Organized Labor and Capital Markets: Evidence from the U.S. Municipal Bond Market*

Job Market Paper

Yunhui Han
Department of Finance
David Eccles School of Business,
University of Utah

November 20th, 2021

*I am grateful to Huayi Tang for his invaluable assistance, insight, and collaboration in preparation of the initial version of this manuscript. I am thankful for the guidance and support of my committee members Jeffrey Coles (chair), Edward Owens, Yihui Pan, Chong Shu, and Feng Zhang. I also thank Jonathan Brogaard, Jonathan Cohn, Austin Hill-Kleespie, Troup Howard, Mark Jensen, Avner Kalay, Karl Lins, Tim Liu, Michelle Lowry, Marcus Painter, Christine Parlour, Dalia Marciukaityte (discussant), Ashleigh Eldemire (discussant), fellow Ph.D. students, and seminar participants at the Department of Finance Research Brownbag of the University of Utah, the 2nd annual Ph.D. Student Symposium on Financial Market Research and Policy Developments at UT Austin, the 2021 Financial Management Association meeting for helpful comments and suggestions. Send correspondence to Yunhui Han, University of Utah, David Eccles School of Business, Department of Finance, Salt Lake City, UT 84112. E-mail: yunhui.han@eccles.utah.edu.

Organized Labor and Capital Markets: Evidence from the U.S. Municipal Bond Market

November 20th, 2021

Abstract

I present three findings on the effects of local unions on the municipal bond market. First, public- and private-sector unions play differential roles in capital markets: municipal bond issuers in areas with higher public-sector union density incur higher issuance costs and lower credit ratings. Private-sector unions only affect municipal bond issuance costs if bonds are backed by tax revenues, if bonds are not insured, or if bond issuers are exposed to strong private-sector union power. Second, by employing a regression discontinuity design using local variation in the vote share of union elections, I find that closely won union elections lead to significantly higher yields on the secondary market. Third, the issuance costs of municipal bonds are reduced by state-level laws that restrict the collective bargaining power and impede the possibility of a strike. Overall, I conclude that municipal bond market participants view union exposure as a risk factor by municipal bond market participants.

Keywords: Municipal bonds, Public-sector unions, Private-sector unions, Cost of debt
JEL Classification: G12, G24, H74, J5

1 Introduction

In this paper, I examine the effect of local unions on municipal bonds issuance costs, focusing on the differential impacts of the public- and the private-sector union participation on bond yields and spreads. Over the last several decades, the membership and composition have shifted significantly. Private-sector union coverage has withered, with the participation rate declining from 25% in the 1970s to 6% in the 2020 (Unionstats, 2020). In contrast, public-sector unions have remained vibrant; on average, 39% of state- and local-government employees belong to labor unions. In 2010, the majority of unionized workers in the United States were employed in the public sector (U.S. Census Bureau 2010).[1] These divergent trends in union density between the two economic sectors invite comparison; however, the previous finance literature has generally ignored them. My paper tries to account for trends in union participation by illuminating the differential roles that public- and private- sector unions play in capital markets.

Unions are generally powerful labor organizations with strong influence over municipalities. More specifically, public-sector unions may introduce frictions that can exert real effects on localities, such as producing higher government deficits (see, e.g., Aidt and Tzannatos, 2002; Freeman and Han, 2012), budgetary outcomes (Kearney, 2007), wages (see, e.g., Rudolo, 1986; Hirsch and Rudolo, 1986; Anzia and Moe, 2015), employment (Abraham and Medoff, 1984; Lewis, 1986), and costs of providing public service (Frandsen, 2016). The fiscal stress posed by strong public-sector unions has caused concern among capital market participants. Private-sector unions, for their part, may influence

[1] This shift has produced a noticeable change in the demographic profile of union members, as well. The image of a union man in a hard hat and steel-toed boots is gone. Unionized workers are more likely to be teachers, librarians, trash collectors, policemen, or firefighters than they are to be carpenters, electricians, plumbers, auto workers, or coal miners (U.S. Census Bureau 2010).

municipalities through their impacts on employers. Literature has documented that private unionization, in general, harms corporate performance and decisions.[2]

However, it still remains an open question whether shocks to private-sector union status and union density affect local finance costs. Despite the significant decline in the scale of private-sector unions and widespread opposition to them among employers private-sector unions may still indirectly affect municipalities through their influences over local firms 'operations and profitability. For example, anecdotal evidence seems to suggest that market participants such as credit rating agencies view labor unions as a risk factor. the following is how a vice president at Moody's responded to a question on how rating agencies perceive the presence of labor unions when evaluating municipal bonds:

> *In my former life as a municipal bond analyst with Moody's, one of the factors we considered was whether a debt-issuing entity was unionized, a status that was inherently viewed as a "credit negative" due to unions' ability to disrupt operations. When we observed history of obstreperous union leadership, we noted this to investors.*[3]

I seek to empirically examine how public- and private-sector union participation affects capital markets. I believe municipal bond markets offer an ideal setting to study this question. First, municipal bond issuers are tied to a specific geographical location. Thus, municipalities in areas with expected exposure to high union density cannot avoid the costs associated with union activities, disrupted operations, and higher wages. Therefore,

---

[2] See, for example, Fallick and Hassett (1999), Matsa (2010), Chen, Kacperczyk, and Ortiz-Molina (2011, 2012), Lee and Mas (2012), John, Knyazeva, and Knyazeva (2015), Tian and Wang (2016), Compello, Gao, Qiu, and Zhang (2017), and Bradley, Kim, and Tian (2017).

[3] Sheffield, C. (2014, November 17). *Stockton Highlights Nationwide Risk of Conflict Between Muni Investors and Public sector unions.* Forbes:https://www.forbes.com/sites/carriesheffield/2014/11/17/stockton-highlights-nationwide-risk-of-conflict-between-muni-investors-and-public-sector-unions/?sh=30e4ce3b303d

investors are more likely to account for union risk when investing in municipal bonds as opposed to corporate bonds or stocks.

Second, almost every municipality has issued municipal bonds in a heterogeneous fashion. This feature leads to a large sample of municipalities that have various levels of union participation and have issued bonds with heterogeneous characteristics and term structures. This allows me to identify cross-sectional variations of the effects of unions on the municipal bond market. Last but not least, the municipal bond market size stands at \$3.95 trillion in 2020, representing a 9.5% share of the total fixed income market (SIFMA, 2020).

As a crucial constituent of fixed income markets, municipal bonds have played a vital role in building a wide range of state and local modern infrastructure, including schools, hospitals, universities, airports, bridges, highways, and water and sewer systems. And yet, despite the economic importance of municipal bonds in America's modern infrastructure, our understanding of municipal bond pricing is limited. My paper thus directly contributes to the literature that studies the determinants of municipal bond offering and secondary yields.

I start by exploring how variations in local union density affect the issuance costs of municipal bonds. To capture the power of local unions, I measure the percent of employees that are unionized (i.e., union density) to capture the power of local unions in the two economic sectors. I find that a one-standard-deviation increase in public-sector union membership is associated with a 3.4 basis point increase in the initial yield of a bond, which translates to a cost of \$1.65 million for an average county. These results are consistent with my expectation that investors do price the risk pertaining to labor unions when investing in the municipal bond market.

I next conduct cross-sectional analyses based on bond type heterogeneity to examine whether the sensitivity of the results is different for various types of bond issues (i.e., GO-only or Revenue issuances, insured issuance or not). I find that the upward impact of public-sector union membership on local financing costs is further amplified in revenue bonds, implying that uncertainties due to public-sector unions have more direct impacts on the efficiency of public service operations. Conversely, I show that GO bonds significantly respond to private-sector union density, suggesting that bonds backed by tax revenues are more sensitive to the potential disruptions from private-sector unions. Furthermore, despite the dramatic decline in the overall scale of private-sector unions in the U.S., some regions are still exposed to relatively active private-sector unions. I show that the yields and spreads of municipal bonds issued in these areas are significantly higher. These results confirm the confirm the potentially different mechanisms through which public- and private- sector unions affect capital markets.

Two identification strategies help me provide further insights into the potential causal effects of unionization on public borrowing costs. First, during my sample period of 2000 to 2018, five states experienced collective bargaining power shocks after passage of Right-to-Work (RTW) legislation, which allows me to employ a difference-in-differences setting to answer the question. Given that RTW laws almost certainly reduce collective bargaining power and limit labor organization activities (see, e.g., Ellwood and Fine, 1987), I am able to perform a quasi-natural experiment. By following Matsa (2010), I conduct difference-in-differences tests to examine whether reduced union power is reflected in bond issuance costs. I show that, after the passage of RTW, issuance costs declined by 3.6 (6.2) basis points — a 8.4% (2%) decrease of yield spreads (initial yields). My second identification strategy involves local union elections. This setting provides an opportunity to implement a regression discontinuity design (RDD) to explore, from secondary market transactions, how unionization influences bond yields. By exploiting the local variation in the vote share that leads to marginal increases in local union density, I implement a sharp RDD that compares the secondary yields of municipal bonds issued in counties that held closely won union elections with the secondary yields of the bonds issued in counties which held closely lost union elections. RDD results indicate that closely won union elections lead to a 50-basis point increase in yields on the secondary market.

Differences in state characteristics provide additional opportunities to study the potential channels through which local unions affect municipal bonds pricing. From a risk perspective, I show that higher bond yields may arise from concerns over the probability and the intensity of union activities such as strikes. I find that the negative impact of higher union density on issuance costs is further exacerbated for issuers located in states that are relatively lenient with strikes, suggesting that investors are in fact concerned about the union-related risk attributed to union activities. In addition, little research has examined whether uncertainties associated with high local union density further exacerbate local financing challenges during economic contractions. I show that investors are even more concerned about the risk associated with high union density during a sluggish economy. Surprisingly, my results also suggest that investors do view both public- and private-sector unions as a risk factor during challenging periods. I also examine the heterogeneity in bond term structures and find more pronounced results for bonds with a longer maturity, implying that the union-related risk is more likely to affect bonds with longer maturity.

Finally, I explore whether local unions affect bond credit ratings. Here I further contribute to the literature on credit rating by showing local union density is significantly associated with a deterioration in municipal bond credit ratings.

A growing literature surrounds municipal bond pricing. Papers have addressed the determinants of municipal bond offering and secondary yields, including the location of the bond underwriter (Butler, 2008), market transparency and interdealer trading (Schultz, 2012), credit rating (Cornaggia, Cornaggia, and Israelsen, 2018), local government bankruptcy policy (Gao, Lee, and Murphy, 2019), racial discrimination (Dougal, Gao, Mayew, and Parsons, 2019; Eldemire-Poindexter, Luchtenberg, and Wynter, 2021), bank financing (Dagostino, 2019), climate risk (Painter, 2020), newspaper closures (Gao, Lee, and Murphy, 2020), and the opioid crisis (Cornaggia, Hund, Nguyen, and Ye, 2021; Li and Zhu, 2019). My paper speaks to the effects of local unions on municipal bond prices on both the primary and the secondary municipal bond markets. To the best of my knowledge, this paper provides the first empirical evidence on the conflicts between labor and suppliers of financial capital to the municipalities, and municipal bond investors in particular.

My paper also contributes to the literature that studies how unions affect strategic financial decisions. Relevant work includes the study of the union on corporate bond performance, such as Chen, Kacperczyk, and Ortiz-Molina (2012) and Compello, Gao, Qiu, and Zhang (2017). These two studies focused on unionization in the private sector and its impact on corporate bonds. Chen et al. (2012) find that higher industry-level unionization rates lead to lower corporate bond yields, whereas Compello et al. (2017) show that unionization hurts unsecured bondholders of large, public firms on the secondary market. My work differentiates from the above by focusing on the presence of both private- and public-sector unions in a specific geographical area, and on unions' impacts on local public finance outcomes, which has never been explored. More specifically, first, I rely on a different setting in which the labor capital, the issuers of the financial claim, and the investors of the financial claim are tied to the same geographical region. Unlike the issuers of corporate bonds (i.e., firms) who can at least maneuver some of their facilities or eliminate part of the bargaining units by relocating unionized workers, issuers of municipal bonds are tied to a specific geographic location.[4] Therefore, investors are more likely to account for frictions introduced by local unions when investing in municipal bonds as opposed to corporate bonds or stocks.

Second, the link between local union shocks and municipal bond prices is more direct due to the ownership structure of the municipal bond market. Corporate bond investors can, at least partially, reduce union-related risk exposure through holding a more diversified corporate bond portfolio. In contrast, municipal bond investors are largely dominated by retail investors who reside and invest in the same geographical area. This is because municipal bond interest payments are exempt from federal and state income taxes for in-state residents.[5] When local union activities introduce innovations to the municipalities' credit quality, the local investors generally are not able to diversify; instead they demand a premium to compensate for the innovation at issue and/or dispose of their securities on the secondary market (Babina et al., 2021). My results show that strong local unions will bring more uncertainties regarding credit quality to the issuer and lead to higher offering yields and higher secondary market yields of municipal bonds.

[4] Under the National Labor Relations Board law, a unionized employer is not required to bargain with the union over a relocation decision, thus it is lawful for a unionized employer to relocate some or all of its facilities and eliminate bargaining unit work. For example, if Amazon.com Inc. felt its Bessemer warehouse at Jefferson County, Alabama, was at risk of being unionized and bargaining for more surplus, Amazon.com Inc. could relocate the factory to an area with little union presence if the surplus transferred to unions outweighs the costs of relocating. However, municipalities in high union density areas would not be able to avoid the costs and frictions associated with union activities, disrupted operations, and higher wages. In this example, Jefferson County, as a municipal bond issuer, cannot relocate its government buildings, public service plants, schools, and other infrastructure and thus cannot eliminate additional costs associated with increased frictions of unionized workers.

[5] Municipal bond markets are largely dominated by local retail investors, with more than 70% total municipal bond ownership (Federal Reserve, 2020).

Third, my results further illuminate the crucial impact of labor unions on financial markets through the persistently strong public-sector union rates. The much-discussed decline of private-sector unions has partially masked this important story.

My results carry several important implications. First, municipalities should factor local union density into their decision-making when issuing bonds to the public arena, as local unions entail additional costs for municipalities. Second, by indicating the significant impact of public-sector union density on issuance yields, underwriters could benefit from my results and adjust their bond pricing strategy in accordance with the presence or absence of strong union participation in a municipality. Lastly, strong unions are likely to protect job security, ensure working environment safety, and improve the welfare of workers, especially during challenging times such as the COVID-19 pandemic. Meanwhile, over the past few years, local governments and municipalities have relied more heavily on debt financing through issuing municipal bonds. My results suggest that governmental entities should not overlook the additional issuance costs incurred by the presence of labor unions and should take steps toward balancing the benefits and costs of supporting labor unions.

2 Background, literature, and hypotheses development

2.1 Municipal bonds, issuance costs, and secondary yields

The Municipal Securities Rulemaking Board (MSRB) oversees the municipal securities market since 1975. According to MSRB (2017), over 3 trillion dollars of debt was issued in this market between 2010 and 2016. In 2020, the municipal bond market size reached \$3.95 trillion, representing a 9.5% share of the total fixed income market (SIFMA, 2020). States and local municipalities use the proceeds from municipal bonds to fund critical infrastructures such as roads, public education, or other public services.[6] In terms of the bond type, the traditional dichotomy states that every obligation with recourse to the issuer's general revenue (i.e., tax revenue) is general obligated, and the rest are revenue bonds. That is, GO bonds are backed by "full faith and credit" (i.e., the taxing power) of the issuer, while revenue bonds are issued to finance particular projects and are backed either by the revenues from that project or by the municipal agency operating the project, such as airports, hospitals, and turnpike or port authorities.[7]

In this study, I use two measures to quantify bond issuance costs: municipal bond issuance yield (a.k.a., offering yield, or initial yield) and yield spread.[8] The yield at issuance of a bond informs us how much demand a particular bond issue is receiving. For example, Gao, Lee, and Murphy (2019) use issuance yield to measure the default risk premium that municipal bond investors demand. The second measure, yield spread, is defined as the difference in yields between a municipal bond and a duration-equivalent risk-free bond based on the US Treasury yield curve. Like other traded fixed income securities, municipal bonds can be bought and sold over the counter. When there are shocks to local union density, i.e., union elections, the secondary yields of municipal bonds can make a

[6] For example, state and local governments accounted for nearly 75% of public infrastructure spending in the United States in 2004.

[7] Developments in the bankruptcy courts have been constantly reshaping the definition of GO (Cestau, Hollifield, Li, and Schürhoff, 2019; Yang, 2019). The most nonrestrictive type of full faith and credit means that investors may compel the issuer to raise taxes and fees through a writ of mandamus. In reality, many GO pledges deviate from this by, for example, restricting the recourse to the general fund or further constraining tax levies by tax limits, also known as limited GO.

[8] Municipalities typically hire underwriters to facilitate the bond issuance process, and underwriters structure the deal and sell the bonds to investors. Once a municipality and underwriter agree on a deal, the underwriter then issues the bonds to the market at the highest price (i.e., lowest yield), given that they can sell the entire bond issue. Compensation that an underwriter receives is referred to as the gross spread (Butler, 2008). Thus, the total bond issuance costs may comprise two parts: the price difference underwriters received from the issue (the gross spread) and the price they sold to the market (the issuance yield). I follow Painter (2020) to compute the annualize gross spread by taking the geometric average of gross spread divided based on the maturity of the bond. My results remain robust when using total issuance costs (gross spreads + initial yields) as the outcome variable (available upon request).

precise measurement of the bond investors' reaction surrounding the shocks. Thus, I also examine the effect of local union elections on municipal bond secondary yields. The secondary market data on municipal bonds is managed by the MSRB Electronic Municipal Market Access (EMMA) database. In this paper, I measure the secondary yield (yield to maturity from the secondary market transaction) as the expected return from holding a bond until maturity given its current price, coupon payments, and face value for options embedded in the bond contract.

2.2 Labor unions and municipalities

Labor-management relationship model differs in how collective bargaining is done in the two economic sectors (Freeman, 1986). The employer in the private- and public sector are not equivalent (Troy, 2004). First, what the prior finance literature identifies as an employer in the private sector (i.e., firms) is not exactly identifiable in the public domain. In the private sector, employers or shareholders pay unionized workers' wages and they may have to enter the arena of collective bargaining. However, in the public sector, employers are actually agents of taxpayers. The taxpayers provide funds and receive the products or benefits from public services, but it is the agent (i.e., public-sector employers) alone who determines how to conduct and resolve bargaining with unions. The differences between the two sectors in labor-management demand a focus on the differential impacts of public-sector and private-sector union participation on the municipal bond market.

2.2.1 Impact of public-sector unions

By 2009, the majority of unionized workers in the United States were employed in the public sector (U.S. Census Bureau 2010). Public-sector unions may impose a burden on local government through raising members' wages, limiting discretion in hiring and firing, organizing strikes, and altering industrial actions and activities (Lewis, 1986). Up to today, whether public unions increase the deficits for local government and whether unionized public-sector workers are overpaid are still under debate. Some literature finds supportive evidence that unions affect deficits, total expenditures, total revenues, or property taxes of the local government. Abraham and Medoff (1984) report that unionized workers are protected from layoffs. Hirsch and Rudolo (1986) provide evidence on how unionization affects the wage and employment of municipal firefighters. Kearney (2007) shows that police unions have exercised some influence on municipal budgetary outcomes. Aidt and Tzannatos (2002) and Freeman and Han (2012) find that unionization is associated with higher wages and higher fiscal deficits. Anzia and Moe (2015) show that public-sector unionization seeks higher wages, better health benefits, and job protections, which is costly for local government to provide. For public employees, Frandsen (2016) shows that collective bargaining rights increase wages for firefighters and shorten the work week for police.

Overall, the previous literature highlights that unionization may negatively affect the fiscal condition of local governments, the efficiency of the public service, and the profitability of public-sector companies, through its collective bargaining power and other labor activities on the distribution of government budgeting, the distribution of wage, and public service operations. Ultimately the adverse impact of unionization leads to reduced revenue of public sector enterprises, less efficient public service, over-paid public employees, and sub-optimal budgeting plans and fiscal policies of municipalities. Since both general revenue and specific revenue from providing public service comprise the primary source for municipalities to repay debt, municipalities in areas that are greatly affected by local unions, especially public-sector unions, would be more subject to a volatile income stream. Thus, investors may perceive stronger unions as a risk factor and demand a higher premium to compensate for such uncertainty. From the perspective of municipalities, the strong union power in the public sector is likely to be associated with higher costs of issuing municipal bonds. The municipal bond market provides a useful setting to study this conjecture, as bond issuers and bond investors are tied to a specific geographic location with limited maneuverability when facing powerful local unions. Therefore, investors are more likely to account for union-related risk when investing in municipal bonds as opposed to corporate bonds or stocks. These yield my first hypothesis:

H1a: On average, municipal bonds issued in areas exposed to stronger public-sector union power will have higher issuance yields.

On the contrary, another strand of the literature suggests union rate in the public sector, in general, does not negatively affect the fiscal condition of local governments. Valletta (1989) shows that collective bargaining did not affect cities' total expenditures, total revenues, or property taxes. Allegretto, Sylvia, Jacobs, and Lucia (2011) provide evidence that public-sector workers are not over-compensated during the recession in 2008, and large state deficits were not due to public-sector workers and their unions. Therefore, it is also possible that the public unions have a limited effect on the fiscal condition of local governments. In this case, investors will not concern about the risk pertaining to the public-sector unions on local government income. These yield my second hypothesis:

H1b: The costs of issuing municipal bonds are less likely to be affected by unionization in the public sector.

General obligation bonds (*GO*) are backed by the tax base of the municipality, whereas revenue bonds (*Revenue*) are tied to the success of the underlying public service project. Because public-sector workers are local public sector employees and local taxpayers, both types of bonds are likely to be affected by public-sector union activities. Disruptions and uncertainties from the public-sector unions are expected to have a more direct impact on the public service operating efficiency and projects cashflows than tax revenues. Thus, I posit that the public-sector unions are expected to have more pronounced impacts on revenue bonds relative to GO bonds. These yield my third hypothesis:

H1c: The effects of public-sector unions on municipal bond yields are less (more) pronounced if the bonds are GO (Revenue) bonds.

2.2.2 Impact of private-sector unions

Over the last several decades in the United States, there have been important shifts in the scale of private-sector union membership rates (see, e.g., Figure 2). The union rate in the private sector declined steeply from 25% in the 1970s, accelerated in the 1990s, down to 7% in the 2010s. Coincident with this trend was a decline in new union organizing activity: in 1966, more than 200,000 private-sector workers gained union representation status, and this number dropped to approximately 80,000 in 2006 (NLRB). Employers generally do oppose unions (Lee and Mas, 2012). Policy decisions and employer opposition to unions (Freeman, 1988) is another force.[9] Ellwood and Fine (1987) suggest that public policy has become more hostile to labor unions at both the state and national levels, making it more difficult for unions to retain their members and negotiate with employers. Legal changes in the 1970s-1990s eroded private-sector union bargaining power, and firms also took advantage of the weak labor law regime to legally and illegally thwart union organizing (Mishel, Rhinehart, and Windham, 2020).

[9] Other explanations include shifting sectoral composition (Farber and Western, 2001), globalization (MacPherson and Stewart, 1990), and technology-induced shifts in labor demand (Acemoglu, Aghion, and Violante, 2001).

In addition to the fact that the union rate in the private sector declines steeply over the last several decades, extensive research provides evidence regarding how unions affect strategic corporate financial decisions. Fallick and Hassett (1999) documented that certification significantly reduces investment in the year following the election. Rosett (2001) shows that the labor-based measures provide risk information over and above information contained in standard risk proxies such as financial and operating leverage and demonstrates the importance of the labor stock measure based on projected compensation costs in risk. Matsa (2010) demonstrates the strategic behavior for a firm to use debt and leverage to bargain with the organized labor. Lee and Mas (2012) show that new unionization is associated with a reduction in the firm's market value among firms with large labor organizations. John, Knyazeva, and Knyazeva (2015) find that conflict of interest between employees and shareholders will reduce the synergy from mergers. Compello, Gao, Qiu, and Zhang (2017) suggest that special treatment of unionized workers in the bankruptcy court will impose extra risk to unsecured bondholders. Bradley, Kim, and Tian (2017) document that passing a union election results in a decline in both patent quality and quantity.

Overall, the previous literature highlights that labor unions in the private sector are diminishing in power and provide supportive evidence on how unions in the private sector can still negatively affect corporate performance and decisions. Determining the impact of labor unions in the private sector on the solvency of municipalities is a vexing problem because, on the one hand, tax revenues are one of the primary sources to repay debt for municipalities. Prior literature provides supportive evidence on how unions in the private sector negatively affect corporate profitability and decisions. Consequently, local tax revenues are more likely to decline for municipalities where the private-sector unions are present. Since general obligation bonds (i.e., *GO*) is a type of municipal bonds that are paid back by the municipality using tax revenue, whereas revenue bonds (i.e., *Revenue*) is a type of municipal bonds that are paid back by the other sources of revenue that come from the public sector projects, I expect GO-only issuance is more sensitive to the uncertainties pertaining to local unions through the private sector. On the other hand, the fact that labor union in the private sector diminishes in power and scale would significantly reduce its impact on municipalities. Due to the dramatic decline in the private-sector union participation rate and power, private-sector unions may no longer be able to exert significant influence over localities through their impacts on employers. Ultimately, municipalities in areas with diminishing private-sector union participation would not face the consequences of tax revenue declines. Private sector unions can only affect the solvency of the municipality when it is exposed to considerably strong union power in the private sector. This leads to another important question: given that labor unions in the private sector are diminishing in power, under what circumstances do investors price private-sector union-related risk since this risk can affect the solvency of the municipalities? From the municipality's perspective, under what circumstances would the high union rate in the private sector affect the costs of issuing municipal bonds? These yield my second hypothesis:

> *H2a: Given that labor union in the private sector is diminishing in its power, an increase in the union rate in the private sector will not affect the issuance costs of municipal bonds.*
>
> *H2b: An increase in union rate in the private sector will increase the issuance costs of municipal bonds if they are GO issuance or if the municipality is exposed to considerably strong union power in the private sector.*

3 Data and sample

I obtain detailed information about municipal bond issuance from Bloomberg. My sample includes municipal bonds issued from January 1, 2000, to December 31, 2018. I apply the criteria similar to Painter (2020). I restrict the newly issued municipal bonds that are with issue sizes above one million dollars and are rated by either Standard & Poor or Moody's. I exclude bonds for which the initial yield is unavailable. My final sample contains 543,081 municipal issues. Figure 1.a plots the average offering yield of municipal bonds in my sample in each year from 2000 to 2018. The figure shows that the bond yield decreases over the sample period, with the highest average issuance yield (5.3%) in 2000, and the offering yield drops to 3.1% at the end of 2018. This trend is primarily driven by the changes in treasury yield. Figure 1.b reports the total number of municipal bonds (columns) and the total face value (in millions) (line) issued in each year from 2000 to 2018. The total number of new issues per year and the total amount of new issues per year increase over the sample period and both spike around the later 2010s. The average amount of new issues per county peaks in 2016, with a total amount of $600 million, as shown in Figure 1.c.

Union density data are retrieved from the Union Membership and Coverage Database.[10] The Current Population Survey (CPS) is the principal raw data source for the Union Membership and Coverage Database, where information on union membership and coverage starting from 1973. CPS surveys participants by asking two questions related to union relationship – "Are you a member of a labor union or of an employee association that is similar to a union?" and "Are you covered by a union or employee association

[10] The Union Membership and Coverage Database, available at www.unionstats.com, is an internet data resource providing private and public sector labor union membership, coverage, and density estimates compiled from the monthly household Current Population Survey (CPS) using BLS methods (Hirsch and Macpherson, 2003).

contract?" (Hirsch and Macpherson, 2003). If the participant responds with "Yes" to the first question, then the respondent will be classified as a union member. Similarly, if a "Yes" to the second question, the respondent will be considered as covered by a collective bargaining agreement. Thus, Union Membership and Coverage Database captures not only the union membership but also the general collective bargaining agreement. The union membership density (*Mem%*) is defined as the number of employees in a union divided by the number of total employments. Similarly, the percentage of collective bargaining agreement coverage (*Cov%*), defined as the number of employees covered by collective bargaining agreement divided by total employment, measures the density of general collective bargaining coverage. Based on the employment of the workers, the two union density measures can further be decomposed into the union density of public-sector employees (*Mem_public% and Cov_public%*) and private-sector employees (*Mem_private% and Cov_private%*) in each geographic region, such as metropolitan statistical areas (MSA) or state. The public-sector union membership mostly includes the public-school teachers, firefighters, police, other cities, county, and state workers, as well as state university workers or community college workers. The decomposition of the union density measures based on major economic sectors provides an ideal setting to the research design, as I are able to distinguish the effect of unionization from different economic sectors on issuance costs of municipal bonds. Figure 2 plots the trend of U.S. union membership density in each year from 1975 to 2018. In these downward-sloping trend lines, a few things stand out. First, the share of overall workers belonging to a union, 10.5% percent, is now lower than the share in the 1970s. Second, private-sector union density fell by two-thirds over this span, from 22% in 1975 to 6.5% in 2018. Strikingly, public-sector union density rates are persistent in most settings, exceeds 34% percent in each year from the 1980s to 2018. I match the location of the municipal bond issuers to the corresponding metropolitan statistical areas and use *Mem_public%, Cov_public%*, *Mem_private%,* and *Cov_private%* at the metropolitan statistical area level in this study.

Table 1 presents the descriptive statistics for the bond data separated into union-strong and union-weak bonds by whether the locations of the bonds' issuers are with an above-median union presence or not. In a univariate setting, public union-strong issuers, on average, pay 2 basis points more in initial yield and 5 basis points more in initial yield than union-weak issuers. The average bond yield spread issued by private union-strong counties is 0.42%, while 0.45% for bonds issued in union-weak counties. For public union-strong (weak) bonds, the average issue amount is \$7.27 (\$5.79) million, and the average maturity is 11.78 (11.87) years. Over half of the bonds in the sample have a call provision, 33% (27%) are insured, 12% (12%) have a sinking provision, 49% (45%) are general obligation bonds. 94% (94%) of the bonds are federally tax-exempt. I follow the standard and convert Moody's and Standard & Poor rating scales into numeric forms.[11] I use Moody's rating if an issue is rated by both Standard & Poor and Moody's. The median sample rating of two indicates that the median rating assigned by Moody's (Standard & Poor's) is Aa2 (AA). As for the type of underwriting procedure, 72% (67%) of union-strong (weak) bonds are offered through negotiated offerings, while the rest are mostly competitively issued. Municipalities often issue multiple municipal bonds in one package with the help of underwriters. The bonds in the same package usually have a similar purpose ((i.e., each bond in the package is issued to fund the same project) but different characteristics like maturity or amount (Painter, 2020). The underwriters assign each bond in the same package a unique CUSIP that is used as the identifier for trading on the secondary market. The mean packaged issue for union-strong (weak) bonds has 19.76 (18.37) CUSIPs.The Pearson pairwise correlations of bond level variables used in the study (see Table 1 Panel

[11] The highest-rated bonds (AAA or Aaa) are given a value of one, bonds with ratings of AA+ or Aa1 are given a value of two, and so forth (Cantor and Packer, 1997).

B) indicate that multicollinearity is not likely to influence the results. Panel C in Table 1 details the summary statistics of the union density measures. The mean of public-sector union membership percentage (collective bargaining coverage) is 38.62% (42.45%), while the mean of private-sector union membership percentage (collective bargaining coverage) is 7.42% (8.19%).

Union elections that occurred at localities provide an ideal setting to identify the causal effect of labor unions on municipal bond yield as the union election process provides a natural experiment for applying regression discontinuity design RDD (see e.g., Lee and Mas, 2012). The National Labor Relations Board (NLRB) provides detailed data on the results of elections to certify a representative union for a collective bargaining unit since 1977. I use information related to the date and location of each union election, the number of participating and eligible voters, and the number of votes "for" and "against" unionization. Consistent with Lee and Mas (2012), I excluded any election with fewer than 100 voters. I further require only one election within each year in the same county.[12] The final union election sample contains 684 elections from 2005 to the end of 2018. Figure 3 shows a declining trend in the number of union elections per year. Notwithstanding a decline in the union election occurrences, union election voting results remain constant over the sample period.

The secondary market data on municipal bonds is obtained from the Electronic Municipal Market Access (EMMA) database, managed by the Municipal Securities Rulemaking Board (MSRB). EMMA provides information including bond price, settlement date, maturity date, par value, and yield of the trade for virtually every municipal security bought and sold. Since 2005 is the first year that municipal bond trading data were

[12] Multiple union elections may occur in a county within a short period with different voting results. The effect of a won (lost) election, therefore, may overlap with a lost (won) election and contaminate the results. Restricting the union election sample to one election per year per county may help to mitigate this issue.

tracked by the platform, the trading sample starts from 2005 and ends in 2018. For each trade in the MRSB EMMA database, I use CUSIP to link it to the issue-level characteristics, including issuer name, issuer county, and issuer state. I measure the secondary yields, a.k.a yield to maturity from the secondary transaction, as the expected return from holding a bond until maturity given its current price, coupon payments, and face value for options embedded in the bond contract. I calculate the remaining years to maturity for each trade as the difference between the year the bond matures and the year the trade is made. Following Jha, Karolyi, and Muller (2021), I aggregate the trade-level data to the bond-week level as follows. I define the weekly yield as the yield associated with the last trade in the week. For weeks with no trades, the weekly yield is taken from the prior week with a trade. The RD analysis examines how the union election occurring in a county will impact the yield of municipal bonds issued by the same county, focusing on the bond secondary yields within four weeks after a union election during 2005 and 2018.

4 Research design

4.1 The effects of the unions on municipal bond: Fixed effect model

To examine the effects of the union density on the cost of issuing a municipal bond, I estimate the following fixed-effect model based on an MSA-Year panel:

$$\begin{aligned} Bond\ yield_{i,m,t} = \beta_1 * UnionDensity_{m,t-1} + \beta_2 * Bond\ controls_{i,m,t} \\ + Rating\ dummys + \eta_s + \gamma_m + \lambda_t + \epsilon_{i,t} \end{aligned} \tag{1}$$

The dependent variable, $Bond\ yield_{i,m,t}$, can stand for either the total *Issuance yield (%)* or *Yield spread(%)* of municipal bond i, of which the issuer is located in a metropolitan area m in year t. $UnionDensity_{m,t-1}$ is the variable of interest, which includes four measures of union density (*Mem_public%, Cov_public%, Mem_private%,* and

Cov_private%) at metropolitan area level *m* in year *t-1.* I follow the prior municipal bond literature (see, e.g., Schultz, 2012; Gao, Lee, Murphy, 2019; Painter, 2020) and include bond level characteristics as control variables, including the total size of the issue (*Amount ($mil)*); the municipal bond's maturity (*Maturity (year)*); a numerical scale of Moody's credit rating (*Rating*); dummy variables equaling one if the bond is callable (*Callable*), is insured (*Insurance*), has a sinking provision (*Sinkable*), is general obligation bonds (*Go*), is revenue bonds (*Revenue*), is state tax-exempt (*St_tax_exempt*), is special tax bond (*Special_tax*), is tax allocation bond (*Tax_allocation*), is pre-refunded (*Pre-refunded*), is negotiated offered (*Negotiated*), is competitively issued (*Competitive*), subjects to alternative min tax (*AMT*), is bank qualified (*BQ*), or is issued through private placements. *#Cusip/issue* reports how many bonds are packaged in each issue. Rating controls include a set of indicator variables for each possible bond rating assigned by Moody's if an issue is rated by both and Moody's and S&P. I also include state fixed effects η_s, metropolitan area (MSA) fixed effects γ_j, and year fixed effect λ_t.[13] These fixed effects control for the possibility that union-strong metropolitan areas tend to issue bonds when issuance costs are relatively high as well as the possibility that the union-related measure captures unobserved cross-metropolitan factors. All standard errors are clustered by the county of issuance, as the residuals of the regressions could be correlated within counties. All variables are defined in Appendix.

To further determine whether the sensitivity of the results is different within various types of issues (i.e., GO-only issuance or Revenue issuance, insured issuance or not) and that through which channel local unions of different economic sectors affect local financing costs, I estimate the following Equation (2) which is similar to specifications found in Gao, Li, and Murphy (2019):

[13] Because many metropolitan areas are across the state borders, the MSA fixed effects will not be absorbed by state fixed effects.

$$
\begin{aligned}
Bond\ yield_{i,m,t} = {} & \beta_1 UnionDensity_{m,t-1} + \beta_2(UnionDensity_{m,t-1} * GO) \\
& + \beta_3(UnionDensity_{m,t-1} * Insuance) + \beta_n Bond\ controls_{i,m,t} \\
& + Rating\ dummys + \delta_s + \gamma_m + \lambda_t + \epsilon_{i,t} \qquad (2)
\end{aligned}
$$

β_2 and β_3 are intended to capture the incremental effect that a bond type has on the yields if the bond is an insured bond or a GO bond respectively.

4.2 The passage of Right-to-work legislation: Difference-in-differences design

To provide further insights into the effect of unionization on the issuance costs of municipal bonds, I conduct a quasi-natural experiment surrounding the state-level passage of Right-to-Work (RTW) legislation, which is likely to significantly reduce the union power and limit the organizing activities.

The passage of Right-to-Work (RTW) legislation at the state level captures variations in the power and effectiveness of labor unions. According to the National Labor Relations Act (Wagner Act, 1935), when a union receives more than 50% of the votes in a bargaining unit, this union is entitled to represent all unit employees and demand union fees and dues. This union entitlement, however, has been toppled by the passage of RTW laws since the mid-1940s. According to the law, unions may collect payments from union members on a voluntary basis (John, Knyazeva, and Knyazeva, 2014). Arguably, the enactment of RTW laws constrains unions by limiting organizing activity and weakening union power (Masta, 2010). Thus, the passage of RTW law considerably reduces the bargaining power of the state. The first states adopting RTW law are Arkansas and Florida in 1944, followed by 19 more states by the mid-1980s. During the sample period of 2000-2018, five states, Oklahoma (2001), Indiana (2012), and Michigan (2012), Wisconsin (2015), and West Virginia (2016), further adopted RTW law. I create an indicator variable $RTW\_state_{s,t}$ which equals one if the bond was issued after the issuer's state passed RTW law and equals zero if the bond was issued before the issuer's state s passed RTW law in year t. By estimating the following Equation (3), the coefficient variable $RTW\_state_{s,t}$ will give the effect of RTW enactments on the issuance costs of municipal bonds.[14] *Pre* is an indicator variable equals one if it is one year prior the passage of RTW law. The estimated coefficient of the interaction term, $Pre \times RTW\_State_{s,t}$, may help to identify whether the parallel trends assumption is satisfied. I expect the coefficient of $RTW\_state_{s,t}$ to be significantly negative. I include state fixed effects η_s, metropolitan area (MSA) fixed effects γ_j, and year fixed effect λ_t in Equation (3).

$$\begin{aligned} Bond\ issuance\ cost_{i,m,t} &= \beta_1 * Pre \times RTW\_State_{s,t} + \beta_2 * RTW\_State_{s,t} \\ &+ \beta_3 * Bond\ characteristics_i + \eta_s + \gamma_m + \lambda_t + \epsilon_{i,t} \end{aligned} \tag{3}$$

Recent literature has shown that when adoption of a treatment (in this case, the passage of RTW law) is staggered and average treatment effects vary across groups and over time, difference-in-differences regression specified in Equation (3) does not identify an easily interpretable measure of the typical effect of the treatment (see e.g., Borusyak and Jaravel, 2017; Callaway and Sant'Anna, 2020; de Chaisemartin and d'Haultfoeuille, 2020; Goodman-Bacon, 2021; Sun and Abraham, 2020). To address the possibility that Equation (3) may not identify the average effect of the treatment on the passage of RTW law, I follow Gardner (2021) to conduct a simple two-stage alternative to difference-in-differences regression (2S-DID) that is robust to treatment-effect heterogeneity when adoption is staggered.[15] The first stage, $Y_{i,m,t} = \boldsymbol{\beta} * Bond\ characteristics_i + \eta_s + \lambda_t + \epsilon_{i,t}$,

[14] In Equation 2, "$RTWstate$" can be viewed as *post*treated states*, of which "*post*" is absorbed by calendar year fixed effects, and "*treated states*" is absorbed by state fixed effects.

[15] In this 2S-DID, the first stage consists of a regression of outcomes on group and period fixed effects, estimated using the subsample of untreated observations. In the second stage, the estimated group and period effects are subtracted from observed outcomes, and these adjusted outcomes are regressed on treatment

is estimated based on a sample of untreated group, where the dependent variable $Y_{i,m,t}$ can be either initial yields or spreads. In the second stage, the residual from the 1st stage is regressed on the treatment variables: $Resid_{1st\ stage} = \boldsymbol{\beta} * RTW\_State_{s,t} + \epsilon_{i,t}$. The coefficient of $RTW\_State_{s,t}$ from the second should give unbiased estimates of dynamic treatment effects (Gardner, 2021). The estimated results are discussed in section 5.2.

4.3 The effects of union elections on municipal bond secondary yields: A regression discontinuity design

Although including Year and MSA fixed effects can effectively control for omitted variables that are metropolitan-specific and time-invariant, the inclusion of these variables does not control for omitted variables that are time-varying. I seek to more precisely identify the effect of local unions on the cost of municipal bonds in the following section.

The results of the fixed effect model may not be valid if omitted variables exist and the error terms are correlated with local union density. To mitigate these endogeneity concerns, I resort to a regression discontinuity design (RDD) that explores the local variation in the vote share of union elections that can lead to marginal increases in local union density (see, e.g., DiNardo and Lee, 2004; Lee and Mas, 2012). In short, I compare the secondary market yields of municipal bonds issued by a county that closely won a union election with the secondary market yields of municipal bonds issued by a county that closely lost a union election.[16] Workers in close-win elections gain additional legal repre-

status. Under the usual parallel trends assumption, this procedure identifies the overall average effect of the treatment on the treated, even when average treatment effects are staggered. I thank John Gardner and Kyle Butts for sharing the "did2s" program package.

[16] I choose to use secondary market yield, since a county might choose to reduce the municipal bond issuance if the yield is against it after the union election, which causes a selection issue, and potential discontinuity in the density surrounding the cutoff. The secondary market trading data will alleviate this bias.

sentation status of the locality while those in close-loss elections do not. For these close-call elections, the randomized variation in marginal increases in local union density helps me identify the causal effect of increasing unionization on municipal bond yields. That is, under the condition that the outcome of close-call union elections is unlikely for investors or issuers to precisely anticipate or manipulate (I verify this condition in data), relative differences in bond yields issued by close-call election counties can be plausibly attributed to the effect of unionization. This local average treatment effect can be identified by comparing the outcome variable just above and below the cutoff where treatment is assigned. In the union election setting, the cutoff point is 50% since a simple majority rule determines the union election result; that is, workers are unionized (the treatment) if the fraction of votes for unionization exceeds 50%.

To implement RDD, I estimate a local polynomial regression of secondary market bond yields on a dummy variable indicating for union win election:

$$Y_{i,c,u,t} = \alpha + \tau Win_u + \sum_{n=1}^{p} \beta_n (X_u - 0.5)^n + \varepsilon_{i,c,u,t} \tag{4}$$

I transform the voting results of elections X_u to $X_u - 0.5$ so that the win margin, which equals the vote share for union subtracts 50%, centers around the vote share cutoff point 50% $(0.5 - h \leq X_u \leq 0.5 + h)$.[17] $Y_{i,c,u,t}$ stands for the secondary yields for municipal bond i issued by county c traded in week t after a county c's union election u over a 4-week window. Win_u is an indicator that equals 1 if the win margin of union election u is above zero (i.e., vote share for union surpasses 50% or $X_u - 0.5 > 0\%$) and zero otherwise. Therefore, τ captures the jump in bond yields as the win margin just above 0% and provides an estimate of the effect of unionization on local municipal bond yields. In this regression, I control for a polynomial function of order p. I apply Rectangular, Epanechni-

[17] h is the robust bandwidth optimally picked using the method described in Calonico, Cattaneo and Titiunik (2014).

kov, and Triangular kernel functions to construct the local-polynomial estimators. The local linear regressions can be represented in a manner similar to the polynomial regressions discussed above: $Y_{i,c,u,t} = \alpha + \tau Win_u + \beta_l(X_u - 0.5) + (\beta_r - \beta_l)Win_u(X_u - 0.5) + \varepsilon_{i,c,u,t}$.

Before proceeding to the RDD approach, I verify two conditions that are necessary for the RDD to be valid: (1) continuity of the distribution of the running variable ($X_u - 0.5$) around the treatment cutoff, and (2) the continuity of the distribution of the observable covariates around the same treatment cutoff (Lee and Lemieux, 2010). I present two standard validity checks to verify the first condition. First, I examine whether the density of the running variable, the union election win margin ($X_u - 0.5$), is continuous at the discontinuity of 0%. Figure 4.a presents a histogram of the running variable for the entire range in 2 percent bins. I implement a manipulation test using the local polynomial density estimators proposed in Cattaneo, Jansson, and Ma (2020). I fail to reject the null hypothesis that there is no break in density around the cutoff, with a p-value of 0.565. Figure 4.b further applies an alternative discontinuity test by following McCrary (2008). The dots represent the observed distribution density for each bin for union vote share, and the solid lines represent the fitted distribution density functions from local linear regressions on either side of the cutoff with 95% confidence intervals. The estimate from the McCrary test is small and statistically insignificant.[18] The results from both tests indicate the validating assumption of no precise manipulation by voters at the known threshold is not violated. Another essential condition for a valid RDD is no discontinuity in other covariates at the threshold. In other words, municipal bonds issued in counties that closely won an election should not be systematically different from bonds issued in counties that barely failed a union election. I perform diagnostic tests by comparing issue-level characteristics,

[18] The discontinuity estimate is 0.268 with a standard error of 0.347.

including issue amount, year-till-maturity, and credit rating of bonds within a close window around the cutoff point in Table A4 and by presenting the distribution of covariates around the cutoff in Figure A1 in Internet Appendix. Neither of them indicates any significant jumps in covariates at the cutoff.

5 Capital market effects of local unions

5.1 The effects of the union density on municipal bonds

Table 2 presents the results for the effect of union density on municipal bond yields by estimating the fixed effect model presented in Equation (1). Panel A compares the effect of union density on issuance yields and yield spreads for all municipal bonds issued during the sample period, 2000 – 2018. Columns (1) and (2) show that municipal bonds are more costly to issue when the union density of the public sector (*Mem_public (%)*) is higher for a given metropolitan area. Under this model specification, one standard deviation (21%; in Table 1) increase in public-sector union membership is associated with a (21*0.16bps) 3.4 basis points increase in the initial yield. Column (2) reports the effects of local unions on municipal bond yield spreads. The coefficient of the local public-sector union density measure remains significantly positive and is at the same magnitude as the one in Column (1). In Column (2), one standard deviation (21%) increase in public-sector union membership is associated with a 3.2 basis points increase in the yield spread of a bond, statistically significant at the 1% level. Regarding the economic magnitude, a county on average issues $600 million of bonds (in face value) in 2017, thus, given that the average modified duration of my bond sample is 8.1 years (consistent with Gao, Murphy, and Qi (2019)), a 3.4 basis points increase in the issuance yield will decrease the bond price by a cost of 8.1*0.034%*$600 million = $1.65 million for an average county (assuming that the bond is issued at par).[19] More strikingly, when comparing with the least publicly unionized metropolitan (*Mem_public (%)* =1.4% in Charleston-North Charleston, SC), the most publicly unionized metropolitan area (*Mem_public (%)* = 86% in Jackson, MI) paid 12.7 basis points (=0.15*(86%-1.4%)) more in 2018. Given that the average yield spread of a municipal bond issued in 2018 is 0.48%, this comparison represents a 27% (12.7 / 48 bps) increase in the average yield spreads. Economically, this gives the most publicly unionized municipality a total burden of an additional $6.17 million in annualized issuance costs if it issues an average amount of municipal bonds each year.[20] The signs of the control variables, though not tabulated for brevity, are consistent with other studies on municipal bond pricing – it is more costly to issue a bond of smaller size, longer maturity, or worse credit ratings. I obtain qualitatively similar results when rating dummies are substituted with a continuous rating control variable.

[Insert Table 2 about here]

The magnitude of the coefficients of private-sector union rates (*Mem_private* (%)) reduces to nearly zero basis point and is insignificant in Columns (1) and (2). This loss of significance is particularly interesting, as it is consistent with my hypothesis *H2a* that, possibly due to the diminishing participation in the private-sector unions and their indirect impacts over municipalities, municipal bond markets, in general, do not view private-sector unions the same as the public-sector unions.[21]

---

[19] The median of the total face value issued by a county was $100 million of bonds in 2017, so 3.4 basis points increase in the issuance yield will decrease the bond price, assumed to issue at par, by 8.1*0.034%*$100 million = $0.28 million.

[20] The average modified duration in the sample is 8.1 years. For a bond that issues at par of $8.5 million (the sample average of face value per issue). On average, a county issues face value of $600 million of bonds in recent years, thus this 12.7 basis points translates to a cost of 8.1*0.127%*$600 million = $6.17 million per year.

[21] One possible concern when interpreting the union density coefficient is that a few metropolitan areas with relatively high union density may drive the results. I address this issue in two ways and report the results in Internet Appendix Table A1. First, I log-transform the union density measures to alleviate the in-

To determine whether the sensitivity of the results is different among various types of issues (i.e., GO issuance or revenue issuance, insured issuance or not), I estimate Equation (2) and present the results in Column (3) and (4). The coefficients of public-sector union density measures in Column (3) and (4) remain significantly positive and is at the same magnitude as the ones in Column (1) and (2). When conditioning on the bond issue type of whether a bond is a GO (where $GO = 1$) or Revenue (where $GO = 0$) issue, I find that the impact of a percent of public-sector union membership on bond yields further decreases by 0.13 basis points. This implies that investors expect a relatively lower (higher) public-sector union-related risk on GO bonds (Revenue bonds) since uncertainties pertaining to the public-sector union are expected to have more direct impacts on the efficiency of public service rather than on the collection of local tax revenue. This result is consistent with Hypothesis *H1c* that the public-sector unions are expected to have less pronounced impacts on GO bonds relative to revenue bonds. I also find that, conditional on GO bonds, a one percent increase in private-sector union membership leads to a 0.63 basis points increase in bond yields. This result supports Hypothesis *H2b* that GO issuance is more likely to be affected by the local unions through the private sector, as local tax revenue is more likely to decline for municipalities where the private-sector unions are present. Finally, if the bond is not insured, a one percent increase in private-sector union further leads to a significant increase of 0.54 basis points in the yield. The impact of public-

fluence of outlying MSAs. Under this specification, the coefficient union density measures remain significant at the 5% level, with a magnitude of 0.033. For the second method, I observe that the percentage of public-sector union participation varies from state to state, for example, Michigan tops the list with roughly 70% of state employees in public-sector unions, with Jackson, MI being the metropolitan area with the highest public- sector union density (86% in 2018). I drop all observations of bond issuances in Jackson, MI and re-estimate the model in Equation (1). I show the results using the sample excluding Jackson, MI, *Mem_public(%)* (log of *mem_public(%)*) is still a significant predictor of annualized issuance costs under this specification, with a significant coefficient of 0.0016 (t = 2.86). These results imply that the effect of union density on issuance costs is not driven by factors specific to a few metropolitan areas with relatively high union density.

sector union. Taken together, results in Columns (3) and (4) suggest that investors are worried about the uncertainties from private-sector labor unions only when the bond is not insured or when the bond is a revenue bond. Investors are concerned about risks pertaining to public-sector unions no matter the bond is insured or not, but they feel more reassured when the bond is backed by tax revenue instead of public service revenue.

In Table 2 Panel B, I present the effect of another group of union density measures, collective bargaining coverage, on issuance yields and yield spreads for all municipal bonds issued during my sample period, 2000 – 2018. The overall results in Panel B are consistent with what I find when using local union membership as union density measures in Panel A.

Despite the overall diminishing union power from the private sector, I also look into the metropolitan areas that are facing high union participation rates in the private sector. I define a bond as a strong private-sector union bond if its issuer locates in an area that is exposed to high private-union density (i.e., the participation of the private-sector union is in the top quintile of *mem_private (%)* and *Cov_private (%)*). I re-estimate the fixed effect model as stated in Equation (1) by dividing all new issues into two subsamples based on whether its issuer is in a high private-union density area or not and report the results in Table 3. Focusing on the strong private-union bonds, the coefficient of *Mem_private (%)* in Panel A and *Cov_private (%)* in panel B of Table 3 are significantly positive at 10% levels. The magnitude of the coefficient, 1.5 basis points in Panel A Column (1), indicates that the issuance yields are significantly high for a municipality only when facing extremely strong private unions. However, the results from Columns (3) and (4) suggest that investors generally do not view private-sector unions as risky for states with weak (or average) private union density.[22] These results support Hypothesis *H2b* that bond investors are concerned about the uncertainties from private-sector labor unions only when the issuer faces high union power from the private sector. To compensate for such risk when investing in high private union power areas, the investor would require a higher premium. Taken all together, the results from Table 2 and Table 3 indicate that local union density does appear to be influential in the issuance cost of municipal bonds, both through the public sector and at least partially through the private sector.

[Insert Table 3 about here]

I also explore the effect of local unions on municipalities' access to capital markets by estimating a model at county level with the outcome variable being the total amount of bond issuance (separately for total issuance, GO issuance, and Revenue issuance).[23]

$$\begin{aligned} Issue\ amount_{i,t} &= \beta_1 * UnionDensity_{i,t-1} + \beta_2 * County\ control \\ &\quad + \gamma_i + \eta_s * \lambda_t + \epsilon_{i,t} \end{aligned} \tag{5}$$

Table A3 in Appendix reports the results for the effect of union density on municipalities' financing amount by estimating Equation (5). Columns (1) and (3) show that increases in public-sector union density on average are significantly associated with a 1.4 million reduction in the total issue amount and a 3 million reduction in the amount of revenue bond issue. Under this model specification, one standard deviation (21%) increase in public-sector union membership is associated with a (21*3) 63 million reduction in revenue bond issue, representing approximately 12.6% (63/500; Figure 1) reduction in the annual issue of a county. One important caveat to these results is that a reduction in bond funding could reflect impaired access of municipalities to capital markets. A larger impact on

[22] The results remain qualitatively similar for the specifications when including public-sector union density in addition to private-sector union density measures (see Table A2).

[23] Bond-level control variables do not apply to this model specification.

revenue issue amount further supports my Hypothesis *H1c* that public-sector unions may have more direct impacts on the efficiency of public service projects than on tax revenues.

5.2 Difference-in-differences around the passage of Right-to-work legislation

In Table 4, I conduct difference-in-differences tests to examine whether a negative shock on union bargaining power reflects into lower bond issuance costs for municipalities with union presence. By estimating Equation (3), the coefficient of variable RTW_state will give the effect of RTW enactments on the issuance costs of municipal bonds, as discussed in 4.2.

[Insert Table 4 about here]

I first check whether RTW states are associated with lower union strength by estimating an OLS regression of union density on the RTW_state dummy. The results are reported in Table 4 Panel A. I show that the coefficients of RTW_state dummy are significantly negative in all four specifications, suggesting that the passage of the RTW legislation indeed is associated with lower union density in both private and public sectors, which reassures us of the potential negative impact of the passage of RTW law on the bargaining power in a state. Table 4 Panel B presents the difference-in-difference estimates regarding the effect of RTW passage on total issuance yields and yield spread specified in Equation (3). The coefficients of the RTW_state dummy in three out of four specifications are significantly negative at the 1% to 10% levels, indicating an approximately 4 to 7 basis points reduction in issuance yields after the passage of RTW law. The coefficients of the interaction term ($Pre \times RTW\_State_{s,t}$) is insignificant in Column (2), suggesting that the issuance yields of municipal bonds between the treated and the control follow a similar trend before the passage of RTW law. However, it is significantly positive in Column (4) when the outcome variable is the spreads. It appears that the bond spreads of treated states and the control states follow somewhat different trends. Overall, the results in Panel B appear to suggest that the reduced bargaining power has been reflected in lower bond issuance yields for municipalities with union presence. Panel C reports the results from estimating a two-stage DID by following Gardner (2021). The coefficients of the RTW_state dummy in three out of four specifications are significantly negative at the 1% to 10% levels. Together with Table 2 and Table 3, the results suggest that union density and union power have meaningful impacts on the issuance cost of municipal bonds. However, as the parallel trends assumption is not satisfied, it is possible that difference-in-differences estimation is not a robust identification strategy. In the section that follows (section 5.3) I introduce a possibly more precise identification strategy.

5.3 Union elections and municipal bond yields on the secondary market

I examine the effect of unionization on municipal bond yields post the union elections. I proceed to RDD results by starting with a graphical illustration of the relationship between union win margin and bond yields following union elections. In Figure 5.a, the x-axis represents the union election win margin and is divided into 20 equal-sized bins. The conditional averages of municipal bond yields to each bin are plotted against the win margin. I fit bond yields using a second-order global polynomial function of the running variable for bonds issued in counties that won or lost a union election, as shown by the solid black line. I also present the 95% confidence intervals of the polynomial estimation in grey dashed lines. Figure 5.b presents local polynomials relating win margins to bond yields, where separate local polynomials are estimated for issuers who closely won and barely lost in the union elections. The robust bandwidths used in Figure 5.b are chosen optimally using the coverage error rate method described in Calonico, Cattaneo, and Titiunik (2014). Both graphs present a significant discontinuity at the cutoff. Within a narrower window around the cutoff point, both graphs show a distinct increase in municipal bond yields from the left side to the right side of the cutoff point. More specifically, bond yields for municipal bonds that are issued in close-win counties are 0.05% or 50 basis points higher. This observation evidences a likely negative impact of local unions on municipal bond yields from the secondary market transaction.

I next present the results of estimating various forms of Equation (4) in Table 5. In panel A of Table 5, I report the results estimated with different combinations of second- to the fourth-order of local polynomial and three kernel functions. For example, Column (1) reports the results estimated from a second-order local polynomial regression using a rectangular kernel function. In each model specification, I control for the covariates and year fixed effects. I choose the robust bandwidths optimally using the coverage error rate method described in Calonico, Cattaneo, and Titiunik (2014).[24] The variable of interest is the indicator of a union election victory, *Win.* The coefficients on the *Win* dummy are significantly positive and consistent in all model specifications (*p-value*<0.01), with the effect size ranging from 10 to 70 basis points over the four weeks following union elections. These estimates suggest that municipal bonds issued in counties that experienced close-win elections have significantly higher yields on the secondary market than comparable bonds issued in counties that had close-lose elections; these results are robust to different orders of polynomials and kernel functions.

[Insert Table 5 about here]

I next consider local linear regressions to verify the results estimated from the local polynomial models. I also use alternative bandwidths from 50% to 200% of the entire op-

[24] Observations are included in an RD specification if the absolute difference between the design value for that observation and the cutoff is less than the bandwidths.

timal bandwidths for robustness. Table 5 Panel B shows the results from local linear estimation using several bandwidth choices. The estimation returns statistically and economically similar results across all specifications. Municipal bonds issued in close-win counties have, on average, a 50-basis-point higher yield on the secondary market over the four weeks following union elections than bonds issued in close-lose counties. Overall, the RDD results show that union election won by close win margin leads to a substantial increase in municipal bond yields. Noted that these results returned from RD tests are estimates of local average treatment effects (LATE), thus I suggest readers treat the inferences with caution when generalizing to all union elections.

6 Additional tests and robustness checks

Even after controlling for observable bond characteristics in a fixed-effect model, there still are potential concerns regarding whether the main results in Table 2 precisely identify the effect of local union power on municipal bond offering costs. In this section, I attempt to mitigate these concerns by conducting several additional tests by considering the heterogeneities of state-level strike policy provisions, general economic conditions, and the heterogeneities of bond term structures.

6.1 Union activity channel

One major source of risk pertaining to strong union power is the adverse impact of strikes on daily operations. Comparing with bonds issued in states with strict strike policy provisions, investors would require a higher premium to compensate for strike-related risk for bonds issued in states that have adopted lenient provisions on strikes. I code the strictness of strike policy of public employees in each state following Freeman and Valletta (2007). I define a state as a state with lenient strike policies (where *Strike_lenient* = 1) if a. the provision permitted its public employees to strike (with qualifications), or b. the provision prohibited strike with no penalties specified (discretion of the court), or c. lacking state-level strike policy provision. If the state prohibited the public employees from striking with penalties specified, the state would be classified as a state with strict strike policies (where *Strike_lenient* = 0). By classifying all bond issues into two categories based on whether the issuers are in a lenient strike policy state or a strict strike policy state, I can test the differential effect of union-related risk on offering yields and spreads of municipal bonds issued in strict strike policy states and lenient strike policy states.

[Insert Table 6 about here]

Table 6 reports the results of estimating the fixed effect model with a *UnionDensity*$\times$*Strike_lenient* interaction term. I find that the effect of public-sector union density is mostly driven by the bonds issued in a state with lenient strike policies. This result suggests that investors are more concerned about the uncertainties from union-related activities and investors would require a higher premium for bonds issued in lenient strike policy states to compensate for such risk. This motivation seemingly diminishes for bonds issued in a state with strict strike policies that prohibits and punishes strikes.

6.2 Union-related risk and economic conditions

I next turn to the ability of a municipality to carry a high debt burden during the economic contraction period and try to explore how uncertainties from high local union density further exacerbate the situation. Municipalities are more likely to be financially constrained during the economic downturn. For example, unions tend to offer their worker higher benefits during a recession (Freeman and Han (2012)). For municipalities facing a strong labor union presence, it is more difficult for them to, for example, reduce funding, lay off workers, cut jobs, and postpone infrastructure projects (e.g., Abraham and Medoff, 1984; Frandsen, 2016). Taxes and public sector revenues are the primary source of payment specified in bond statements and are directly related to a municipal's ability to repay debt, but these restrictions due to unions further constrain a municipality's ability to repay municipal bonds. Thus, it is expected that investors would require a higher premium to compensate for union-related risk during a recession. I define the recession period following U.S. business cycle dating provided by the National Bureau of Economic Research (NBER) and classify the sample based on whether the bond was issued during economic contraction (where *NBER_Recession* = 1) or expansion (where *NBER_Recession* = 0).

[Insert Table 7 about here]

Table 7 presents the results of estimating Equation (1) with a *UnionDensity×NBER_Recession* interaction term. I find that the negative impacts of union density in the public sector during recessions are significantly stronger than their impacts during an expansion, implying that investors are more concerned about the uncertainties from union-related activities and would require a higher premium to compensate for union-related risk when during a recession. Surprisingly, the significantly positive coefficients on *Mem_private(%)×NBER_Recession* seem to suggest that investors would consider union-related risk from the private sector during economic contraction as well. In Table 7 Panel B, I present the effect of another group of union density measures, collective bargaining coverage, on issuance yields and yield spreads during economic contraction and expansion. The overall results in Panel B are consistent with what I find in Panel A.

6.3 Union-related risk and bond maturity

I also test whether the results are more prominent for bonds with longer maturity since the union-related risk is more likely to affect bonds with longer maturity. I repeat the estimation of Equation (1) by dividing all bond issues into quintiles based on maturity. The bottom quintile up to top quintile of maturity are 1-5 years, 5-9 years, 9-13 years, 13-18 years, and greater than 18 years, respectively. Table 8 reports the results for maturity quintiles splits. Panel A of Table 8 shows that, when sorting all bonds into quintiles base on their maturities, the impact of union density on issuance yields becomes more prominent for new bond issues with longer maturity. Columns (1) to (5) present results based on the new issues of which maturities fall into the bottom to the top quintile of maturity. The coefficient of *Mem_public (%)* of the bottom quintile sample is insignificant and with the lowest magnitude, while the coefficients of *Mem_public (%)* increase monotonically with the length of the term structure cutoff point. For the bottom and top quintile samples, the magnitude of the *Mem_public (%)* is 0.07 basis points (bottom, insignificant) and 0.17 basis points (top, significant at 1%) for a one percent increase in local public union density. Panel B of Table 8 focuses on the impact of union density on yield spreads at issue for sorted subsamples based on maturity as well. The results are consistent with the results in Panel A. Overall, Table 8 suggests that the impact of public-sector union density on issuance yields and spreads becomes more prominent for bonds with longer maturity. These results support the argument that investors require a higher premium to compensate for union-related risk when the time horizon of the investment is longer.

[Insert Table 8 about here]

6.4 Union-related risk and bond credit ratings

In this section, I examine whether local unions affect credit ratings of municipal bonds. The municipal bond market is dominated by retail investors, who rely heavily on credit ratings for information due, at least partly, to information costs (Cornaggia et al., 2018). However, the credit rating process of a municipal bond is highly mechanical and mainly relies on the financial statements of municipalities. Thus, it is ex-ante unclear whether credit ratings reflect information related to local union density. To examine this question, I run the following fixed effect model:

$$\begin{aligned} \mathit{Bond\ ratings}_{i,m,t} &= \beta_1 * \mathit{UnionDensity}_{m,t-1} + \beta_2 * \mathit{Bond\ controls}_{i,m,t} \\ &+ \eta_s + \gamma_m + \lambda_t \end{aligned} \tag{6}$$

where $\mathit{Bond\ ratings}_{i,m,t}$ is the numeric Moody's ratings or S&P's ratings at bond issuance with 1 corresponding to the highest credit quality and 21 the lowest.[25] The coefficient estimate β_1 measures the average impact in credit rating attributable to a one percent increase in local union membership rates.

The results of estimating Equation (6) are tabulated in Table 9. [26] I find a positive and significant loading on public-sector union density measures, implying a link between union-related uncertainties and decreased credit quality. Noted that, from the coefficient (0.037) in Column (1), I can infer that a change from no union presence to a fully unionized public sector in a county would move the bond credit rating down by 0.37 of a notch. The coefficients on private-sector union density measures are insignificant, suggesting that

[25] It would be more ideal to use the historical credit rating information of issuers, rather than the bond level rating at the time of issuance. However, only bond issue level rating information are available to this study due to data availability. I suggest readers treat the inferences with caution when considering issuers may experience upgrades or downgrades post bond issue.

[26] All the prior results are estimated by controlling for bond credit ratings and suggest that that the municipal bond market prices union-related credit risk after controlling for municipal bond ratings.

municipal bond credit ratings only reflect information related to union risks pertaining to the public sector but not the private sectors.

[Insert Table 9 about here]

7 Conclusion

In this paper, I bring to the fore the role of labor unions in the municipal bonds market by investigating the impact of union participation rates on municipal bonds. My results suggest that local union participation has a meaningful but differential impact on the municipal bond market. I find that the issuance costs of municipal bonds are significantly affected by public-sector union density, whereas the issuance costs are only influenced by the presence of private-sector unions if bonds are backed by tax revenues, if bonds are not insured, or if bond issuers are exposed to strong private-sector union power. This finding is robust to different measures of union participation rates. Additionally, by employing a quasi-natural experiment surrounding the state-level passage of Right-to-Work (RTW) legislation, I further provide evidence that the issuance costs of municipal bonds significantly decrease after a state passes the RTW law. Furthermore, by relying on the regression discontinuity approach, I find that close-win union election victories are associated with significantly higher bond yields on the secondary market. Finally, I show that the adverse impact of union density on bond issuance costs is more pronounced when issuers are located in a state with lenient strike policies and during economic contraction periods. I also find that bond investors require a higher bond premium to compensate for union-related risk when the investment horizon (bond maturity) becomes longer.

My study carries important implications for market participants such as bond issuers (municipalities), bond underwriters, rating agencies, and bond investors. First, a municipality should factor local union density into their decision to issue bonds to the public arena, as it entails additional costs for the municipality. Second, by indicating the significant impact of public sector union density on issuance yield, underwriters could benefit from my results and adjust their bond pricing strategy in accordance with the presence or absence of strong union participation in a municipality. Lastly, market participants should be aware that the negative relation between union density and bond yields is more prominent in times of economic downturns and in areas where legislation supports unions' organizing activities.

My results also have important policy implications. Strong unions are likely to protect job security, ensure working environment safety, and improve the welfare of the workers, especially during challenging times like the COVID-19 pandemic. Meanwhile, over the past few years, local governments and municipalities rely more heavily on debt financing through issuing municipal bonds. Prior literature indicates a multiplier effect of municipal bond financing costs on local public finance and economy (see e.g., Adelino et al. (2017) and Dagostino (2018)), thus my results suggest that governmental entities should not overlook the additional issuance costs incurred by the presence of labor unions.

This paper is the first to document that investors account for the risk that local union participation poses on municipal bonds in their investment decisions. The results of this paper may potentially motivate municipalities to take steps toward balancing the benefits and costs of supporting labor unions.

Appendix: Variable Definition

Bonds controls	
Issuance yield (%)	The yield at issuance of a municipal bond.
Yield spread (%)	The yield spread (%) between a municipal bond and a duration-equivalent risk-free bond based on the US Treasury yield curve.
Secondary yield	Secondary yield is the yield to maturity and measures the expected return from holding a bond until maturity given its current price, coupon payments, and face value for options embedded in the municipal bond contract. I calculate the remaining years to maturity for each trade as the difference between the year the bond comes to maturity and the year the trade was made. Following Jha, Karolyi, and Muller (2021), I aggregate the trade-level data to the bond/week-of-sample level.
Amount ($mil)	Natural logarithm the total size of the issue (in millions).
Maturity (year)	The maturity of the municipal bonds (in years).
Rating	Standard & Poor's and Moody's rating scales were converted into numeric form. E.g., the highest-rated bonds (AAA or Aaa) are given a value of one, bonds with ratings of AA+ or Aa1 are given a value of two, and so forth.
Callable	An indicator taking the value of one if the bonds have a call provision.
Insurance	An indicator taking the value of one if the bonds are insured.
Sinkable	An indicator taking the value of one if the bonds have a sinking provision.
Go	An indicator taking the value of one if the bonds are general obligation bonds.
Revenue	An indicator taking the value of one if the bonds are insured.
State_tax_exempt	An indicator taking the value of one if the bonds are state tax-exempt.
Special_tax	An indicator taking the value of one if the bonds are special tax bonds.
Tax_allocation	An indicator taking the value of one if the bonds are tax allocation bonds.
Pre-refunded	An indicator taking the value of one if the bonds are pre-refunded.
Negotiated	An indicator taking the value of one if the bonds is subject to a negotiated offering.
Competitive	An indicator taking the value of one if the bonds subject to a competitive offering.
AMT	An indicator taking the value of one if the bonds subject to the federal alternative minimum tax (AMT).
Bank_qualified	An indicator taking the value of one if the bonds enjoy a tax-advantaged status when purchased by commercial banks.
Privplacement	An indicator taking the value of one if the bonds are issued through private placements.
#Cusip/issue	The total number of issued bonds in the same package (CUSIP).

Union density measures	
Mem_public (%)	The percent of public sector employed workers who are union members, including wage and salary workers, ages 16 and over.
Cov_public (%)	The percent of public sector employed workers who are covered by a collective bargaining agreement, including wage and salary workers, ages 16 and over.
Mem_private (%)	The percent of private-sector employed workers who are union members, including wage and salary workers, ages 16 and over.

Cov_private (%)	The percent of private-sector employed workers who are covered by a collective bargaining agreement, including wage and salary workers, ages 16 and over.

Union election measures

Win margin	The total number of votes for unionization is divided by total eligible votes in a given union election, then minus 0.5.
d_Win	An indicator variable that equals one if a majority of employees votes for unionization in a given election (Win margin >0) and zero if a majority of employees votes against unionization in a given election (Win margin <0).

Other variables

RTW_states	An indicator taking the value of one if the states have passed Right-to-Work (RTW) legislation.
NBER_Recession	The recession period is defined as US business cycle contractions by NBER.
Strike_lenient	An indicator taking the value of one if a state: [1] permitted its public employees to strike (with qualifications), or [2] prohibited strike with no penalties specified (discretion of the court); or [3] have no state-level strike policy provision. The dummy takes the value of zero if the state prohibited the public employees to strike with penalties specified (Valletta and Freeman, 1988).

References

Abraham, K. G., & Medoff, J. L. (1984). Length of service and layoffs in union and nonunion work groups. *ILR Review*, *38*(1), 87-97.

Acemoglu, D., Aghion, P., & Violante, G. L. (2001, December). Deunionization, technical change and inequality. In *Carnegie-Rochester conference series on public policy* (Vol. 55, No. 1, pp. 229-264). North-Holland.

Adelino, M., Cunha, I., & Ferreira, M. A. (2017). The economic effects of public financing: Evidence from municipal bond ratings recalibration. *The Review of Financial Studies*, *30*(9), 3223-3268.

Aidt, T., & Tzannatos, Z. (2002). *Unions and collective bargaining: Economic effects in a global environment*. Washington, DC: World Bank.

Allegretto, S. A., Jacobs, K., & Lucia, L. (2011). The wrong target: Public sector unions and state budget deficits. *University of California at Berkeley Policy Brief*.

Anzia, S. F., & Moe, T. M. (2015). Public sector unions and the costs of government. *The Journal of Politics*, *77*(1), 114-127.

Babina, T., Jotikasthira, C., Lundblad, C., & Ramadorai, T. (2021). Heterogeneous taxes and limited risk sharing: Evidence from municipal bonds. *The review of financial studies*, *34*(1), 509-568.

Borusyak, K., & Jaravel, X. (2017). Revisiting event study designs. Available at SSRN 2826228.

Butler, A. W. (2008). Distance still matters: Evidence from municipal bond underwriting. *The Review of Financial Studies*, *21*(2), 763-784.

Butts, Kyle (2021). did2s: Two-Stage Difference-in-Differences. Following Gardner (2021). R package version 0.4.0.

Callaway, B., & Sant'Anna, P. H. (2020). Difference-in-differences with multiple time periods. *Journal of Econometrics.*

Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica*, *82*(6), 2295-2326.

Campello, M., Gao, J., Qiu, J., & Zhang, Y. (2018). Bankruptcy and the cost of organized labor: Evidence from union elections. *The Review of Financial Studies*, *31*(3), 980-1013.

Cantor, R., & Packer, F. (1997). Differences of opinion and selection bias in the credit rating industry. *Journal of Banking & Finance*, *21*(10), 1395-1417.

Cattaneo, M. D., Jansson, M., & Ma, X. (2020). Simple local polynomial density estimators. *Journal of the American Statistical Association*, *115*(531), 1449-1455.

Cestau, D., Green, R. C., Hollifield, B., & Schürhoff, N. (2017, July). The cost burden of negotiated sales restrictions: A natural experiment using heterogeneous state laws. In *6th annual Municipal Finance Conference, Brookings institute*.

Cornaggia, J., Cornaggia, K. J., & Israelsen, R. D. (2018). Credit ratings and the cost of municipal financing. *The Review of Financial Studies*, *31*(6), 2038-2079.

Cornaggia, K. R., Hund, J., Nguyen, G., & Ye, Z. (2021). Opioid crisis effects on municipal finance. *Available at SSRN 3448082*.

Dagostino, R. (2018). The impact of bank financing on municipalities' bond issuance and the real economy. *Work. Pap., Univ. Rochester, Rochester, NY Google Scholar Article Location*.

de Chaisemartin, Cl´ement and Xavier D'Haultfœuille. 2020. "Two-way fixed effects estimators with heterogeneous treatment effects." *American Economic Review*, *110*(9), 2964-2996.

DiNardo, J., & Lee, D. S. (2004). Economic impacts of new unionization on private sector employers: 1984–2001. *The Quarterly Journal of Economics*, *119*(4), 1383-1441.

Driessen, G. A. (2018). Tax-exempt bonds: A description of state and local government debt. *RL30638*.

Dougal, C., Gao, P., Mayew, W. J., & Parsons, C. A. (2019). What's in a (school) name? Racial discrimination in higher education bond markets. *Journal of Financial Economics*, *134*(3), 570-590.

Ellwood, D. T., & Fine, G. (1987). The impact of right-to-work laws on union organizing. *Journal of Political Economy*, *95*(2), 250-273.

Farber, H. S. (1978). Individual preferences and union wage determination: the case of the united mine workers. *Journal of Political Economy*, *86*(5), 923-942.

Farber, H. S., & Western, B. (2002). Ronald Reagan and the politics of declining union organization. *British Journal of Industrial Relations*, *40*(3), 385-401.

Fallick, B. C., & Hassett, K. A. (1999). Investment and union certification. *Journal of labor Economics*, *17*(3), 570-582.

Frandsen, B. R. (2016). The effects of collective bargaining rights on public employee compensation: Evidence from teachers, firefighters, and police. *ILR Review*, *69*(1), 84-112.

Freeman, R. B., & Han, E. (2012). The war against public sector collective bargaining in the U.S. *Journal of Industrial Relations*, *54*(3), 386-408.

Freeman, R. B., & Medoff, J. L. (1984). What do unions do. *Indus. & Lab. Rel. Rev.*, *38*, 244.

Freeman, R. B., & Valletta, R. G. (2007). 3. The Effects of Public Sector Labor Laws on Labor Market Institutions and Outcomes. In *When public sector workers unionize* (pp. 81-106). University of Chicago Press.

Gao, P., Lee, C., & Murphy, D. (2019). Municipal borrowing costs and state policies for distressed municipalities. *Journal of Financial Economics*, *132*(2), 404-426.

Gao, P., Lee, C., & Murphy, D. (2020). Financing dies in darkness? The impact of newspaper closures on public finance. *Journal of Financial Economics*, *135*(2), 445-467.

Gardner, J. (2021). Two-stage differences in differences. Working paper.

Goodman-Bacon, Andrew. 2018. "Difference-in-differences with variation in treatment timing." NBER working paper no. 25018.

Hirsch, B. T. (2004). What do unions do for economic performance?. *Journal of Labor Research*, *25*(3), 415-455.

Hirsch, B. T., & Macpherson, D. A. (2003). Union membership and coverage database from the current population survey: Note. *ILR Review*, *56*(2), 349-354.

Hirsch, Barry T., and David A. Macpherson. （2019）. *Union Membership and Earnings Data Book: Compilations from the Current Population Survey.* Arlington, VA: Bureau of National Affairs, Inc.

Chen, H., Kacperczyk, M., & Ortiz-Molina, H. (2011). Labor unions, operating flexibility, and the cost of equity. *Journal of Financial and Quantitative Analysis*, 25-58.

Chen, H., Kacperczyk, M., & Ortiz-Molina, H. (2012). Do nonfinancial stakeholders affect the pricing of risky debt? Evidence from unionized workers. Review of Finance, 16(2), 347-383.

Jha, A., Karolyi, S. A., & Muller, N. Z. (2020). *Polluting Public Funds: The Effect of Environmental Regulation on Municipal Bonds* (No. w28210). National Bureau of Economic Research.

John, K., Knyazeva, A., & Knyazeva, D. (2015). Employee rights and acquisitions. *Journal of Financial Economics*, *118*(1), 49-69.

Kearney, R. C. (2010). Public Sector Labor-Management Relations: Change or Status Quo?. *Review of Public Personnel Administration*, *30*(1), 89-111.

Lee, D. S., & Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of economic literature*, *48*(2), 281-355.

Lee, D. S., & Mas, A. (2012). Long-run impacts of unions on firms: New evidence from financial markets, 1961–1999. *The Quarterly Journal of Economics*, *127*(1), 333-378.

Lewis, H. G. (1986). Union relative wage effects. *Handbook of labor economics*, *2*, 1139-1181.

Madland, D., & Bunker, N. (2011). State Budget Deficits Are Not an Employee Compensation Problem, the Great Recession Is to Blame. *Center for American Progress Action Fund*, *10*.

Matsa, D. A. (2010). Capital structure as a strategic variable: Evidence from collective bargaining. *The Journal of Finance*, *65*(3), 1197-1232.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of econometrics*, *142*(2), 698-714.

Mishel, L., Rhinehart, L., & Windham L (2020). Explaining the erosion of private-sector unions.

Nunn, R., O'Donnell, J., & Shambaugh, J. (2019). The Shift in Private Sector Union Participation: Explanation and Effects. *The Hamilton Project: Washington, DC, USA*.

Magnani, E., & Prentice, D. (2003). Did globalization reduce unionization? Evidence from U.S. manufacturing. *Labour Economics*, *10*(6), 705-726.

Painter, M. (2020). An inconvenient cost: The effects of climate change on municipal bonds. *Journal of Financial Economics*, *135*(2), 468-482.

Rosett, J. G. (2001). Equity risk and the labor stock: the case of union contracts. *Journal of Accounting Research*, *39*(2), 337-364.

Schultz, P. (2012). The market for new issues of municipal bonds: The roles of transparency and limited access to retail investors. *Journal of Financial Economics*, *106*(3), 492-512.

Sun, Liyang and Sarah Abraham. 2020. "Estimating dynamic treatment effects in event studies with heterogeneous treatment effects." *Journal of Econometrics*, forthcoming.

Tian, X., & Wang, W. (2016). Hard marriage with heavy burdens: Organized labor as takeover deterrents. *The Review of Corporate Finance Studies*.

Troy, L. (2004). *The twilight of the old unionism*. ME Sharpe.

United States. Bureau of the Census, United States. Economics, & Statistics Administration. (2011). *Statistical Abstract of the United States, 2011*. U.S. Government Printing Office.

Valletta, R. G. (1989). The impact of unionism on municipal expenditures and revenues. *ILR Review*, *42*(3), 430-442.

Li, W., & Zhu, Q. (2019). The opioid epidemic and local public financing: Evidence from municipal bonds. *Available at SSRN 3454026*.

Figure 1

The municipal bond issue, by year

Figure 1.a plots the average bond offering yields in each year from 2000 to 2018. I retrieve the sample of municipal bonds from Bloomberg. All bonds in this sample have issue sizes of $1 million or greater and are rated by either S&P or Moody's. The solid line plots the average bond yield in each year. Figure 1.b plots the total number of municipal bonds issued and the total face value (in millions) of municipal bonds issued in each year from 2000 to 2018. The grey columns report the total number of bonds issued per year from 2000 to 2018. The solid line plots the total new amount (in $millions) of municipal bonds issued per year from 2000 to 2018. Figure 1.c plots the total new amount (in $millions) of municipal bonds issued by geographic area (county or MSA) per year from 2000 to 2018.

Figure 1.a Average yield of new issues, per year

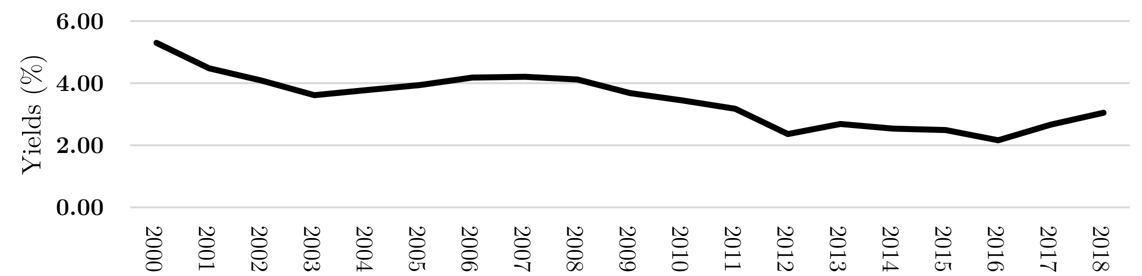


Figure 1.b Total number and total amount of new issues, per year

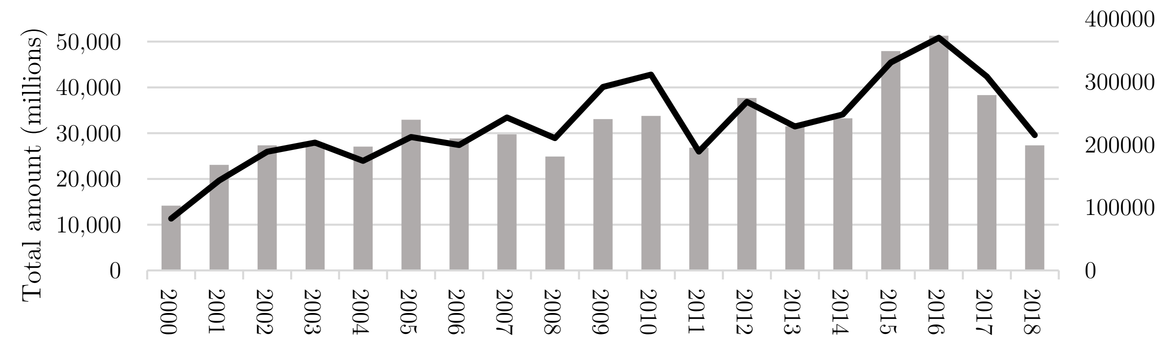


Figure 1.c Total amount of bond new issues, per geographic areas

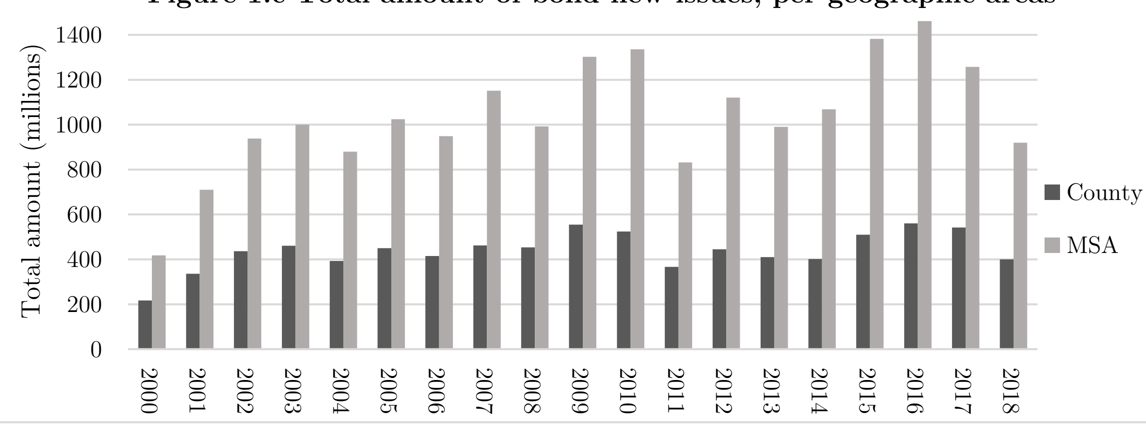


Figure 2

Union membership density since 1975

This figure plots the union membership density by metropolitan areas since 1975. Union member densities are defined as the percent of public sector employed workers (Public mem%), private sector employed workers (Private mem%), and overall employed workers who are union members (Total mem%). Only wage and salary workers, ages 16 and over included. My sample period is highlighted in grey, from 2000 to 2018.

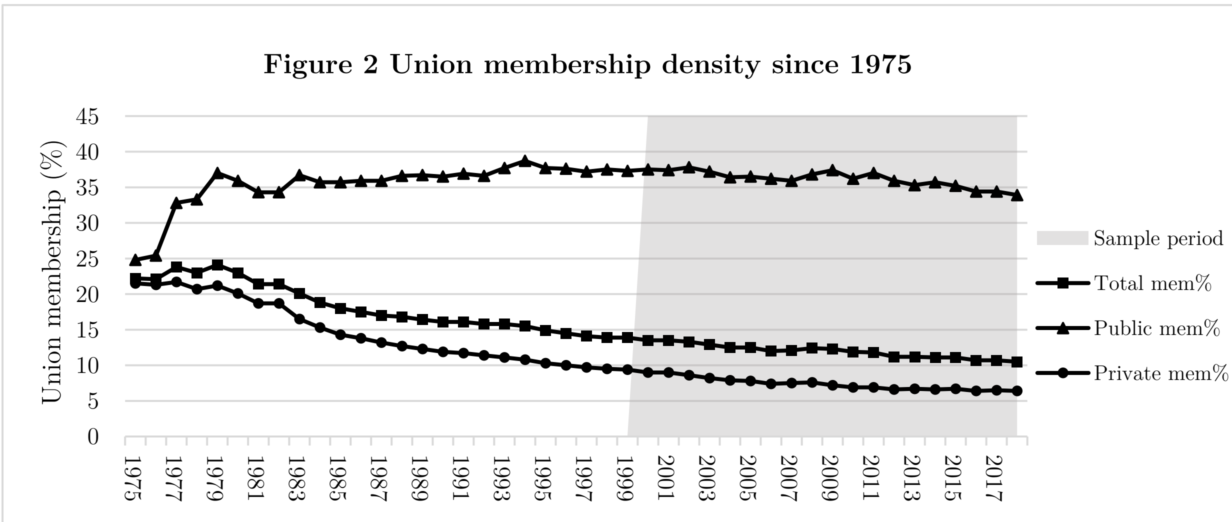


Figure 3

Union election frequencies and results

This figure plots the number of union elections (solid line) and the average vote shares (dash line) per year from 2005 to 2018.

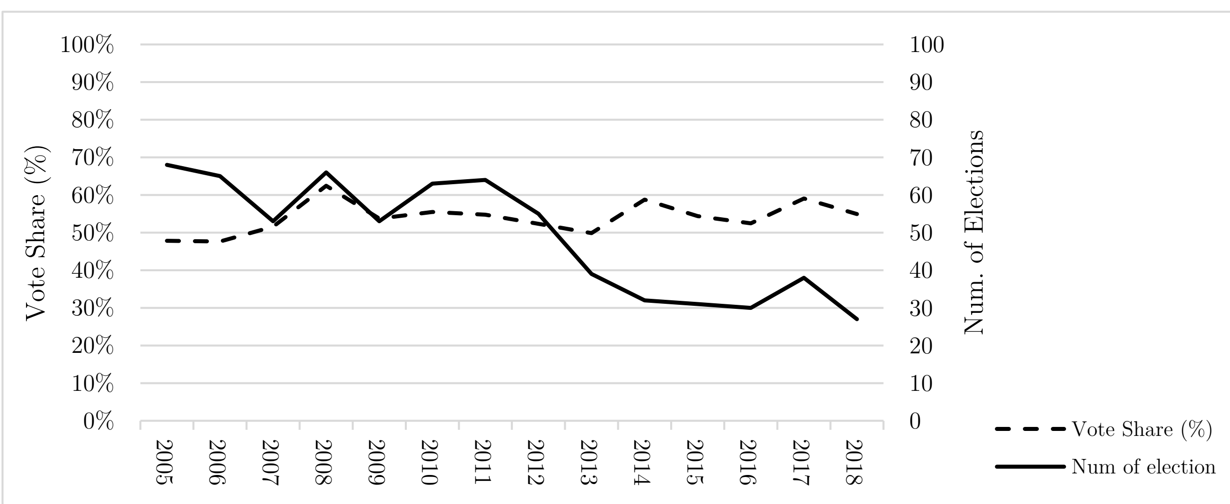


Figure 4

Distribution of union vote share

Panel (a) shows the histogram of the NLRB union election win margin from 2005 to 2018 for the full range in 2 percent bins and reports the p-value of the manipulation test using the local polynomial density estimators proposed in Cattaneo, Jansson, and Ma (2020). The graph in Panel (b) shows the McCrary (2008) test of whether there is a discontinuity in the density of the NLRB union election win margin.

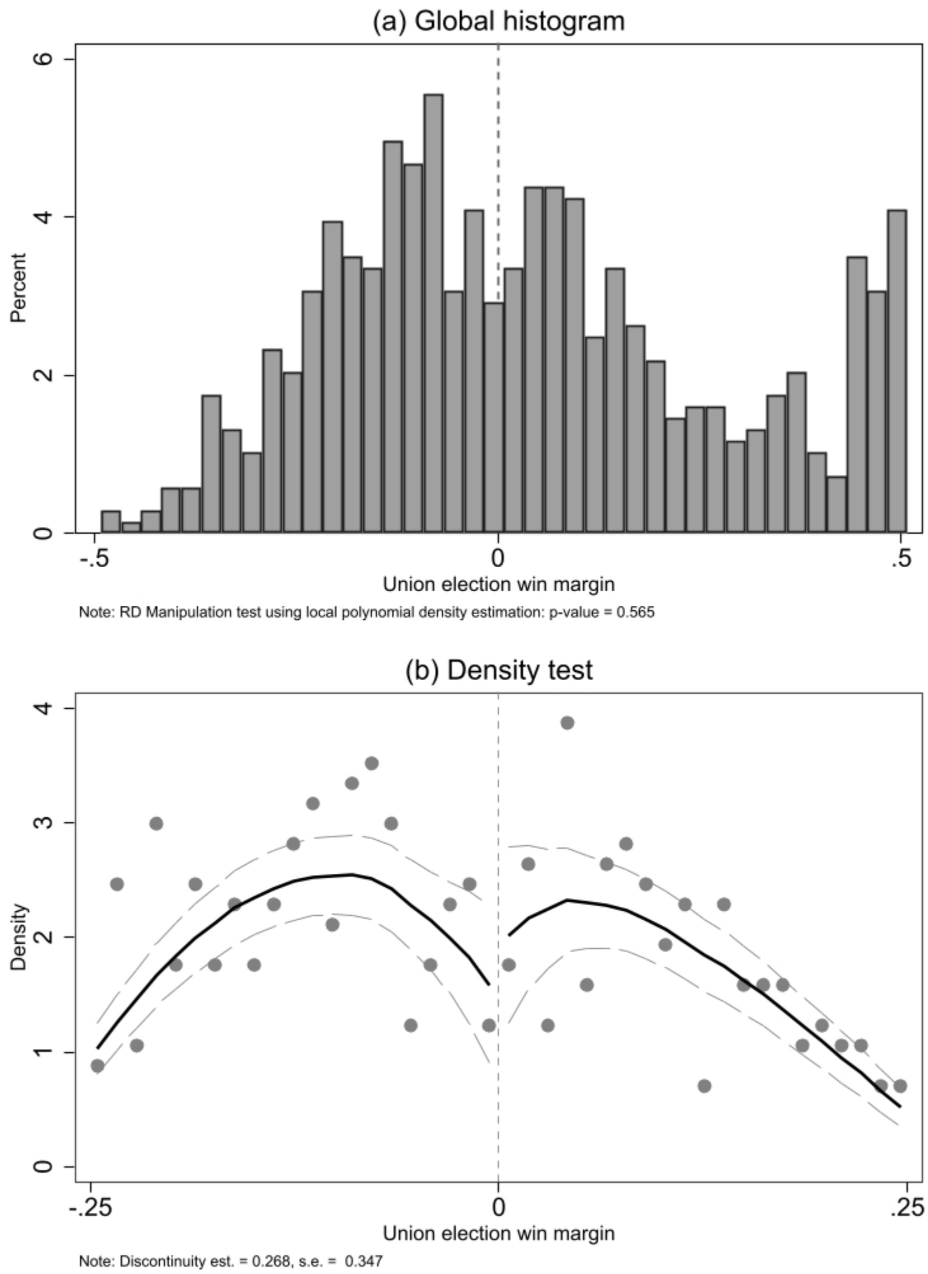


Figure 5

Regression discontinuity plots of secondary yields following an election

This figure shows a graphical illustration of the RD design. The horizontal axis represents the election win margin, and the vertical axis is the municipal bond secondary yields. The dots in Panel (a) are conditional means of secondary yields for each of the 20 equally sized bins of the union election win margin. The solid black line represents the fitted second-order polynomial function on each side of the threshold at zero estimated from my RDD analyses. The outer gray dotted lines denote 95 percent confidence intervals of the polynomial estimation. Panel (b) presents local second-order polynomials using the Epanechnikov kernel function on secondary yields for municipal bonds issued in counties with the union election win margin above versus below the cutoff.

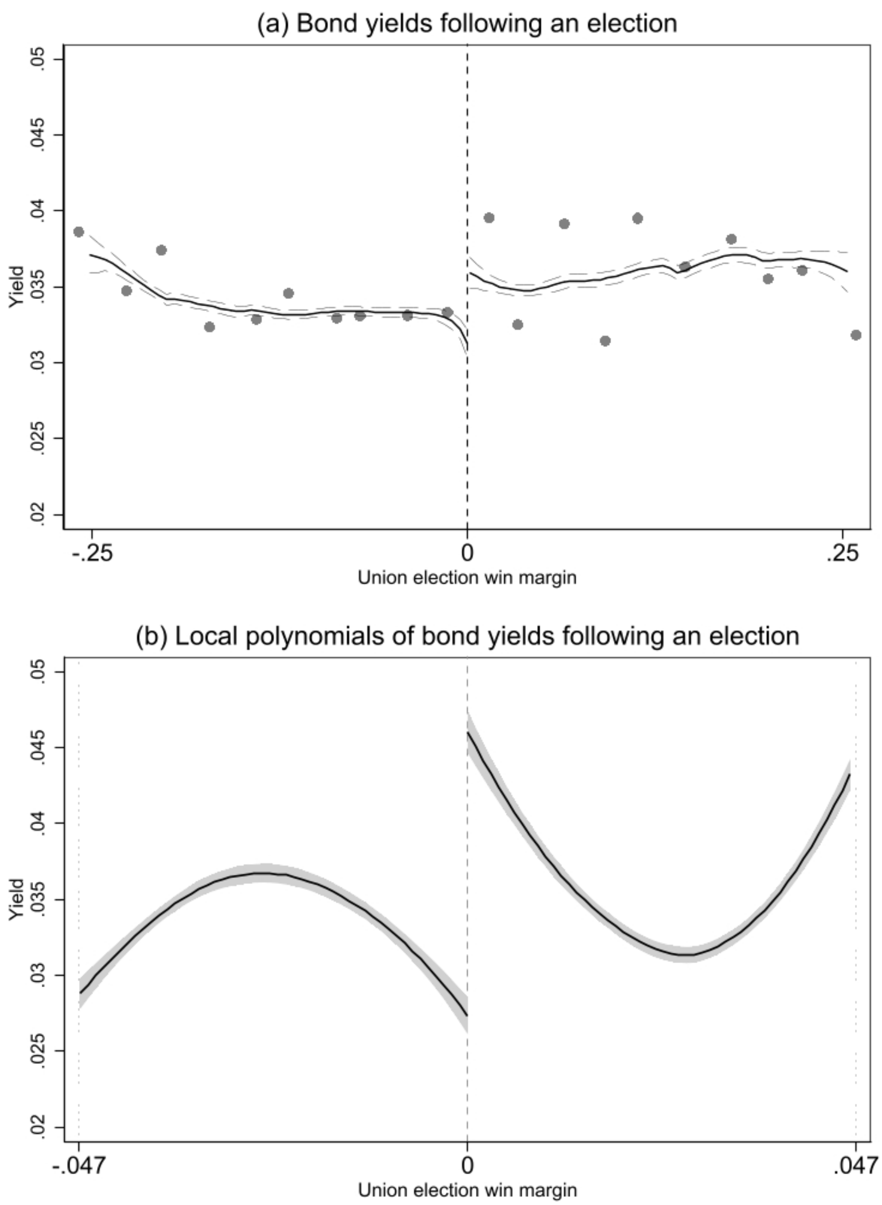


Table 1

Summary statistics of new issue municipal bonds and union density data.

This table reports the summary statistics of the municipal bond issue-level characteristics relevant to my analysis. My sample includes municipal bonds issued from January 2000 to December 2018, retrieved from Bloomberg. All bonds in this sample have issue sizes of $1MM or greater and are rated by either Moody's or S&P. Panel A presents the descriptive statistics including the number of observations, mean, median, and standard deviation. I break down the sample by bond issuers who are located in a union-strong area or not, defined as whether a bond issuer is located in union-strong areas (the union membership density is above the median), or in a union-weak area (below the median). Bond level variables used in this study including the bond yield at issue (*Issuance yield (%)*); the yield spread (*Yield spread (%)*) defined as the difference between a municipal bond and a duration-equivalent risk-free bond based on the US Treasury yield curve; the total size of the issue (*Amount ($mil)*); the municipal bond's maturity (*Maturity*); a numerical scale of Moody's credit rating (*Rating*); dummy variables equaling one if the bond is callable (*Callable*), is insured (*Insurance*), has a sinking provision (*Sinkable*), is general obligation bonds (*Go*), is revenue bonds (*Revenue*), is state tax-exempt (*St_tax_exempt*), is special tax bond (*Special_tax*), is tax allocation bond (*Tax_allocation*), is pre-refunded (*Pre-refunded*), is negotiated offered (*Negotiated*), is competitively issued (*Competitive*), subjects to alternative min tax (*AMT*), is bank qualified (*BQ*), or is issued through private placements. *#Cusip/issue* reports how many bonds are packaged in each issue. Panel B reports pairwise correlations of the bond level variables used in the study. Panel C presents the summary statistics of the union density measures, including the percentage of all public or private sector employed workers who are union members in all metropolitan areas (*Mem_public (%); Mem_private (%)*), and the percentage of all public or private sector employed workers who are covered by a collective bargaining agreement in all metropolitan areas (*Cov_public (%); Cov_private (%)*). Continuous variables are winsorized at 1% and 99%. N denotes the number of observations for each union density measure that has nonmissing values of total annualized issuance cost. All variables are defined in Appendix A.

Panel A: Descriptive statistics by union density

	Public Union Density						**Private Union Density**					
	Union Intensive Bonds (N=271673)			Non union Intensive Bonds (N=271409)			Union Intensive Bonds (N=274681)			Non union Intensive Bonds (N=268401)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	mean	p50	sd	mean	p50	sd	mean	p50	sd	mean	p50	sd
Issuance yield (%)	3.3	3.44	1.30	3.28	3.40	1.28	3.39	3.56	1.29	3.18	3.27	1.29
Yield spread (%)	0.46	0.39	0.88	0.41	0.34	0.83	0.42	0.34	0.88	0.45	0.39	0.82
Amount ($mil)	7.27	2.85	12.11	5.79	2.71	9.32	7.19	2.86	11.95	5.86	2.70	9.51
Maturity (year)	11.78	11.00	6.98	11.87	11.00	6.85	11.82	11.00	6.97	11.83	11.00	6.86
Rating	2.89	3.00	1.98	2.49	2.00	1.78	2.80	3.00	1.94	2.58	2.00	1.83

Callable	0.52	1.00	0.50	0.54	1.00	0.50	0.53	1.00	0.50	0.53	1.00	0.50
Insurance	0.33	0.00	0.47	0.27	0.00	0.44	0.34	0.00	0.48	0.25	0.00	0.43
Sinkable	0.12	0.00	0.32	0.12	0.00	0.32	0.12	0.00	0.33	0.11	0.00	0.32
Go	0.48	0.00	0.50	0.45	0.00	0.50	0.48	0.00	0.50	0.46	0.00	0.50
Revenue	0.45	0.00	0.50	0.50	1.00	0.50	0.46	0.00	0.50	0.49	0.00	0.50
State_tax_exempt	0.91	1.00	0.28	0.98	1.00	0.14	0.91	1.00	0.28	0.98	1.00	0.14
Negotiated	0.72	1.00	0.45	0.67	1.00	0.47	0.70	1.00	0.46	0.68	1.00	0.47
Competitive	0.27	0.00	0.44	0.32	0.00	0.47	0.28	0.00	0.45	0.31	0.00	0.46
#Cusip/issue	19.76	17.00	14.50	18.37	17.00	11.68	19.61	17.00	14.43	18.51	17.00	11.74

Panel B: Correlation Matrix

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. Issuance yield (%)	1.00												
2. Yield spread (%)	0.14	1.00											
3. Mem_public%	0.01	0.03	1.00										
4. Mem_private%	0.10	-0.05	0.76	1.00									
5. Amount ($mil)	0.12	0.10	0.08	0.08	1.00								
6. Maturity (year)	0.64	0.31	-0.01	0.00	0.26	1.00							
7. Rating	-0.04	0.46	0.12	0.04	0.09	0.02	1.00						
8. Callable	0.52	0.25	-0.02	-0.01	0.10	0.76	0.01	1.00					
9. Insurance	0.34	-0.26	0.07	0.12	-0.08	0.12	-0.32	0.10	1.00				
10. Sinkable	0.35	0.25	0.00	0.01	0.21	0.55	0.10	0.30	0.07	1.00			
11. Go	-0.11	-0.13	0.01	-0.01	-0.10	-0.06	-0.21	-0.01	-0.06	-0.12	1.00		
12. Revenue	0.09	0.12	-0.03	0.00	0.13	0.06	0.20	0.01	-0.01	0.10	-0.90	1.00	
13. State_tax_exempt	-0.02	-0.06	-0.10	-0.12	-0.01	0.02	-0.04	0.01	0.01	0.01	-0.09	0.07	1.00

Panel C: Descriptive statistics of union density measures

	(1)	(2)	(3)	(4)	Correlation Matrix			
	N	mean	p50	sd	(1)	(2)	(3)	(4)
Mem_public%	543082	38.62	38.90	20.87	1			
Mem_private%	543082	7.42	6.70	4.77	0.78	1		
Cov_public%	543082	42.45	44.50	20.55	0.99	0.78	1	
Cov_private%	543082	8.19	7.60	4.95	0.77	0.99	0.77	1

Table 2

The effect of local unionization on municipal bond issuance costs

This table presents the results of estimating the fixed effect model specified in Equation (1) and equation (2). The variables of interest are *Mem_public (%)* and *Mem_private (%)* (*Cov_public (%)* and *Cov_private (%)* in panel B). The dependent variables are issuance yield (*Issuance yield (%)*) in columns (1) and (3), and yield spread (*Yield spread (%)*)in columns (2) and (4). Rating controls include a set of indicator variables for each possible bond rating assigned by Moody's. Other bond controls include *Amount ($mil)*), *Maturity*, *#Cusip/issue*, and a group of dummy variables includes *Callable*, *Insurance*, *Sinkable*, *Go*, *Revenue*, *St_tax_exempt*, *Special_tax*, *Tax_allocation*, *Pre-refunded*, *Negotiated*, *Competitive*, *AMT*, *BQ*, and *Priv-placement*. All regressions include state, metropolitan areas (MSA), and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

Panel A: Local union membership density and municipal bond issuance costs

	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
Mem_public (%)	0.0016***	0.0015***		
	(2.884)	(2.717)		
Mem_private (%)	-0.0011	0.0002		
	(-0.482)	(0.086)		
Mem_public (%)			0.0019***	0.0018***
			(2.929)	(3.179)
Mem_private (%)			-0.0021	-0.0009
			(-0.693)	(-0.406)
Mem_public(%)×GO			-0.0013***	-0.0013***
			(-2.763)	(-2.835)
Mem_private(%)×GO			0.0063***	0.0063***
			(2.678)	(3.093)
Mem_public(%)×Not_Insured			-0.0009	-0.0005
			(-1.577)	(-1.262)
Mem_private(%)×Not_Insured			0.0054**	0.0049**
			(2.044)	(2.560)
Constant	3.2230***	2.8340***	2.8263***	0.8433***
	(9.655)	(10.632)	(10.606)	(4.224)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.792	0.673	0.792	0.673

Table 2 *(continued)*

Panel B: Local collective bargaining agreement coverage and municipal bond issuance costs				
	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
Cov_public (%)	0.0011**	0.0010**		
	(2.218)	(2.037)		
Cov_private (%)	0.0001	0.0002		
	(0.057)	(0.076)		
Cov_public (%)			0.0012**	0.0016**
			(2.151)	(2.378)
Cov_private (%)			-0.0008	0.0000
			(-0.268)	(0.005)
Cov_public(%)×GO			-0.0013***	-0.0013**
			(-2.764)	(-2.307)
Cov_private(%)×GO			0.0059***	0.0059**
			(2.648)	(2.395)
Cov_public(%)×Not_Insured			-0.0009	-0.0005
			(-1.429)	(-0.906)
Cov_private(%)×Not_Insured			0.0053**	0.0049**
			(1.977)	(2.009)
Constant	3.2359***	2.8484***	2.8263***	0.8433***
	(9.682)	(10.707)	(10.606)	(4.224)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.787	0.791	0.792	0.673

Table 3

The effect of private-sector unionization on municipal bond issuance costs

This table presents the results of estimating Equation (1), after dividing the sample into bond issuers that are exposed to strong union power from private sector and bond issuers that are facing moderate/weak private-sector union density. I define a metropolitan area as facing strong private-union power if its private-sector union density percentage falls into the top quintile of sample distribution, and otherwise as facing moderate/weak private-sector union power. The variables of interest are *Mem_private (%)* in panel A and *Cov_private (%)* in panel B. The dependent variable in Column (1) and (3) is the initial yield of the bond (*Issuance yield (%)*) and in Column (2) and (4) is the yield spread (*Yield spread (%)*). definitions of variables can be found in Appendix. All regressions include states, metropolitan areas (MSA) and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

Panel A: The effect of private-sector unionization on municipal bond issuance costs

	Strong Private Union		**Moderate/Weak Private Union**	
	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
Mem_private (%)	0.0150*	0.0135*	0.0006	0.0023
	(1.918)	(1.656)	(0.232)	(0.828)
Amount (mil)	-0.0184***	-0.0069	-0.0340***	-0.0238***
	(-2.767)	(-0.803)	(-8.800)	(-7.229)
Maturity	0.0643***	0.0363***	0.0712***	0.0400***
	(39.706)	(13.823)	(65.411)	(45.346)
Constant	2.2045***	-0.9635***	3.1806***	0.5011***
	(8.164)	(-2.813)	(26.680)	(2.810)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	80,261	80,261	378,699	378,699
R-squared	0.790	0.674	0.794	0.674

Table 3 *(continued)*

Panel B: Private-sector collective bargaining agreement coverage on municipal bond issuance costs				
	Strong Private Union		**Moderate/Weak Private Union**	
	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
Cov_private (%)	0.0104*	0.0100	0.0019	0.0035
	(1.759)	(1.376)	(0.873)	(1.401)
Amount (mil)	-0.0183***	-0.0069	-0.0340***	-0.0238***
	(-2.756)	(-0.796)	(-10.836)	(-7.222)
Maturity	0.0643***	0.0363***	0.0712***	0.0400***
	(39.711)	(13.824)	(91.778)	(45.349)
Constant	2.2631***	-0.9194***	3.1714***	0.4915***
	(8.450)	(-2.678)	(24.234)	(2.772)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	80,261	80,261	378,699	378,699
R-squared	0.790	0.674	0.794	0.674

Table 4

Difference-in-differences of issuance costs around the passage of Right to Work legislation

This table presents difference-in-difference estimates (Equation (3)) for the issuance costs before and after Right-to-work (RTW) law was passed. *RTW_states* dummy takes a value of one if a state has passed Right-to-Work (RTW) law and otherwise zero. During my sample period of 2000 to 2018, five states, Oklahoma (2001), Indiana (2012), and Michigan (2012), Wisconsin (2015), and West Virginia (2016), further adopted RTW laws. Panel A reports the OLS estimation on whether RTW states are associated with lower union density. Panel B presents the difference-in-difference estimates. The dependent variable in Columns (1) and (3) is the issuance yield of a municipal bond (*Issuance yield (%)*) and in Columns (2) to (4) is the yield spread of the bond (*Yield spread (%)*). All variables are defined in Appendix. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

Panel A: The passage of RTW and union density rates

	(1)	(2)	(3)	(4)
	Mem_public (%)	Mem_private (%)	Cov_public (%)	Cov_private (%)
RTW_states	-4.712***	-1.2713***	-6.189***	-1.743***
	(-2.655)	(-2.670)	(-3.414)	(-4.053)
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Observations	3941	3941	3941	3941
R-squared	0.831	0.791	0.815	0.768
Clustered by	MSA	MSA	MSA	MSA

Panel B: The passage of RTW and municipal bond issuance costs

	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Issuance yield (%)	Yield spread (%)	Yield spread (%)
*Pre*Treated states*		0.0631		0.0857**
		(1.372)		(2.324)
RTW_states	-0.0617**	-0.0710**	-0.0359*	-0.0264
	(-2.334)	(-2.467)	(-1.690)	(-1.498)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.792	0.792	0.673	0.693

Table 4 *(continued)*

Panel C: Two-Stage Difference-in-Differences Estimation				
	Whole sample		**Legal status change states**	
	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
RTW_states	-0.0354**	-0.0371***	-0.0993***	-0.01990
	(-4.637)	(-3.013)	(-2.291)	(-0.67)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State Year	State Year	State Year	State Year
Clustered by	County	County	County	County
Observations	543,081	543,081	47,805	47,805

Table 5

Municipal bond yields after the union election

Panel A reports regression results from polynomial regression analyses for secondary yields of municipal bonds issued in counties with the union election win margin above versus below the cutoff. I consider second-order polynomials in Columns (1) to (3), third-order polynomials in Columns (4) to (6), and fourth-order polynomials in Columns (7) to (9). I control for local polynomials using Uniform kernel functions in Columns (1), (4), and (7), using Epanechnikov kernel functions Columns (2), (5), and (8), and using Triangular kernel functions in Columns (3), (6), and (9). The discontinuity is determined by the union election win cutoff (0%). The regressions are estimated by choosing separate bandwidths in centered election margin for observations to the left versus the right of the cutoff; these bandwidths are chosen optimally based on the coverage error rate method as specified in Calonico, Cattaneo, and Titiunik (2014). Panel B reports the results from the local linear regression analysis for secondary yields of municipal bonds. Column (3) reports the estimates using the optimal bandwidths *h* determined by Calonico, Cattaneo, and Titiunik (2014). To verify the robustness of the results of local linear regression analyses, I consider alternative bandwidths ranging from 50% of *h* to 200% of *h*. Standard errors are clustered by CUSIP6 and year and are bias-corrected as discussed in Calonico, Cattaneo, and Titiunik (2014). T-stats are in parentheses. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

Panel A: Polynomial regression results for municipal bonds yields post the union election

Outcome	Secondary yields								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Union victory	0.002***	0.001***	0.003***	0.002***	0.007***	0.006***	0.005***	0.006***	0.006***
	(3.523)	(4.575)	(11.690)	(7.304)	(13.687)	(13.218)	(10.746)	(12.104)	(13.503)
Control Function	Quadratic	Quadratic	Quadratic	Cubic	Cubic	Cubic	Quartic	Quartic	Quartic
Co-variates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Optimal Bandwidth	0.071	0.095	0.077	0.102	0.131	0.069	0.083	0.087	0.107
Kernel Type	Rectan	Epan	Trian	Rectan	Epan	Trian	Rectan	Epan	Trian
Observations	58,445	92,602	61,515	93,788	57,472	58,086	75,541	84,808	96,510

Table 5 *(continued)*

Panel B: Linear regression results for municipal bonds yields post the union election							
Outcome	Secondary yields						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Union victory	0.024***	0.018***	0.005***	0.005***	0.005***	0.006***	0.007***
	(8.394)	(2.806)	(2.031)	(2.325)	(4.831)	(4.837)	(6.812)
Co-variates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bandwidth	50%*h	75%*h	h	125%*h	150%*h	175%*h	200%*h
Kernel Type	Rectan	Rectan	Rectan	Rectan	Rectan	Rectan	Rectan
Observations	6,450	8,077	10,821	15,337	19,867	20,892	30,058

Table 6

Strike policy provisions, unionization, and municipal bonds issuance costs

This table reports the results of the differential effects of union-related risks on offering yield and spreads of municipal bonds issued in strict strike policy states and lenient strike policy states. I define a state with lenient strike provisions (*Strike_lenient*) if it: [1] permitted its public employees to strike (with qualifications), or [2] prohibited its public employees to strike with no penalties specified (discretion of the court); or [3] had no state-level strike policy provision. The variables of interest are *Mem_public (%)* and *Mem_public(%)×Strike_lenient*, *Cov_public (%),* and *Cov_public(%)×Strike_lenient.* The dependent variable in Columns (1) and (3) is the initial yield of a municipal bond (*Issuance yield (%)*), and in Columns (2) and (4) is the yield spread (*Yield spread (%)*). All variables are defined in Appendix. All regressions include state, metropolitan area (MSA), and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield(%)	Yield spread(%)	Issuance yield(%)	Yield spread(%)
Mem_public (%)	-0.0013	-0.0005		
	(-1.501)	(-0.557)		
Mem_public (%)×Strike_lenient	0.0036***	0.0025**		
	(3.266)	(2.233)		
Cov_public (%)			-0.0008	-0.0000
			(-0.919)	(-0.042)
Cov_public (%)×Strike_lenient			0.0022**	0.0017*
			(2.148)	(1.683)
Amount (mil)	-0.0497***	-0.0172***	-0.0498***	-0.0173***
	(-12.685)	(-5.541)	(-12.698)	(-6.483)
Maturity	0.1016***	0.0351***	0.1016***	0.0351***
	(89.334)	(49.681)	(89.357)	(67.736)
Constant	2.8270***	0.9927***	2.8528***	0.9993***
	(11.028)	(4.817)	(11.147)	(5.321)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.791	0.671	0.792	0.673

Table 7

The effect of local unions on municipal bond issuance costs around recession periods

This table reports the results of estimating Equation (1) for the costs to issue a municipal bond during US business cycle expansions and contractions. I define the sample period as recession periods (*NBER_Recession* = 1) and expansion periods (*NBER_Recession* = 0) based on the business cycle reference dates defined by NBER. The dependent variable in columns (1) and (3) is the initial yield of the bond (*Issuance yield (%)*), and in columns (2) and (4) is the yield spread (*Yield spread (%)*). The variables of interest are *Mem_public (%)*, *Mem_private (%),* and their interactions with *NBER_Recession*. All variables are defined in Appendix. All regressions include state, metropolitan area (MSA), and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

Panel A: The effect of union membership density on municipal bond issuance costs around the recession

	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield	Yield spread	Issuance yield	Yield spread
Mem_public (%)	0.0016***	0.0015**		
	(2.634)	(2.516)		
*Mem_public(%)*NBER_Recession*	0.0005	0.0006*		
	(1.563)	(1.825)		
Mem_private (%)			-0.0004	-0.0006
			(-0.184)	(-0.233)
*Mem_private(%)*NBER_Recession*			0.0023*	0.0028*
			(1.675)	(1.718)
Amount (mil)	-0.0511***	-0.0497***	-0.0512***	-0.0498***
	(-13.015)	(-12.678)	(-13.040)	(-12.700)
Maturity	0.0971***	0.1016***	0.0971***	0.1016***
	(90.187)	(89.324)	(90.177)	(89.318)
Constant	2.8263***	0.8389***	2.8934***	0.9021***
	(10.677)	(4.106)	(10.869)	(4.427)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.792	0.675	0.792	0.674

Table 7 *(continued)*

Panel B: The effect of collective bargaining coverage on municipal bond issuance costs around the recession

VARIABLES	(1) Issuance yield	(2) Yield spread	(3) Issuance yield	(4) Yield spread
Cov_public (%)	0.0009*	0.0007		
	(1.790)	(1.561)		
*Cov_public(%)*NBER_Recession*	0.0007**	0.0046***		
	(2.253)	(12.472)		
Cov_private (%)			0.0005	-0.0012
			(0.211)	(-0.753)
*Cov_private(%)*NBER_Recession*			0.0026*	0.0202***
			(1.734)	(11.657)
Amount (mil)	-0.0498***	-0.0174***	-0.0498***	-0.0173***
	(-12.694)	(-6.583)	(-12.695)	(-6.543)
Maturity	0.1016***	0.0352***	0.1016***	0.0352***
	(89.332)	(67.890)	(89.321)	(67.906)
Constant	2.8469***	0.8440***	2.8858***	0.8932***
	(10.769)	(4.125)	(10.849)	(4.365)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.792	0.675	0.792	0.675

Table 8
Maturity split

This table reports the results of fixed effect model of Equation (1) by varying term structure specifications. The whole sample splits into five equal parts by the quintiles of bond maturity. Municipal bonds included in "< 5 Years" sample have maturity less than 5 years (the bottom quintile). Bonds included in "> 18 Year" sample has maturity greater than 18 years (the top quintile). The variable of interest is *Mem_public (%)* in Panel A, and *Cov_public (%)* in Panel B. All variables are defined in Appendix. All regressions include state, metropolitan area (MSA), and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

Panel A: Issuance yield (%)

	(1)	(2)	(3)	(4)	(5)
VARIABLES	< 5 Years	5 - 9 Years	9 - 13 Years	13- 18 Years	> 18 Years
Mem_public (%)	0.0007	0.0009	0.0012**	0.0016***	0.0017**
	(1.265)	(1.436)	(2.183)	(2.819)	(2.453)
Mem_private (%)	0.0000	0.0010	-0.0027	-0.0031	-0.0033
	(0.012)	(0.436)	(-1.019)	(-1.049)	(-1.268)
	(-0.793)	(-0.506)	(-1.327)	(-0.901)	(-1.300)
Constant	1.7935***	1.7156***	2.3546***	3.2888***	4.3612***
	(17.816)	(17.129)	(24.576)	(37.995)	(39.735)
Rating controls	Yes	Yes	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County	County
R-squared	0.864	0.808	0.771	0.759	0.755

Table 8 *(continued)*

Panel B: Yield spread (%)					
	(1)	(2)	(3)	(4)	(5)
VARIABLES	< 5 Years	5 - 9 Years	9 - 13 Years	13- 18 Years	> 18 Years
Mem_public (%)	0.0005	0.0012	0.0013**	0.0017***	0.0022***
	(0.733)	(1.566)	(2.016)	(2.592)	(2.914)
Mem_private (%)	-0.0020	-0.0012	-0.0034	-0.0027	-0.0034
	(-0.999)	(-0.512)	(-1.314)	(-0.917)	(-1.291)
Constant	1.3331***	1.6053***	2.2885***	3.2499***	4.3188***
	(13.392)	(16.053)	(24.070)	(37.654)	(39.668)
Rating controls	Yes	Yes	Yes	Yes	Yes
Bond controls	Yes	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County	County
R-squared	0.857	0.789	0.737	0.723	0.693
Observations	111,983	114,533	111,296	110,363	94,882

Table 9

Future bond ratings

This table reports the results of fixed effect model of Equation (6). The variable of interest are union density measures and collective bargaining coverage measures. All regressions include state, metropolitan area (MSA), and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively. All variables are defined in Appendix.

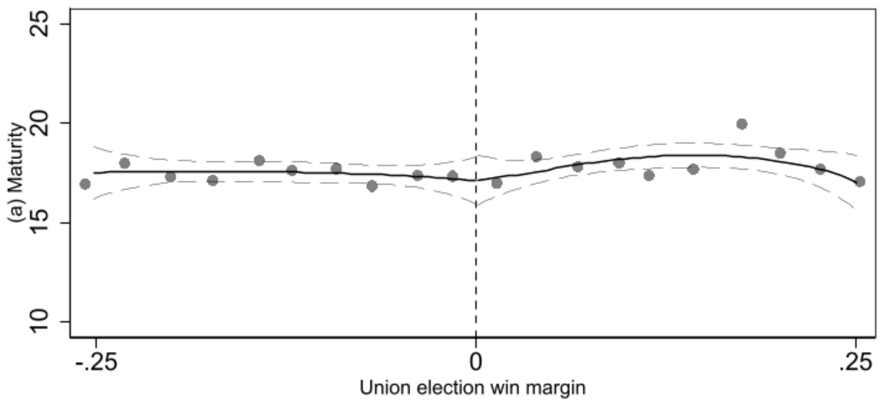
VARIABLES	(1) Moody's Rating (t+1)	(2) S&P Rating (t+1)	(3) Moody's Rating (t+1)	(4) S&P Rating (t+1)
Mem_public (%)	0.0037**	0.0035*		
	(2.214)	(1.739)		
Mem_private (%)	-0.0053	-0.0076		
	(-0.690)	(-0.957)		
Cov_public (%)			0.0025*	0.0013
			(1.764)	(0.803)
Cov_private (%)			-0.0111	-0.0078
			(-1.586)	(-1.090)
Constant	3.8046***	3.7168***	3.8917***	3.9417***
	(13.483)	(10.560)	(13.758)	(13.316)
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.342	0.276	0.342	0.319

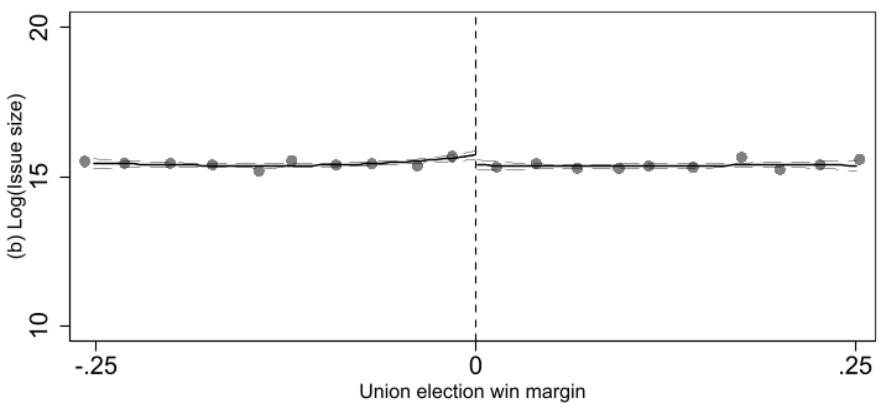
Internet Appendix

Figure A1

Continuity of municipal bond characteristics

This figure shows the continuity of municipal issue-level characteristics given vote shares for union in an election. The horizontal axis represents the vote share in support of the union, and the vertical axis represents bond characteristics. Panels (a) through (c) show the distribution for bond maturity, issue amount, and issue-level rating, respectively. The dots represent average bond characteristics in each 5% interval of vote shares. The solid lines represent fitted polynomials of 2nd-order, fitted over the whole range of vote shares, maintaining the same coefficients on both sides of the cutoff. The dotted lines represent the 5th- and 95th-percentile confidence intervals of the fitted functions based on clustered standard errors.





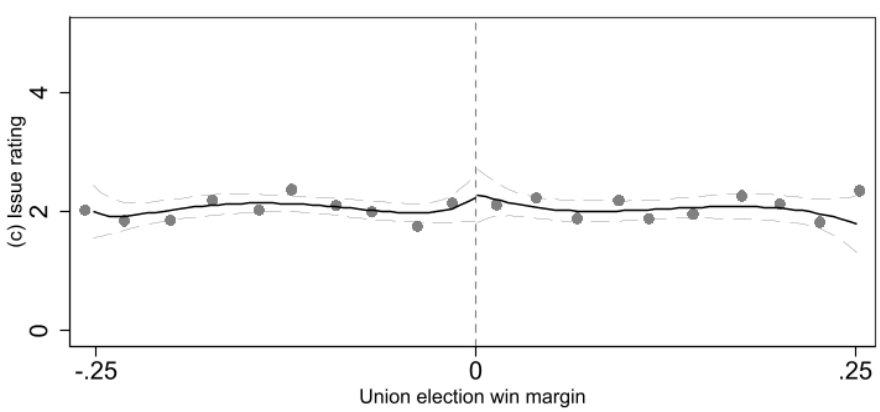


Table A1

Robustness checks 1 - The effect of labor unions on municipal bond issuance costs

This table presents the results of estimating model specifications in Table 2. I use the log-transformed *Mem_public (%) Mem_private (%), Cov_public (%),* and *Cov_private (%)* in Panel A. I exclude metropolitan areas (i.e., Jackson, MI) with extremely high public-sector union density in Panel B. The dependent variable in Columns 1 and 2 is the total issuance yield of a municipal bond (*Issuance yield (%)*). In Columns 3 and 4, the dependent variable is the yield spread of the bond (*Yield spread (%)*). All regressions include state, metropolitan areas (MSA) and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

Panel A: Log transformation of union density measure

	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
log(Mem_public)	0.0328**	0.0302**		
	(2.298)	(2.070)		
log(Mem_private)	-0.0128	-0.0009		
	(-0.987)	(-0.076)		
log(Cov_public)			0.0187	0.0271*
			(1.352)	(1.650)
log(Cov_private)			0.0006	0.0111
			(0.043)	(0.838)
Constant	2.7994***	0.8108***	2.8234***	0.7962***
	(10.358)	(3.585)	(10.455)	(3.487)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	543,081	543,081	543,081	543,081
R-squared	0.792	0.673	0.792	0.673

Table A1 *(continued)*

Panel B: Excluding Jackson, MI				
	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
Mem_public (%)	0.0016***	0.0015***		
	(2.856)	(2.723)		
Mem_private (%)	-0.0007	0.0002		
	(-0.288)	(0.075)		
Cov_ public (%)			0.0010**	0.0012**
			(2.035)	(2.447)
Cov_ private (%)			0.0005	0.0010
			(0.246)	(0.405)
Constant	2.8119***	0.8423***	2.8259***	0.8416***
	(10.517)	(3.817)	(10.591)	(3.814)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Observations	529,626	529,626	529,626	529,626
R-squared	0.792	0.673	0.792	0.673

Table A2

Robustness check 2 - The effect of private-sector unionization on municipal bond issuance costs

This table presents the results of estimating specifications in Table 3 by including *Mem_public (%)* as an additional control. The dependent variable in Column 1 and 2 is the issuance yield of a municipal bond (*Issuance yield (%)*). In Column 3 and 4, the dependent variable is the yield spread of the bond (*Yield spread (%)*). The variables of interest are *Mem_private (%)* and *Cov_private (%)*. All regressions include state, metropolitan areas (MSA), and calendar year fixed effects. I compute t-statistics using heteroskedasticity robust standard errors clustered by county and report them in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

	High Private-Sector Union Density			
	(1)	(2)	(3)	(4)
VARIABLES	Issuance yield (%)	Yield spread (%)	Issuance yield (%)	Yield spread (%)
Mem_private (%)	0.0024*	0.0021*		
	(1.812)	(1.667)		
Mem_public (%)	0.0139*	0.0125*		
	(1.787)	(1.674)		
Cov_private (%)			0.0006	0.0013
			(0.452)	(0.948)
Cov_public (%)			0.0116*	0.0134*
			(1.681)	(1.792)
Constant	2.0716***	-1.0841***	2.4638***	-0.5828*
	(7.466)	(-3.228)	(8.699)	(-1.718)
Rating controls	Yes	Yes	Yes	Yes
Other bond controls	Yes	Yes	Yes	Yes
Fixed Effects	State MSA Year	State MSA Year	State MSA Year	State MSA Year
Clustered by	County	County	County	County
Observations	80,261	80,261	88,090	88,090
R-squared	0.786	0.790	0.794	0.679

Table A3

Local union density and municipality financing activity

This table reports the effects of local union density of both economic sectors on annual county-level financing activity during the period from 2000 till 2018 (Equation (5)). The dependent variables are the annual county-level issuance amount (in millions) of total issuance (***Total amount***), GO issuance (***Total amount (GO)***), and Revenue issuance (***Total amount (Rev)***). The variables of interest are *Mem_public (%)* and *Mem_private (%)*. County controls, county fixed effects, state×year fixed effects are included. Standard errors are clustered at the county level. t statistics are reported in parentheses below each coefficient. ***, **, and * correspond to statistical significance at the 1%, 5%, and 10% levels for two-tailed tests, respectively.

	(1)	(2)	(3)
VARIABLES	Total amount	Total amount (GO)	Total amount (Rev)
Mem_public (%)	-1.3192*	0.0205	-3.0148*
	(-1.757)	(0.055)	(-1.819)
Mem_private (%)	-3.5617	-0.7894	3.0825
	(-0.720)	(-0.414)	(0.243)
Observations	9,139	5,554	3,172
R-squared	0.887	0.825	0.896
County control	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes
State× Year fixed effects	Yes	Yes	Yes
Clustered by	County	County	County

Table A4

Differences in observable characteristics between union election win and loss bonds

This table shows differences in observable characteristics between bonds issued in a county that participates in union elections and wins versus that loses by a small margin (vote shares within the interval of [48%, 52%]). Union election results are from the NLRB over 2000–2018. Municipal bonds data are from Bloomberg over the 2000–2018 period.

	Loss	Win	Difference	SE	T-Stat
Maturity	16.97	16.95	0.02	0.96	0.02
log(Issue Amount)	15.89	15.28	0.61	0.33	1.86
Issue Rating	2.17	2.19	-0.02	0.24	-0.06
Go	0.56	0.61	-0.05	0.08	-0.69
Revenue	0.56	0.46	0.10	0.08	1.29
Callable	0.79	0.80	-0.02	0.06	-0.27
Sinkable	0.20	0.20	0.00	0.06	-0.05
Certificate Part	0.00	0.03	-0.03	0.02	-1.54
Negotiated	0.72	0.75	-0.03	0.07	-0.37
State_tax_exempt	0.97	1.00	-0.03	0.02	-1.63