Political and Institutional Determinants of Tax-Exempt Bond Yields
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Abstract

Political-institutional factors—such as the political composition of state legislatures, and interstate variations in public sector labor environments, such as union strength, and collective bargaining rights—can explain a significant proportion of interstate variation in bankruptcy risk. We find that, controlling for multiple economic variables, states with weaker unions, weaker collective bargaining rights, and fewer Democratic state legislators pay less in borrowing costs absolutely, and less in borrowing costs at similar levels of unexpected budget deficits, than do states with stronger unions and a higher proportion of Democrats

Introduction and Context

For the first time since the Great Depression, multiple U.S. states might effectively go bankrupt, and find themselves unable to pay their employees or their bondholders. As early as March of 2010, the *Wall St. Journal* asked "Who Will Default First: Greece or California?," and in testimony before the *Congressional Financial Crisis Inquiry Commission*, investor Warren Buffett—who owns more than $4 billion of state and local debt—stated that the federal government may ultimately be compelled to bail out states.[1]

If the failure of commercial banks posed a 'systemic risk' in 2008, it will be difficult to argue that U.S. states are not 'too big to fail' in 2011: State and local governments represent more than 12% of the nation's GDP, and more than 15% its employment.[2] As many as one million public employees stand to lose their jobs in 2011 if the federal government does not step in.[3] The municipal bond market is more than $3 trillion in size, and state and local governments use it to finance their schools, highways, and other projects. More than two thirds of outstanding state and local debt is held by small investors and public institutions.[4] Should states require a bail out by the federal government in 2011, it would likely rival the 2008 bailout of the U.S. banking system.

Arguments are already being made against such a bail-out, ranging from the problem of moral hazard, to the fact that it would likely change forever the face of American federalism—which historically privileged the fiscal autonomy and independence of states as a defining feature of the federal system. Unprecedented alternatives are being sought: The *New York Times* recently reported that lawmakers are looking for ways to circumvent existing constitutional jurisprudence, so as to allow States to declare bankruptcy (they currently cannot).[5] [6]

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[1] http://www.reuters.com/article/2010/05/01/berkshire-buffett-ratings-idUSN0118355720100501

[2] http://www.cbsnews.com/stories/2010/12/19/60minutes/main7166220.shtml

[3] Ibid

[4] Ibid

[5] http://www.nytimes.com/2011/01/21/business/economy/21bankruptcy.html

[6] Strictly speaking, states cannot declare 'bankruptcy' (Chapter 9 of the U.S. Bankruptcy Code). In this discussion, following (Poterba and Rueben 2001) and the terminology of the field, I use the terms 'yields,' 'spreads,' 'borrowing costs,' and 'default risk' interchangeably. The yields on state bonds are the 'risk premia' that investors demand to hold state debt versus safer U.S. Treasury counterparts. They can also be understood as the 'interest rate' a state has to pay its bondholders to hold its state bonds, and thus yields directly translate into state borrowing costs, since higher bond yields in state A versus state B mean that state A has to pay a higher periodic interest payment on its principal than does state B to borrow the exact same amount of money from the bond market. The 'spread' of a state's or group of state's bonds are the difference between the yield of its bonds and the yield of the bonds in the relevant 'benchmark' (in the case of U.S. state bonds, U.S. government bonds). As the 'spreads' (yields) of a group of bonds increase over the yields of the benchmark, this means that they are being priced by bond markets as increasingly riskier than the benchmark. Market practitioners and academic economists thus use the terms 'yields', 'spreads,' and 'borrowing costs' interchangeably, and this set of terms can themselves be interchanged with the term 'default risk,' since the yield or spread of a bond (and thus the borrowing cost of the bond issuer) is a market-based assessment of the default risk of the bond (the likelihood that the bond issuer will be unwilling or unable to pay to the bondholder the face value of the bond when it comes up for maturity, or required periodic interest payments prior to maturity), with higher yields or spreads (and thus higher borrowing costs to the bond issuer) implying a greater market-assessed probability of default by the issuer. But yields are not, strictly speaking, only *predictive* of default risk. As yields increase, government borrowers find themselves paying more 'interest' on their borrowed funds, increasing their existing debt service burden, and thus making it more likely, from the perspective of *solvency*, and not just abstract probability, that they will default on their debt payments, *vis a vis* a situation in which lower yields (interest payments) were demanded by the market to maintain the same debt burden.

But the pressure is building: By the summer of 2011, $160 billion in federal stimulus money—given to states and local governments during the financial crisis to keep them afloat—will run out.[7] The average U.S. state budget faces roughly a 20% deficit heading into 2011, with states like New Jersey and Illinois projecting 40% and 50% shortfalls, respectively.[8]

This report investigates which states face the highest risk of 'bankruptcy' in the wake of the financial crisis, and why. More precisely, it investigates how state-level institutional factors—such as the political composition of state legislatures and interstate variations in public sector labor environments—mediate the bond market's reaction to unexpected state budget deficits, such as those encountered in the wake of the recent financial crisis (Cf. Poterba and Rueben 2001).

The 2008 financial crisis—and the general economic stress the nation has faced ever since—has increased the yields on state bonds (the 'risk premium' that investors demand to hold state debt versus U.S. Treasury counterparts) and widened interstate differentials in borrowing costs. In investigating which factors explain inter-state variance in default risk—as measured by state general obligation debt yields, we find that in the wake of the crisis, 'political' variables—particularly the extent to which public employees enjoy collective bargaining rights, the level of public sector union membership in a state, and the percentage of state legislators who are Democrats—explain a significant amount of the interstate variance in market-based measures of 'default risk,' and explain a significant amount of the interstate variance in bond market reactions to unexpected deficit shocks.

The Fiscal Crisis

Almost all states are facing considerable and unexpected budget deficits in the wake of the recent financial crisis, though the states vary widely in the size of their deficits. (Table 1). Large and populous states like New Jersey, Texas, California, and New York, are facing deficits of 38 percent, 32 percent, 29 percent, and 18 percent, respectively, while states such as Virginia and North Carolina are facing deficits of around 13 percent. Several states, such as Alaska and Montana, are not facing deficits, however they tend to be resource-rich states with very small populations.

Already spending far more than they were taking in before the financial crisis—U.S. state spending nationwide between 2000-2008 grew 60 percent while revenues grew 45 percent—U.S. states, with little savings—and substantial commitments to public sector employees and pensioners—were hit particularly hard by the global economic slowdown that began in 2007. In the two years since the collapse of the U.S. banking system U.S. states have collectively spent nearly a half a trillion dollars more than they collected in taxes, and face an additional trillion dollar shortfall in their public pension funds. For Fiscal Year 2011 alone, the gap in state budgets totaled $121 billion, or 19 percent of budgets in 46 states. Without federal assistance, the total shortfall in state budgets will soon reach $140 billion. This study investigates which political, institutional, and public sector labor environments mediated bond market reactions to these fiscal shocks in the wake of the financial crisis.

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[7] http://www.cbsnews.com/stories/2010/12/19/60minutes/main7166220.shtml
[8] Ibid

Diverging Bond Yields, Government Borrowing Costs, and Risk of Default: Puzzle and Hypothesis

The fiscal uncertainty of U.S. states following the financial crisis has lead to substantially higher borrowing costs for state governments. The borrowing costs of every state increased exponentially during the global credit seizure of fall 2008 (see Figure 1). Between September and December of 2008, the premium that investors demanded to hold California debt over U.S treasuries jumped from 24 basis points to 271 basis points, a ten-fold increase and an all-time record. But while some states, such as Massachusetts, have seen their borrowing costs return to pre-crisis levels, others, like California, face borrowing costs that remain near all-time highs. The interstate differences in borrowing costs have widened substantially as well.

In September of 2008, prior to the global credit seizure, the difference between the premium that investors demanded to hold California debt over Texas debt was 15 basis points. But as of the beginning of 2011, California was paying 84 basis points more on their general obligation debt than was Texas, almost a six-fold increase. In fact, in the wake of the financial crisis, the borrowing costs of some states—such as Illinois and California—stood at levels more comparable to the borrowing costs of countries facing sovereign debt crises—such as Greece and Ireland—than to the borrowing costs of the other states within the Union.

The wide and still-persistent disparities in state borrowing costs since the financial crisis reflect divergent economic conditions, but they may also reflect more systematic factors, such as differences in state political institutions and public sector labor environments.

These 'political' factors might signify to the bond market whether a state government has the *willingness* and *capacity* to initiate needed fiscal adjustments and austerity measures during the state fiscal crises that followed the financial crisis, and thus might provide some information to market participants about the likeliness that a given state government will choose to default on its debt instead of making politically difficult or undesirable budget cuts. Similarly, public sector labor environment variables, such as union strength, might signify to market participants the degree of organized political opposition state lawmakers would have to overcome to implement such austerity measures. Therefore we would expect states with weaker unions and fewer left-leaning state legislators to pay less in borrowing costs at similar levels of debt and similar levels of unexpected fiscal shock than states with stronger unions and more left-leaning legislators, since market participants would view these latter states as less politically willing to, or capable of, implementing austerity measures in the wake of an unexpected shortfall in revenue, and thus as a higher credit risk, all else being equal.

Data and Methodology

Data

To investigate whether political factors can explain inter-state variance in borrowing costs and default risk, we obtained Bloomberg's *State General Obligation Municipal Yield Curve* Data[9]—the market-based measure of state bond yields widely used by market

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[9] Bloomberg's state municipal curves are constructed with G.O. bonds that are issued by the state, as well as municipalities that are within the state, so long as they have the same average rating as the state General Obligation Bonds.

participants—for every state[10] for which Bloomberg compiles such data (i.e. those economically significant enough to have a highly liquid government bond market). These turn out to be the twenty economically largest states, and together they make up about 80 percent of the U.S. economy in terms of real GDP[11]. Specifically, we obtained the daily closing price in basis points of the one, five, and ten year Bloomberg *State General Obligation Municipal Yield Curves* for every trading day since 2004.

While our dependent variable is the default risk of a state—which we measure using the spread of a synthetic[12] one, five, and ten year bond issued by each state, as reported by Bloomberg, we also employ controls for general economic conditions within the states, so as to distinguish the effects of economic variables—such as the overall size of the state economy—on interstate variation in default risk, from the effects of political-institutional variables, such as changes in legislative composition, or union strength.

Our measured effect of political institutions controls for a state's general economic health with several economic variables: state real gross domestic product (GDP), state budget deficit to state real GDP, and state unemployment rates. Those three control variables were selected after preliminary tests, as they were the three economic variables with the greatest effect in explaining our dependent variable. The list of economic variables considered and tested include state population estimate, real GDP, GDP per capita, state debt to GDP, state budget deficit to GDP, unemployment rate, state tax burden, and property tax base as a percentage of state revenue.

Our independent variables of interest include cross-state variations in political and public-sector labor characteristics. Among various political institutions, we are interested in whether political party affiliation of a state's governor and dominant political orientation of a state's legislature is associated with a state's risk of default. We also test for a number of other variables: number of years for which the current ruling party has been ruled as a governor of the state, Democratic vote share margin of victory in the election when the incumbent governor was elected, and number of years left until the next gubernatorial election. Among public-sector labor environments we are interested in whether the proportion of public sector employees in a state who are unionized and the strength of collective bargaining in that state are associated with a state's risk of default. Generally, we are interested in whether 'union strength' in a state associated with a state's risk of default. We find that the two most salient measures of 'union strength', collective bargaining rights and union membership, are highly associated (see Figure), as would be expected, and both variables turn out to be highly associated with a state's risk of default (see discussion below). Since both variables are essentially measuring the same phenomena, we include only one at a time in any given regression, and generally, in our discussion of the results, we treat public sector union membership as our proxy for 'union strength' in a state, since it is ordinal as opposed to binary (the case for state level collective bargaining rights), and thus allows for more statistically rigorous testing, but it should be noted that the significance of public sector union membership should be treated as a derivate proxy for the significance of collective bargaining rights in a state, and again these are very highly correlated. The full list of public-sector labor

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[10] California, Connecticut, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, Wisconsin

[11] Seventy seven percent in 2007

[12] Bloomberg State General Obligation Yield Curves are aggregate instruments which represent a hypothetical bond of a given maturity class, as opposed to any actual particular bond. These synthetic measures are used by market participants because aggregate measures avoid liquidity-based price-distortions that can affect any given individual bond (See Poterba and Rueben 2001).

variables we test for includes the presence of right to work laws, collective bargaining rights, rights to strike, applied to state employees in a state, and the proportion of public sector employees in a state who are unionized.[13] For a list of data sources, please see the appendix.

Method

Our empirical strategy builds upon Poterba and Rueben (2001). It aims to answer the following question; during the financial crisis, what institutional environments place the twenty largest states in the United States at increased risk of sub-sovereign default? To answer this question, we rely on multiple regression analysis, as described below.

Among various economic variables, we control for the three economic variables that turn out to have the most significant effect on dependent variable: unemployment rate, the overall size of a state's economy measured by real GDP, and state budget deficit to GDP. Specifically, we rely on the two empirical models: (1) A standard multiple regression analysis of the determinants of state bond yields,

$$R_{i,t+1} = \alpha + \beta_1 Z_{it} + \beta_2 X_{1t} + \varepsilon_{1t} \tag{1}$$

hereafter, '**Model 1**' (we ran model 1 separately for before and after the global credit market seizure—Fall 2008—to see whether a change in the component determinants of state bond yields was associated with the crisis), (2) and an adaptation of the deficit interaction model of Poterba and Rueben (2001),

$$\Delta R_{i,t+1} = \alpha + \beta_1 \Delta Defshock_{it} + \beta_2 \Delta(Defshock_{it} Z_i) + \beta_3 \Delta X_{1t} + \Delta \varepsilon_{1t} \tag{2}$$

hereafter, '**Model 2**,' where in both models R_{it} denotes the difference between the Treasury yield and the yield on bonds issued by each state. We use bonds with 5-year maturity. X_{it} and Z_i are economic covariates and institutional environments of state i in fiscal year t, respectively and Δ denotes time-difference operator. For the institutional variables Z_i, we use an average level of those variables during the time span of our analysis so that ΔZ_i is cancelled out. $Defshock_{it}$ is unexpected deficit shock in a given fiscal year t in state i, which is defined as follows.

$$Revshock_{it} = Actual\ revenue_{it} - \Delta Tax_{it} - Forecast\ revenue_{it} \tag{3}$$

$$Expshock_{it} = Actual\ outlays_{it} - \Delta Spend_{it} - Forecast\ outlays_{it} \tag{4}$$

$$Defshock_{it} = Expshock_{it} - Revshock_{it} \tag{5}$$

where ΔTax_{it} and $\Delta Spend_{it}$ are the change in tax revenue and spending during fiscal year t that are enacted during that fiscal year. Thus, the unexpected deficit shock equals the difference between unexpected revenue and unexpected expenditure. Each component is defined by the difference between forecast revenues or expenditures at the beginning of the fiscal year and the revenues or expenditures that would have been collected during the fiscal

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[13] Those data come from the NBER Public Sector Collective Bargaining Law Data Set and we use information from 1996 or, when data for 1996 were not available, from 1991, the most recent year otherwise.

year, given actual economic conditions (See Poterba and Rueben 2001 for further information). We match the right-hand side variables of year *t* with the left-hand side dependent variable in June of year *t+1*, allowing the fact that there might be some delays in market response. However, our results are highly robust and do not depend on whether we use lagged dependent variables or not.

Both models attempt to test whether and how the financial crisis changed the component determinants of state bond yields; Model 1 does this by running separate regressions pre- and post- the exogenous global credit market seizure, which is identifiable in time (Fall 2008), whereas Model 2 undertakes the same test more formally, by measuring how various institutional factors *mediated* the bond market reaction to the fiscal shocks that were associated with the crisis, where they occurred. Thus while both models produce highly similar and complimentary results, model 2 more precisely measures the mechanism or 'channel' through which the crisis operates (fiscal shocks) and in association with which institutional factors come to have very significant effects, and it allows us to measure accurately the scope of the effect of an institutional factor per unit of additional 'crisis effect' (i.e., fiscal shock). Thus model 2 aims to estimate the institutional circumstances under which an unexpected deficit shock is more easily transmitted to state's risk of default, as perceived by credit markets.

In examining whether public sector union membership and Democratic party share in the state legislature have an impact on the association between unexpected deficit shock and a state's risk of default, we test variable Z_i, the average public union membership and Democratic party share of the legislature in the given state during 2007-08.

Findings

Our three central findings are as follows:

1) **Periods of general economic stress, such as the 2008 financial crisis, tend to widen the interstate differentials in the state bond market and increase the spreads of state bonds over U.S. Government counterparts;**

2) **Once that happens, the bond market pays as much—or even more—attention to political factors as to economic factors;**

3) **The two political factors the bond market pays most attention to are public sector union strength in a state (as measured by public sector union membership and strength of collective bargaining rights) and the proportion of Democrats in the state legislature. These two variables explain a significant amount of the interstate variance in default risk absolutely, and make it more likely that an unexpected deficit shock or unemployment shock in a state will be transmitted to that state's risk of default.**

The result reported in Table 3 and 4 show that, controlling for a range of economic variables, high public sector union membership, strong collective bargaining rights, and a strong Democratic orientation in the state legislature were associated with increased yields, reflecting higher default risk. The result reported in Tables 2, 5, and 6 show that high public sector union membership in a state and a strong Democratic orientation in the state legislature were associated with an increased likelihood that a state's unexpected deficit shock and/or unexpected increase in unemployment would be transmitted to bond market perceptions of a

state's risk of default. During and after the financial crisis we find strong evidence that measures of 'union strength' in a state—the proportion of public sector employees who are unionized, and collective bargaining rights given to public employees—is significantly associated with interstate variation in bond yields and risk of default, as is the proportion of Democrats in the state legislature.

When the financial crisis broke in June 2008, the impact of the shock on the state and local bond market was immediate, as is shown in Figure 1.

As that figure shows, rates of return on state bonds before the financial shock trailed those for Treasury securities because federal taxes need not be paid on the returns from most state and municipal bonds. But after the financial crisis, the spread between state and federal bonds turned from negative to positive, as the relative risk from state investments outweighed any tax advantages. Further, the variation among states in the spread between its bonds and those of the federal securities increased dramatically, as some states were perceived to be at much greater risk of default than others.

Significantly, the perceived risk of default was correlated with the share of the public-sector workforce that was unionized. In June 2008, prior to the financial crisis, the simple relationship between union membership and default risk was only modest, but over the next six months that relationship became noticeably stronger. This is shown in Figure 2. On the vertical axis is displayed the spread between federal securities and state bonds with a one-year maturity for the twenty states for whom daily yield spreads are publicly available, while the horizontal axis displays the share of the state's public-sector workforce that is unionized. The relationship between the two variables, modest in June 2008, becomes pronounced by June 2009, as bondholders became highly sensitive to a state's perceived political capacity to take actions needed to bring budget deficits under control. The differences in the steepness of the slopes taken by the regression lines in Figure 2 describe the strengthening of the simple relationship between the union share of the public-sector workforce and default risk.

A similar presentation of the simple relationship between yield spreads and the partisan composition of the state legislature is displayed in Figure 3. Prior to the financial crisis, bondholders appear to have seen an increase in default risk if the Democratic party share of the state legislature was larger. But after the financial crisis that relationship attenuates even though yield spreads widened. Appearances are misleading, however, as becomes evident when one makes an unbiased estimate that adjusts for economic factors that were also affecting yield spreads.

The summary results from such an analysis are displayed in Table 2. Here, unbiased estimates of the impact of political variables on state default risks are estimated by identifying the relationship in the context of an unexpected fiscal shock.[14] As mentioned, this analysis adjusts for economic factors that Poterba and Rueben have shown to be associated with a state's default risk—change in a state's unemployment rate, the growth in its Gross Domestic Product (GDP), and the change in its deficit to GDP ratio.[15]

As can be seen in Table 2, changes in the unexpected deficit shocks of the size that took place in 2008 do not directly affect a state's yield spread. The market seems to recognize that such changes in deficit shocks can occur and do not necessarily imply an

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[14] Since the relationship between decisions to issue state bonds and yield spreads are endogenous, an unbiased estimate of the factors affecting yield spreads cannot be obtained by a ordinary least squares regression. However, if a change in the size of the deficit is unexpected, the demand for credit changes regardless of the price of the bond, permitting unbiased estimates.

[15] James M. Poterba and Kim Rueben, "Fiscal News, State Budget Rules, and Tax-Exempt Bond Yields" (2001). *Journal of Urban Economics* 50 (2001), 537-562.

increase in the state's risk of default. But changes in deficit shocks do affect yield spreads under certain political conditions. In Table 2 estimates of the impact on yield spreads of the union share of the workforce and partisan representation in the legislature are presented in separate models, because unionism and partisan balance are highly correlated with one another, making it difficult, with the small number of observations available, to identify the independent impact of each within a single model. But as can be seen in Table 2, once economic determinants of default risk are controlled, it becomes apparent that bondholders see additional risks if the political situation within a state is unfavorable. A one percent difference in union membership in a state is associated with an additional 2.02 basis point change in state borrowing costs, if the state has experienced a billion dollar change in its unexpected deficit shock. In other words, a twenty percentage point difference in the share of the public-sector workforce that is unionized (one standard deviation) is associated with an additional increase in the level of state bond spreads of 40.4 basis points, if a state has suffered an unexpected deficit shock change of a billion dollars.

Similarly, a one percentage point increase in the Democratic share of the state legislature is associated with an additional 3.02 basis point increase in state borrowing costs if a state has experienced a change in its unexpected deficit shock of a billion dollars. That implies that a twenty percentage point increase in the Democratic share of the legislature is associated with an increase of 60.4 basis points in the yield spread in the context of a billion dollar deficit shock. The cost to the state taxpayer of a standard deviation shift in either variable is, roughly speaking, about one half of one percent on a five-year security note. That amount is non-trivial. In Illinois, an increase in the yield spread of that magnitude on its debt of $145.5 billion amounts to $727 million dollars in additional interest costs annually.

These two indicators of political situation within a state—union share of the public-sector workforce and partisan representation in the legislature--should not be reified. They are best understood as indicators of a broader set of factors that affect a state's default risk.[16] As mentioned, the union share of the public-sector workforce is unionized is correlated with such factors as whether or not the state is a right to work state and whether collective bargaining in the public sector has been legalized, both of which are associated with bond yield spreads. Similarly, the overall share of the legislature that is Democratic is highly correlated with the percentage Democratic in each house of the legislature, which also are correlated with bond yield spreads. (However, it is worth noting that the partisan affiliation of the governor is not correlated with yield spreads, suggesting that governors have broader constituencies than do members of the legislature.)

So the two interval variables emphasized here—union share and Democratic share — should be understood as useful proxies for a broader set of collective bargaining and partisan factors that affect bond yields. Each has their own, strong correlation with bond yield spreads that occur in the wake of a financial crisis. Also, as one might expect from the key role that public sector unions play within the Democratic coalition, the two variables are highly correlated with one another. As a result, within a single regression, the effect of each cancels out the perceived effect. For that reason, Table 2 presents two separate models, one showing the significance of union membership, the other showing the significance of the composition of the state legislature.

Economic factors—economic growth, change in the deficit to GDP ratio, and change in the unemployment rate—have their own impact on yield spreads, as economists have

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[16] By contrast, we found that variations in state expenditures on Medicaid, a highly redistributive program that might be considered a default risk factor, were not correlated with yield. Apparently, bondholders think such expenditures can be managed more easily than deficits generated by obligations incurred in the course of collective bargaining agreements.

previously shown. But separate and apart from their impact, political factors also are taken into account by bondholders. When both are entered into the same equation, the political variables seem to be at least as important as growth in GDP and changes in unemployment rates.

Model 1

Simple Multiple Regression of Determinates of State Borrowing Costs Pre- and Post-Crisis, Without Fiscal and Unemployment Shock Interactions

Public sector union membership

Using simple multiple regressions, we find that in the wake of the financial crisis, public sector union membership is positively associated with state default risk, and the result is highly robust (Table 3 & 4). An increase in public sector union membership by ten percentage points increases the level of state bond spreads by about four percent points. In fact, this result suggests that public sector union membership explains a large part of the interstate variations in default risk in the wake of the financial crisis. For example, an interstate variation of one standard deviation in public sector union membership is about twenty percentage points, which is associated with a variation of eight basis points in state bond spreads. This is comparable with the effect of an interstate variation of one standard deviation in the state unemployment rate, and with the effect of an interstate variation of one standard deviation in the a state's budget deficit to GDP ratio[17].

Right to work law & Collective bargaining rights

In addition to public sector union membership, we also examined whether public sector legal institutions are associated with states' risk of default, and find an especially strong association between right to work laws and collective bargaining rights on the one hand, and state borrowing costs on the other (Table 4). In the post crisis period, the presence of right to work laws in a state (laws which diminish the power of unions by allowing public employees to circumvent the collective bargaining process) was associated with an 18.18 basis point decrease in borrowing costs versus states in which right to work laws were not present. Similarly, in the wake of the crisis, the presence of collective bargaining rights in a state was associated with a 23.14 basis point increase in borrowing costs, reflecting higher default risk.[18]

Public sector labor institutions are significantly associated with public sector union membership as shown in the Figure 4. Among the twenty economically largest states in the U.S., states where the right to work law does not apply to public employees (or where employers have a duty to bargain) had about forty percent greater public sector union membership in 2008 than did 'right to work' states. Thus, as mentioned above, much of the

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[17] A cross-state variations of one standard deviation in real GDP is associated with a variation of about twenty percentage points in level of spread.

[18] Each of the labor institutions are coded as follows.
- Collective bargaining right is coded 1 if the employer has a duty to bargain whether implicit or explicit, and 0 otherwise.
- Right to work law is coded 1 if a state has a right to work law applying to public employees and 0 otherwise.
- Right to strike is coded 1 if strike is permitted (with qualifications) and 0 otherwise.

effect of public sector labor institutions in a state is measuring the same underlying effect as the proportion of public sector union membership in a state, and vice versa.

Democratic party share in state legislatures

We also tested whether the party affiliation of the governor or the state legislatures is associated with a state's risk of default, and find that only party affiliation of state legislatures has a significant effect (Table 3): A 1% increase in Democratic party share in state legislatures is associated with a .288 basis point increase in state borrowing costs in the pre-crisis period and a .495 basis point increase in state borrowing costs in the post-crisis period, reflecting higher default risk.

Model 2

Multiple Regression of Determinates Mediating Bond Market Reactions to Unexpected Deficit and Unemployment Shocks.

Now following the Poterba and Rueben (2001) methodology, we test how state-level political and labor factors, such the political orientation of governors, the political composition of state legislatures, and state-level public sector labor environments, mediate the bond market reaction to unexpected state budget deficits, and unemployment shocks, such as those encountered in the wake of the recent financial crisis (Tables 2, 5 and 6). We find that high public sector union membership in a state and a strong Democratic orientation in the state legislature were associated with an increased likelihood that a state's unexpected deficit shock and unemployment shock would be transmitted to bond market perceptions of a state's risk of default. As stated earlier, we can see in this interaction model that political and public sector labor institutions have a significant effect in mediating the bond market's reaction to an unexpected state deficit shock. As can be seen in Table 5, once economic determinants of default risk are controlled, it becomes apparent that bondholders see additional risks if the political situation within a state is unfavorable. A one percent difference in union membership in a state is associated with an additional 2.02 basis point change in state borrowing costs, if the state has experienced a billion dollar change in its unexpected deficit shock. In other words, a twenty percentage point difference in the share of the public-sector workforce that is unionized (one standard deviation) is associated with an additional increase in the level of state bond spreads of 40.4 basis points, if a state has suffered an unexpected deficit shock change of a billion dollars.

Similarly, a one percentage point increase in the Democratic share of the state legislature is associated with an additional 3.02 basis point increase in state borrowing costs if a state has experienced a change in its unexpected deficit shock of a billion dollars.

To check the robustness of our findings, we carried out a further test by allowing for borrowing costs to be affected by interactions between changes in the state unemployment rate and the three political-institutional variables that turn out to be significant in Table 5. The result is shown in Table 6 and once again we find that the pattern of coefficients on the interactions between deficit shock and the three variables are consistent with what we find in Table 5. The only difference between Table 5 and Table 6 is that the coefficient on the interaction between unemployment rate and public union membership is significant, which suggests that an increase in the unemployment rate raises a state's borrowing cost more if the state has a high union membership on average. In sum, Table 6 supports our conclusion.

Conclusions

This would constitute some of the first empirical evidence that bond markets are not only considering, but are in fact *discounting* the presuppositions of classical rational choice models of political bargaining, i.e. the notion that instead of a classical economics story where 'only growth and employment matter,' 'political' factors might additionally signify to the bond market whether a state government has the *willingness* and *capacity* to initiate needed fiscal adjustments and austerity measures during a state fiscal crisis, such as the ones that followed the current financial crisis, and thus the likeliness that a given state government will *choose* to default on its debt instead of making politically difficult or undesirable budget cuts. It seems that discounting classical game theoretical models of budgetary bargaining and legislative 'blocks' (Cf. Alessina, 1998) public sector labor environment variables, such as union strength, might signify to market participants the degree of organized political opposition state lawmakers would have to overcome to implement such austerity measures. We find that, all things being equal, states with weaker unions, weaker collective bargaining rights, and fewer left-leaning state legislators pay less in borrowing costs at similar levels of debt and similar levels of unexpected budget deficits than do states with stronger unions and more left-leaning legislators. More practically, these findings suggest that the strength of public sector unions has become among the most important factors in bond market perceptions of a state's risk of financial collapse.

APPENDIX : DATA SOURCES

Variables	Details	Data Source
Spread (5-year maturity)	In basis points (unit = one basis point). Change in level of spread between June 30th 2008 and 2009	Bloomberg Data Stream, Bloomberg Terminal
Real GDP	Real Gross Domestic Product in 1000 billions USD	U.S. Bureau of Economic Analysis (BEA), Regional Economic Accounts, Gross Domestic Product (GDP) by State and Metropolitan Area, http://www.bea.gov/regional/index.htm
Unemployment rate	In percentage (unit = one percent)	Bureau of Labor Statistics (BLS), Local Area Unemployment Statistics, Unemployment Rate by State, http://www.bls.gov/lau/
Deficit to GDP	In percentage (unit = one percent)	U.S. Census bureau, State & Local Government Finance http://www.census.gov/govs/estimate/
Deficit shock	Change in Unexpected budget deficit shock in billions USD between Fiscal Year 2007 and 2008	The National Association of State Budget Officers (NASBO) Fiscal Survey of States Table A.1 & 2 http://www.nasbo.org/Publications/FiscalSurvey/FiscalSurveyArchives/tabid/106/Default.aspx
Party identity of Governor	Whether the Governor is a Democrat (1 if a Democrat, 0 otherwise)	State government websites
Party identity of state legislatures	The Democratic share of the legislature in percentage (unit = one percent)	National Conference of State Legislatures (NCSL), Party Composition of State Legislatures http://www.ncsl.org/Default.aspx?TabID=746&tabs=1116,113,776#1116
Union membership	Public union membership as a percentage of all public sector employees (unit = one percent)	Union Membership and Coverage Database from the Current Population Survey (CPS), II. State: Union Membership, Coverage, Density, and Employment by State and Sector http://www.unionstats.com/ For further information, refer to *Barry T. Hirsch and David A. Macpherson, "Union Membership and Coverage Database from the Current Population Survey" Industrial and Labor Relations Review, Vol. 56, No. 2, January 2003, pp. 349-54.*
Collective bargaining	Whether the State has the duty to bargain (1 if yes, 0 otherwise)	National Bureau of Economic Research (NBER) Collective bargaining Dataset http://www.nber.org/publaw/
Right to work	Whether right to work law is applied to public sector (1 if yes, 0 otherwise)	
Right to strike	Whether right to strike is permitted by law (1 if yes, 0 otherwise)	

Table A. 1. Summary Statistics

Variables	Num. of Obs.	Mean	Std. Dev.	Minimum	Maximum
Spread (5-year tenure bonds), June 30th 2008-June 30th 2009	20	7.5	32.4	-40.5	146.5
Collective bargaining right	20	0.7	0.5	0	1
Right to strike	20	0.2	0.4	0	1
Right to work	20	0.4	0.5	0	1
Party identity of the Governor	20	0.7	0.5	0	1
Union membership	20	39.6	20.8	8.1	70.5
Dem. share in Lower State Legislature	20	56.0	12.9	35.0	87.5
Dem. share in Upper State Legislature	20	53.3	13.8	35.0	87.5
Dem. share in State Legislature	20	54.7	12.8	35.0	87.2
Real GDP	20	5.0	3.9	1.5	17.8
Unemployment rate	20	5.3	1.1	3.0	8.3
Deficit to GDP	20	-0.8	2.2	-4.7	4.1
Unexpected Deficit Shock	20	-0.2	0.7	-1.5	1.7

Table 1. States with Projected FY2012 Gaps

States	FY12 Projected Shortfall as Percent of FY11 Budget (percent)
Nevada	45.2
New Jersey	37.4
Texas	31.5
California*	29.3
Oregon*	25
Minnesota	23.6
Louisiana	20.7
New York	18.7
Connecticut	18
South Carolina	17.4
Pennsylvania	16.4
Vermont	16.3
Washington	16.2
Maine	16.1
Florida	14.9
Illinois	14.6
Mississippi	14.1
Alabama	13.9
Colorado	13.8
Virginia*	13.1
Wisconsin	12.8
North Carolina	12.7
Arizona	11.5
Rhode Island	11.3
Ohio*	11
South Dakota	10.9
Maryland	10.7
Oklahoma	9.4
Nebraska	9.2
Kentucky*	9.1
Missouri	9.1
Kansas	8.8
New Mexico	8.3
Hawaii	8.2
Utah	8.2
Georgia	7.9
Delaware	6.3
Michigan	5.9
Massachusetts	5.7
District of Columbia	5.2
Idaho	3.9
Iowa	3.5
Indiana	2
New Hampshire	N/A
Tennessee	N/A
States Total	**17.6**

1. * Kentucky and Virginia have two-year budgets. They closed their FY2012 shortfalls when they enacted their budgets for the FY2011-FY2012 biennium. California's shortfall includes an $8.2 billion shortfall carried forward from FY2011. Oregon and Ohio's shortfalls are one half of the states' total projected shortfalls for the 2011-2013 biennium. Estimates of Ohio's two-year shortfall range from $6 to $8 billion. N/A means that a state is projecting a shortfall but its size is unknown.

2. Some states are not projecting shortfalls. Mineral-rich states — such as New Mexico, Alaska, and Montana — saw revenue growth in the beginning of the recession as a result of high oil prices. Only two states, North Dakota and Montana, have not reported budget shortfalls in any of the years since the crisis. Two other states — Alaska and Arkansas – faced shortfalls in fiscal year 2010 but have not projected gaps for subsequent years.

Source: Center on Budget and Policy Priorities,
<http://www.cbpp.org/cms/?fa=view&id=711>. Accessed 5/11/11.

Table 2. The Effect of Unexpected Deficit Shocks, Political, and Labor Institutions on Changes in State Bond Yields (Model 2)

	(1)	(2)
ΔDefshock	24.17	-11.02
	(14.25)	(11.51)
ΔDefshock **x** Union membership	2.02***	
	(0.61)	
ΔDefshock **x**Dem. share in State Legislature		3.02***
		(0.96)
ΔUnemployment rate	37.41	57.65*
	(23.11)	(27.48)
ΔReal GDP	131.5	-128.3
	(177.0)	(139.2)
ΔDeficit to GDP	8.598**	13.23***
	(3.335)	(4.267)
Constant	-100.3***	-131.9***
	(31.96)	(40.42)
N	20	20
R^2	0.702	0.723

1. Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
2. Data are for 2007-08 for 20 states.
3. Independent variables are change from 2007 (before crisis) to 2008 (after crisis) for 20 states, which include the 15 largest states.
4. Dependent variable has a 6 month lag and thus is a change from June 2008 to June 2009. We use a 6 month lag, allowing the fact that there might be some delays in market response. However, our results are highly robust and do not depend on whether we use lagged dependent variables or not.
5. The list of 20 states : California, Connecticut, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, Wisconsin

TABLE 3: Multiple Regression of Determinates of State Bond Yields, pre- and post- crisis. Political Institutions (Model 1)

	(1)	(2)	(3)	(4)	(5)	(6)
	Before crisis			After crisis		
Party identity of the Governor	-1.061 (3.485)	-1.661 (3.893)	-1.617 (3.585)	4.901 (5.154)	4.279 (5.468)	4.335 (5.184)
Democratic share in upper House	0.289** (0.105)			0.470** (0.171)		
Democratic share in lower House		0.235* (0.125)			0.440* (0.239)	
Democratic share in state legislature			0.288** (0.116)			0.495** (0.204)
Real GDP	0.696* (0.332)	0.546 (0.382)	0.604* (0.326)	5.876*** (0.517)	5.666*** (0.616)	5.766*** (0.539)
Unemployment rate	3.503** (1.606)	3.242* (1.652)	3.398* (1.613)	8.434** (3.279)	8.053** (3.249)	8.344** (3.264)
Deficit to GDP	-4.391** (1.948)	-4.528* (2.448)	-4.585** (2.131)	6.902*** (2.261)	7.157*** (2.309)	7.057*** (2.270)
Constant	-78.83*** (12.54)	-74.63*** (13.98)	-78.33*** (13.02)	-80.20*** (19.00)	-76.29*** (19.50)	-80.88*** (18.85)
N	20	20	20	20	20	20
R^2	0.586	0.503	0.556	0.890	0.877	0.887

1. Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
2. Every regression includes year fixed effect
3. Independent variables are for 2007 (before crisis) and 2008 (after crisis) for 20 states, which include the 15 largest states.
4. Dependent variable has a 6 month lag and thus is for June 2008 and June 2009 respectively. We use a 6 month lag, allowing the fact that there might be some delays in market response. However, our results are highly robust and do not depend on whether we use lagged dependent variables or not.
5. The list of 20 states : California, Connecticut, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, Wisconsin

TABLE 4: Multiple Regression of Determinates of State Bond Yields, pre- and post- crisis. Public Sector Union Membership and Labor Institutions (Model 1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Before crisis				After crisis			
Collective bargaining right	7.237[**] (2.460)				23.14[***] (7.687)			
Right to work		-3.926 (3.302)				-18.18[*] (8.733)		
Right to strike			-3.796 (4.220)				1.860 (5.679)	
Public sector union membership				0.160[***] (0.0484)				0.399[*] (0.220)
Real GDP	0.830[**] (0.289)	0.848[**] (0.298)	0.759[**] (0.318)	0.771[**] (0.267)	7.576[***] (1.327)	7.786[***] (1.255)	8.067[***] (1.396)	7.557[***] (1.325)
Unemployment rate	2.751[*] (1.447)	2.745 (1.579)	3.438[**] (1.509)	2.411[*] (1.302)	13.80[***] (3.822)	13.76[***] (3.463)	12.12[***] (3.741)	12.86[***] (3.285)
Deficit to GDP	-0.744 (2.126)	-1.558 (2.292)	-2.639 (2.014)	-1.242 (1.962)	5.846[*] (2.945)	6.489[*] (3.070)	8.606[**] (3.562)	7.169[**] (2.784)
Constant	-5.026 (9.135)	-0.710 (10.28)	-6.879 (8.380)	-5.604 (7.392)	-144.4[***] (22.71)	-123.3[***] (19.53)	-123.9[***] (19.72)	-139.8[***] (16.54)
N	20	20	20	20	20	20	20	20
R^2	0.613	0.507	0.487	0.614	0.896	0.879	0.841	0.877

1. Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
2. Every regression includes year fixed effect
3. Independent variables are for 2007 (before crisis) and 2008 (after crisis) for 20 states, which include the 15 largest states.
4. Dependent variable has a 6 month lag and thus is for June 2008 and June 2009 respectively. We use a 6 month lag, allowing the fact that there might be some delays in market response. However, our results are highly robust and do not depend on whether we use lagged dependent variables or not.
5. The list of 20 states : California, Connecticut, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, Wisconsin

TABLE 5: The Effect of Unexpected Deficit Shocks, Political, and Labor Institutions on Changes in State Bond Yields (Model 2)

	(1)	(2)	(3)	(4)	(5)	(6)
ΔDefshock	-15.91	-16.40	79.20[***]	24.17	-26.25	-11.02
	(12.91)	(16.61)	(23.82)	(14.25)	(16.36)	(11.51)
ΔDefshock x Collective bargaining right	50.13[*]					
	(25.73)					
ΔDefshock xStrike permitted		12.52				
		(49.69)				
ΔDefshock x Right to work applied to public sector			-99.41[***]			
			(24.79)			
ΔDefshock x Union membership				2.023[***]		
				(0.612)		
ΔDefshock x Party identity of the Governor					22.95	
					(19.47)	
ΔDefshock xDem. share in State Legislature						3.02[***]
						(0.96)
ΔUnemployment rate	48.43	60.23	35.21	37.41	60.54	57.65[*]
	(30.06)	(44.53)	(20.36)	(23.11)	(46.03)	(27.48)
ΔReal GDP	299.1	128.9	-6.350	131.5	85.64	-128.3
	(281.9)	(261.8)	(110.0)	(177.0)	(262.5)	(139.2)
ΔDeficit to GDP	10.03[**]	10.26	9.134[***]	8.598[**]	11.87[*]	13.23[***]
	(4.452)	(6.335)	(2.861)	(3.335)	(6.286)	(4.267)
Constant	-112.4[**]	-122.9[*]	-104.5[***]	-100.3[***]	-127.3[*]	-131.9[***]
	(43.30)	(64.54)	(27.13)	(31.96)	(66.49)	(40.42)
N	20	20	20	20	20	20
R^2	0.591	0.457	0.767	0.702	0.490	0.723

1. Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
2. Data are for 2007-08 for 20 states.
3. Independent variables are change from 2007 (before crisis) to 2008 (after crisis) for 20 states, which include the 15 largest states.
4. Dependent variable has a 6 month lag and thus is a change from June 2008 to June 2009. We use a 6 month lag, allowing the fact that there might be some delays in market response. However, our results are highly robust and do not depend on whether we use lagged dependent variables or not.
5. The list of 20 states : California, Connecticut, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, Wisconsin

TABLE 6: The Effect of Unexpected Deficit Shocks, Unemployment Shocks, Political, and Labor Institutions on Changes in State Bond Yields (Model 2)

	(1)	(2)	(3)	(4)
ΔDefshock	13.21	66.31***	38.47**	-10.53
	(18.83)	(18.70)	(13.51)	(13.55)
ΔDefshock x Collective bargaining right	6.911			
	(27.17)			
ΔUnemployment rate x Collective bargaining right	89.06**			
	(39.70)			
ΔDefshock x Right to work applied to public sector		-70.76**		
		(25.31)		
ΔUnemployment rate x Right to work applied to public sector		-50.14		
		(29.26)		
ΔDefshock x Union membership			0.914*	
			(0.448)	
ΔUnemployment rate x Union membership			2.851***	
			(0.792)	
ΔDefshock xDem. share in State Legislature				2.92**
				(1.13)
ΔUnemployment rate xDem. share in State Legislature				0.26
				(1.59)
ΔUnemployment rate	-22.24	46.33*	-1.200	56.10*
	(25.70)	(22.61)	(17.72)	(30.80)
ΔReal GDP	327.9	-63.21	45.38	-140.6
	(266.2)	(97.32)	(96.54)	(169.9)
ΔDeficit to GDP	8.858**	8.420**	5.497*	12.95**
	(4.076)	(3.003)	(2.833)	(4.807)
Constant	-36.36	-108.1***	-45.84*	-129.1**
	(30.61)	(27.17)	(22.36)	(46.16)
N	20	20	20	20
R^2	0.657	0.798	0.836	0.723

1. Standard errors in parentheses, * p < 0.10, ** p < 0.05, *** p < 0.01
2. Data are for 2007-08 for 20 states.
3. Independent variables are change from 2007 (before crisis) to 2008 (after crisis) for 20 states, which include the 15 largest states.
4. Dependent variable has a 6 month lag and thus is a change from June 2008 to June 2009. We use a 6 month lag, allowing the fact that there might be some delays in market response. However, our results are highly robust and do not depend on whether we use lagged dependent variables or not.
5. The list of 20 states : California, Connecticut, Florida, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington, Wisconsin
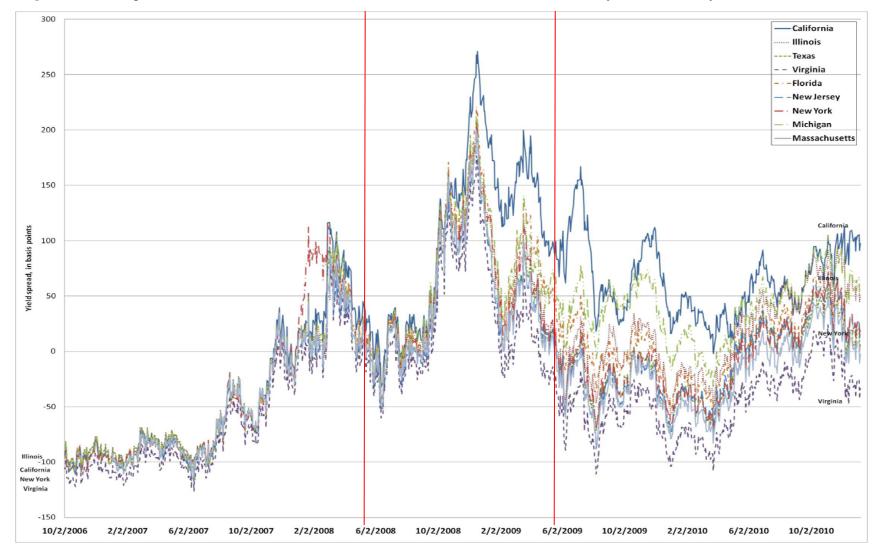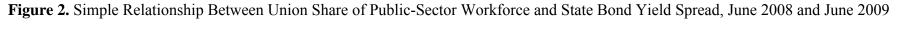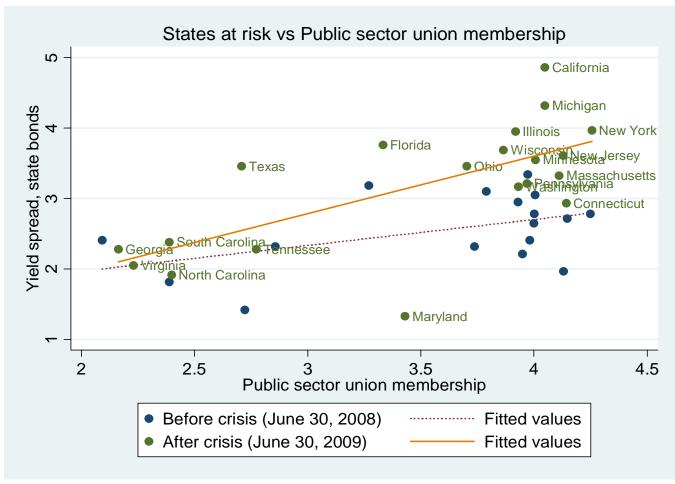
Figure 1. Yield-Spread of 5 Year Bonds of Selected U.S. States versus 5 Year U.S. Treasury Bonds, January 2007-2001
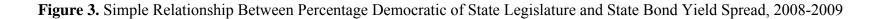

1. Red lines indicate moment of pre-crisis and post-crisis measurement in the Harvard study (June 30th 2008 and June 30th 2009).
Source: Reconstructed from Bloomberg Data

Figure 2. Simple Relationship Between Union Share of Public-Sector Workforce and State Bond Yield Spread, June 2008 and June 2009
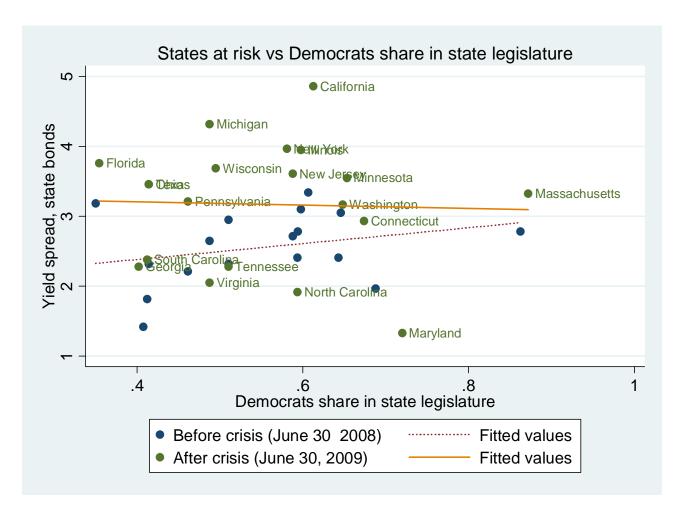

1. Variables are log transformed to make units of analysis visually comparable.
2. June 2008 spread data are all shifted upward by thirty basis points to make it visually comparable with June 2009 data

Figure 3. Simple Relationship Between Percentage Democratic of State Legislature and State Bond Yield Spread, 2008-2009

1. Variables are log transformed to make units of analysis visually comparable.
2. June 2008 spread data are all shifted upward by thirty basis points to make it visually comparable with June 2009 data.
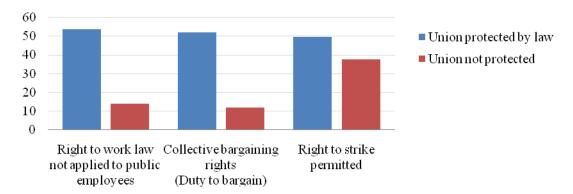
Figure 4. Average public sector union membership (%) & public sector labor institutions

(*) 20 largest states in 2008