees	-16.493***	-11.214***	-10.184**	-21.135***
	(4.641)	(4.223)	(4.245)	(4.804)
Card check law for public sector employees	2.038	2.132	2.215	2.012
	(2.948)	(2.739)	(2.761)	(2.783)
Collective bargaining prohibited (Category 1)	-14.202**	-15.959***	-16.156***	-14.091**
	(5.589)	(5.200)	(5.267)	(5.832)
Employer authorized but not required to bargain (Category 2,3,4)	-14.849**	-13.243**	-13.010**	-13.561**
	(5.897)	(5.702)	(5.711)	(5.842)
Employer has a duty to bargain (Category 5,6)	7.465	9.171	9.341	9.333
	(6.385)	(6.261)	(6.267)	(6.345)
Strike prohibited (Category 1,2)	-0.870	-4.204	-4.559	-3.306
	(6.249)	(6.154)	(6.155)	(6.177)
Strike permitted	-7.792	-9.060	-9.453	-12.820*
	(6.801)	(6.447)	(6.444)	(6.945)
(Pseudo) Adjusted R-Squared	0.438	0.441	0.442	0.436
Overall F-statistic	17.040***	16.598***	16.665***	16.618***
F-statistic for joint significance of fixed time effects	36.084***	36.009***	36.009***	36.050***

Notes: Standard errors reported in parentheses. *** denotes significance at the 1 percent level, ** at the 5 percent level, and * at the 10 percent level. Each model includes fixed year effects that are not reported. Models were corrected for state-specific, first-order serial correlation, state-specific heteroskedasticity, and cross-state correlation. Estimation was by feasible generalized least squares.

Table 7: Reduction in State Borrowing (Interest) Costs Due to Collective Bargaining Laws, Per $10,000,000 in Government Debt

	Model E	Model F	Model G	Model H
Right-to-work law exists	$569,697	$389,235	$353,819	$726,935
	7.1%	4.8%	4.4%	9.0%
Collective bargaining prohibited	$491,595	$551,522	$558,229	$487,803
	6.1%	6.8%	6.9%	6.1%
State has no requirement to bargain	$513,685	$458,804	$450,829	$469,684
	6.4%	5.7%	5.6%	5.8%

Note: Assumes a 20-year bond, where the rate of return compared to a 3 percent benchmark is calculated using the coefficient estimates in Table 6.