Municipal Financing Responsiveness: Evidence from a Tax Law Shock

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Abstract

Advance refunding transactions are an important fiscal tool that accounted for 44 percent of municipal debt issuances in 2017. These transactions allow municipalities to refinance not-yet-callable debt, thereby acting as early "synthetic" call options. The Tax Cuts and Jobs Act of 2017 (TCJA) repealed the interest income tax exemption on advance refunding bonds. Using this setting, we examine how responsive municipalities' financing practices are to legislative shocks. We present several major insights. First, advance refunding temporarily surged in the short window between TCJA's passage and implementation. Second, advance refunding then declined sharply to only 8 percent of municipal debt issuances. Third, this shock to refunding did not appear to change the contracting terms for new municipal debt. In summary, many municipalities anticipated the shock and quickly adjusted their advance refunding behavior, but the taxation of advance refunding transactions did not have upstream spillovers effects on new contracting. These findings offer both nuanced and countervailing evidence to a mosaic of recent studies finding that municipal financing practices are poorly timed and undisciplined.

Keywords: advance refunding, municipal debt, tax-exempt interest, Tax Cuts and Jobs Act

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1. Introduction

State and local governments in the U.S. have $4.2 trillion of outstanding municipal debt obligations (MSRB 2021). Advance refunding transactions offer a mechanism for municipalities to refinance callable bonds before their call date—effectively mimicking the early exercise decision of an American option and functioning as an early "synthetic" call option. Historically, advance refunding transactions accounted for up to half of the municipal debt issued each year (Ang et al. [2017]). Like interest from other forms of municipal debt, interest income from advance refunding bonds was tax-exempt. However, in a short time frame at the end of 2017 and in the face of substantive legislative gridlock, Congress passed the Tax Cuts and Jobs Act (TCJA). Among other things, this legislative shock repealed the tax-exemption of interest income from advance refunding bonds issued after December 31, 2017. Given a growing chorus of literature documenting that municipalities are inattentive, face internal resource constraints, need external monitoring, and generally make inefficient decisions, we study how municipalities respond to the abrupt imposition of investor-level taxes on advance refunding debt (Chen, Cohen, Liu [2023]; Gao, Lee, and Murphy [2020]; Ang et al. [2017]).

Despite their popularity and economic importance, advance refunding transactions are not widely understood. Original issuances of callable municipal debt frequently have a call feature (e.g., 10-year call). Advance refunding offers municipalities a mechanism to refinance that debt before the call date, thereby providing opportunities for cost savings and debt restructuring.[1] Loosely speaking, prior to TCJA, municipalities could issue a new, tax-exempt bond and then invest the proceeds in U.S. Treasury securities until the original bond is callable,

[1] IRC §149(d)(2) defines *advance* refunding bonds as those "issued more than 90 days before the redemption of the refunded bond." Refunding transactions issued less than 90 days before a bond is callable and those issued after a bond is callable are referred to as *current* refunding transactions. TCJA did not change the tax-exempt status of current refunding transactions.

at which point the original bond would be called with the invested funds. Following TCJA, municipalities can still engage in advance refunding transactions, but interest earned from advance refunding bonds is no longer tax-exempt. In both regimes, if done correctly, the Governmental Accounting Standards Board (GASB) allows municipalities to account for these advance refunding transactions with only a single bond being recognized on a municipality's balance sheet.

Several recent and concurrent studies have scrutinized municipal financing, in general, and advance refunding transactions, specifically. Gao, Lee, and Murphy [2020] document a variety of negative public finance outcomes following the loss of municipal monitoring by local newspapers (e.g., higher borrowing costs and increased advance refunding activity). Other studies scrutinize the timing of refunding transactions and reveal multiple channels of municipal debt refinancing inefficiency and irresponsiveness. For example, Ang et al. [2017] find that 85 percent of advance refunding transactions are issued with a negative net present value (NPV), especially among financially constrained municipalities.[2] Additionally, Chen, Cohen, and Liu [2022] find that municipalities sustain sizeable losses by waiting an average of seven months to refinance debt that could have been favorably called earlier. They also find these delays are longer during busy times and for smaller municipal finance departments. Taken together, these studies suggest that municipalities lack the internal resources to ensure they are efficient and responsive in municipal financing decisions.

In contrast to studies that examine municipal actions with reference to bond call dates, we

[2] In order to reach the 85% negative NPV conclusion, Ang et al. [2017] compare the NPV of an advance refunding transaction to the NPV of a refunding transaction wherein the bond is called optimally (i.e., either advance refunded or refunded in the optimal year after the call date). In contrast, conversations with practitioners indicate that they view the relative NPV of an advance refunding transaction as a comparison between the advance refund bond and the original bond—not a theoretically optimal transaction.

examine municipalities' financing responsiveness in the face of an unexpected, major, and timely legislative shock (i.e., the rapid passage of new federal tax law). Our unique setting allows us to offer triangulating evidence on municipal financing practices. Specifically, we analyze how quickly resource-constrained municipalities navigate this passage of new tax law, as well as the law's short- and long-term consequences. Additionally, we examine whether the taxation of advance refunding transactions had spillover effects on the contracting terms of original municipal debt issuances.

Before we examine these primary research questions, we first validate the assumption that the imposition of an investor-level income tax on advance refunding transactions increases the bond yields for these instruments. Implicit tax theory maintains that the after-tax returns on two substantively equivalent securities must be equal in a competitive equilibrium (Scholes et al. [2014]). Therefore, the imposition of a tax on income from one type of bond, but not another, would reduce relative demand for the taxable bond, thereby driving its yield higher. Empirically, we observe the expected increase in advance refunding bond yields relative to three distinct control groups. Having confirmed that investor-level taxation increased the cost of advance refunding to municipalities and corroborated known dynamics in our setting, we turn our attention to our primary research questions about municipal financing practices.

To examine the responsiveness of municipal financing practices, we examine changes in the amount of advance refunding debt issued in the immediate aftermath of the TCJA. The TCJA was formally introduced in both houses of the U.S. Congress in early November 2017, signed into law by the President on December 22, 2017, and ultimately took effect for debt issued after December 31, 2017 (Gaertner, Hoopes, and Williams [2020]). Because restructuring municipal debt is typically a multi-month process that involves many parties, municipalities that wanted to

take advantage of the last opportunity to issue more favorable debt needed to anticipate and rush to complete transactions in a very short window. Univariate statistics show that municipalities issued four times the amount of aggregate advance refunding debt in December than they did in any other month of 2017. Multivariate analysis corroborates that this temporary increase is significant when compared to contemporaneous trends in original issued debt and current refunding debt. Overall, this spike in affected municipal debt transactions suggests municipalities have adequate incentives and resources to nimbly react to major abrupt legislative changes—a result which runs counter to the findings of the aforementioned recent studies.

To investigate the longer-term impact of the imposition of investor-level taxes on advance refunding bonds, we examine changes in the number of advance refunding transactions and the amount of advance refunding debt issued after the repeal of the tax-exemption of advance refunding bonds. Based on implicit tax theory, introducing taxes on advance refunding bonds increases the cost of advance refunding transactions. However, Ang et al. [2017] suggest municipalities could predominately use advance refunding transactions to restructure debt rather than for cost savings. Debt restructuring motives broadly include the elimination of debt covenants, retirement of senior or subordinate debt, acceleration or extension of due dates, alteration of debt payments or service requirements, etc. Given the benefits of these changes and the few alternative mechanisms to achieve the debt restructuring benefits, the increased costs may not diminish the prevalence of advance refunding. We find the frequency of advance refunding transactions decreased significantly and accounted for just 8.2 percent of all municipal debt issued in 2018. In more formalized difference-in-differences tests, we find this effect is statistically and economically significant. However, in even longer-horizon analysis, we observe a resurgence in advance refunding transactions after approximately 18 months despite the higher

cost of issuing taxable bonds to replace tax exempt bonds in the post-TCJA regime. The TCJA halted the rapid two-decade rise in the popularity for a non-trivial time frame; however, the reemergence of costly advance refunding transactions suggest that municipalities are willing to trade off the increased cost of debt for the ability to restructure their debt using the practice.

To determine the spillover effects of the imposition of investor-level taxes on advance refunding transactions, we examine changes to several common contracting terms of original (i.e., new) municipal bond issuances. To the extent that TCJA removes (or at least increases the cost of) the early synthetic call option offered by advance refunding, municipalities that issue new debt could alter non-price contracting terms to protect themselves from the loss in financial flexibility. Consistent with this expectation, some market experts predicted that original issued debt after TCJA would have shorter calls (Kalotay [2018]). We use a difference-in-differences test to compare the contracting terms of new issuances of traditional tax-exempt municipal debt with new issuances of taxable municipal debt (e.g., public debt issued to support private activities like stadiums that do not qualify for the tax-exempt treatment) around the passage of TCJA. Across a battery of tests, we do not find significant changes in callability, call dates, and term length of new municipal debt issuances around TCJA across these groups. One potential explanation for this non-result is that investors hold market power and set the terms of municipal debt contracts. Therefore, municipalities are unable to alter standard or sticky contracting terms to compensate for the decreased financial flexibility that results from imposing investor-level taxes on advance refunding.

We also conduct several additional analyses to try to reconcile and also differentiate our findings with prior literature. First, we examine the moderating effect of municipalities internal resource constraints. Consistent with the arguments in Chen, Cohen, and Liu [2022] about

workload-driven inattentiveness, we find that municipalities short-run response to TJCA is moderated by municipal resource constraints (i.e., large municipalities with lower resource constraints are more likely to advance refund debt). Second, we consider the potential moderating effect of underwriter resource constraints. We also find that larger underwriters help municipalities to advance refund debt more quickly. Finally, we examine changes in the advance refunding deal structure and find that municipalities used negotiated bond sales with a single underwriter rather than other sale methods (e.g., competitive bids and private placements) to place debt in December 2017, which helps explain one aspect of how municipalities were able to quickly complete these transactions. Together, these tests suggest that both municipalities and banks contributed to this rapid proliferation of transactions at the end of 2017 and that municipal financing responsiveness isn't driven unilaterally by one party.

Our study contributes to both research and practice around municipal financing. First, we add empirical evidence to a mosaic of studies about the responsiveness of municipalities. In sum, state and local government budgeting practices are frequently criticized for being inflexible (McGranahan [2002]). Further, prior studies find municipalities sub-optimally advance refund debt too quickly (Ang et al. [2017]) *and* sub-optimally delay refinancing (Chen, Cohen, and Liu [2022]). In contrast, our results show municipalities quickly reacted to large and consequential changes in the federal taxation of interest on advance refunding bonds—even during a holiday season.[3] This triangulating evidence should help bond investors, as well as those who monitor municipal debt, calibrate expectations of a municipality's responsiveness in financing decisions

[3] In Section 5, we posit several potential reasons for the difference between the inferences in our study and the inferences of other recent studies that suggest municipal financing practices are poorly timed and undisciplined. Potential explanations might include the systemic nature of the legislative shock versus the idiosyncratic nature of individual municipal bond timing decisions, as well as the deadline for action inherent in the tax law change.

to various types of events and shocks.

Second, our study documents a tax-induced structural change in the practice of advance refunding transactions. Despite the hundreds of billions of dollars invested annually in advance refunding bonds, research differentiating between advance refunding and other forms of municipal financing is rather scarce. The few academic studies on advance refunding have focused on the transaction's rapid expansion despite its negative valuation implications (Ang et al. [2017]; Vijayakumar [1995]; Moldogaziev and Luby [2012]). We contribute to the literature on advance refunding by documenting the effects of federal, investor-level taxation, which ultimately caused a severe and prolonged curtailing of the practice, and then it's costly resurgence. Others have noted a decline in advance refunding (Fidelity [2019] and Curry [2021]), but none have studied the trend with the empirical rigor required for evidence-based policy making (Leuz and Wysocki [2016]).

Finally, our study also contributes to understanding the interplay between advance refunding and original municipal debt issuances. Because municipal debt contracts have such a long-time horizon, one could expect rational a municipality to consider potential later refinancing options into their initial debt contracting decisions. Our finding that the callability, call dates, and term length of original municipal debt issuances did not change around TCJA suggests municipal debt contracting terms are not made with refunding in mind or that there are frictions that prevent municipalities from adjusting sticky contracting processes. Regardless of the specific reasons, these findings should be useful to those who monitor municipalities.

2. Background and Hypothesis Development

2.1 Background

Municipalities that need to raise capital via financial markets frequently issue multi-

decade bonds that are non-callable for the first 10 years. This period of non-callability guarantees bond investors will receive at least 10-years of tax-exempt interest at the stated coupon rate. However, this practice, by itself, locks municipalities into a financing commitment for a minimum of 10 years. After which, municipalities can continue to service the debt, call the obligation to retire (i.e., payoff), or refund (i.e., refinance) the debt.

A refunding transaction occurs when municipalities issue new debt in order to replace their old debt. Refunding of callable debt (i.e., debt that typically has been held for at least 10 years) is referred to as *current* refunding. However, municipalities often find it advantageous or necessary to refinance bonds *before* their call date, and frequently do so through a process called *advance* refunding.

Municipalities may engage in advance refunding for several reasons. First, when market interest rates drop or before they potentially rise, municipalities may take advantage of currently lower rates by locking-in a long-term reduction of their debt service cash outflows. This reduction begins after the call date of their originally issued debt which is not yet callable. We refer to these transactions as *cost savings* transactions. Second, municipalities may desire or feel the need to restructure their debt and bond covenants before it is callable. This may occur for political reasons such as before or after the political winds change, to score political points at a crucial time with their electorate, or while the political will to do so is available. This may also or alternatively occur for long-term planning reasons, such as to restructure current debt to remove restrictions so that other or new projects can be funded sooner. Changes to debt covenants may include, but are not limited to, the acceleration or lengthening of key maturity dates, the removal of negative or affirmative bond covenants, or the altering of certain financial and numerical metric restrictions. We refer to these types of transactions as *debt restructuring* transactions.

Prior to the Tax Reform Act of 1986 (TRA86), nearly all issuances of advance refunding bonds generated tax-exempt interest income. As part of TRA86, Congress partially limited municipalities' ability to engage in advance refunding. Cash received from advance refunding issuance must be held in escrow and invested in a portfolio of Treasury bonds (specifically, the State and Local Government Series securities) that provide a yield that is not more than 0.001% above the yield on the new refunding bond issued. In other words, positive yield arbitrage is limited to a 0.001% gain, effectively requiring municipalities to accept either a neutral or negative arbitrage position in order to issue advance refunding bonds as tax-exempt. If positive arbitrage exceeds 0.001%, then interest payments from the advance refunding bonds become federally taxable to bond investors.

Additionally, for original bonds issued after December 31, 1986, only the *first* advance refunding bond issued for that original debt could be issued as a tax-exempt bond. Both the original bond and advance refunding bond can concurrently exist, both with tax-exempt statuses, up through the first call date of the original bond. If the original bond is called and refunded on the original bond's call date, then the advance refunding bond retains its tax-exempt status, if not then the advance refunding bond becomes a taxable bond and its future coupon interest payments become federally taxable to bond investors. This escrow process also allowed municipalities to technically have two concurrently outstanding bonds, but only record one of them on their financial statements (GASB Statement 7, paragraph 9). The tax treatment under TRA86 remained significantly unchanged for over 30 years, limiting tax-exempt advance refunding to a one-time tool.

On December 22, 2017, the Tax Cuts and Jobs Act was enacted and repealed the tax-exempt status of all advance refunding bonds issued after December 31, 2017. As a result,

investors would be subject to Federal income taxes on interest income from advance refunding bonds. For several reasons outlined below, it is unclear ex-ante how municipalities would react to this change.

2.2 Validation and Hypothesis Development

2.2.1 Validation Test

Before developing hypothesis, we outline theory to validate that municipal bond markets in our sample behaved in accordance with established implicit tax theory. Implicit tax theory suggests that in a competitive market, the risk-adjusted total tax rate is the same for all assets (Atwood [2003]; Engel, Erickson, and Maydew [1999]; Erickson and Maydew [1998]; Guenther and Sansing [2023]). The total tax rate is the summation of the explicit tax rate (i.e., the rate paid to a tax authority) and the implicit tax rate (i.e., the "difference between the before-tax return on a fully taxable bond and the risk-adjusted before-tax return on an alternative asset") (Scholes et al. [2014]). Put differently, implicit tax theory states that the after-tax returns on two assets will be the same in a competitive market.

Differences in explicit tax treatment alter supply and demand for the two assets, which cause their pre-tax rates of return to be different. This difference is the implicit tax. At the lower bound, the theoretical implicit tax rate is zero. This situation also reflects the pre-TCJA tax regime when interest income from new money and advance refunding debt were both tax-exempt. In the post-TCJA tax regime, individuals in the highest tax bracket are subject to a 40.8 percent tax rate on interest income from advance refunding.[4] This tax rate reflects the upper bound of the implicit tax rate. Given the implicit tax, we expect higher bond yields for advance

[4] The 40.8 percent is the sum of the highest Federal individual income tax rate of 37 percent and the net investment income tax surcharge of 3.8 percent. However, corporations, especially insurance companies, also invest in municipal debt and are subject to a 21 percent income tax rate. Pension funds also invest in municipal debt and investment earnings in the plan are generally not taxed until distribution.

refunding bonds issued in 2018 relative to tax-exempt issuances in 2018. Thus, we expect the following:

Validation: Bond yields increase for advance refunding bonds following their interest being subject to investor-level taxes.

2.2.2 Setting and Hypothesis Tests

Our first hypothesis deals with municipal responsiveness to a legislative shock. Two features of the passage of TCJA make this an appropriate setting. First, municipalities faced uncertainty over the passage of TCJA. For example, TCJA passed in the Senate by a close vote of 51 to 49. The vote recalled earlier 2017 legislative efforts to reform health care, but that effort ultimately failed. Consistent with uncertainty over TCJA, equity markets reveal substantial changes in opinions about TCJA's likelihood of passage and provisions in the bill (Wagner, Zeckhauser, and Ziegler [2018]). Although the provision to remove tax-exempt status for advance refunding debt was part of every TCJA bill starting from its introduction to the House, many provisions were removed, added, or changed throughout TCJA's uncertain legislative process. As debt issuance transaction costs are substantial, municipalities are unlikely to preemptively advance refund debt for a law change with uncertainty over its passage.

Second, TCJA's legislative window lasted a mere 50 calendar days starting with its introduction in the House of Representatives on November 2, 2017 and ending with its enactment on December 22, 2017. The key date resolving uncertainty over TCJA's passage is likely its Senate vote on December 2 (note that earlier 2017 health care reform failed due to its inability to pass the Senate). Excluding weekends and Christmas Day, municipalities had 19 working days in December after TCJA's Senate vote to finalize the issuance of tax-exempt advance refunding debt. The short window suggests that constrained municipalities—especially

those that had not anticipated a potential legislative change—would be unable to issue advance refunding debt in 2017.

The cost savings of completing an advance refunding transaction in 2017, rather than waiting until 2018, creates a clear incentive for municipalities to accelerate advance refunding transactions in December 2017. However, it is not obvious that municipalities would be able to successfully accelerate transactions. Chen, Cohen, and Liu [2022] find that municipalities delay refinancing by an average of seven months and thereby substantially increase their cost of debt. The delay in refinancing is greater during busy times of the year. They conclude that the suboptimality is due to the resource constraints faced by municipalities. To the extent that municipalities face binding resource constraints, they would not be able to accelerate advance refunding transactions despite having a clear incentive to do so.

We state our initial hypothesis in the alternate form:

H1: Municipalities are able to quickly adjust public financing in response to legislative shocks.

We also consider the longer-term decision of municipalities to engage in advance refunding transactions. On the one hand, we expect municipalities to engage in fewer advance refunding transactions after the interest on the replacement debt becomes taxable because implicit tax theory suggests they would be more costly. However, there are very few commonly used alternatives besides advance refunding for municipalities that need to restructure debt before it is callable.

While we can think of no reason why the imposition of federal income taxes on the interest income would increase municipalities use of advance refunding debt transactions, we do have several reasons for a credible null hypothesis. Ang et al. [2017] find that 85% of all

advance refunding bonds from 1995 to 2013 were value destroying and had a negative NPV, meaning that advance refunding transactions created less favorable cash flows that municipalities would have otherwise had if they had not advance refunded the original bond—at least in terms of the NPV. The authors find strong evidence that financial constraints are a primary driver in the decision to issue advance refunding debt. Relatedly, Gao et al. [2020] find that advance refunding transactions increase and less favorable interest costs are agreed to when a reduction in municipality monitoring provided by local newspapers occurs. Further, municipalities use advance refunding transactions because advance refunding generally does not need voter approval whereas issuing new debt sometimes requires voter approval.[5] To the extent municipalities are forced to utilize advance refunding to manage debt, municipalities may continue to issue advance refunding bonds at the same rate after the imposition of an investor-level tax on interest from advance refunding bonds.

We state this hypothesis in alternate form as follows:

H2: Municipalities decrease their use of advance refunding transactions after legislation that introduces investor-level taxes.

Our third hypothesis examines the interplay between advance refunding transactions and the financial flexibility afforded by the contracting terms in original municipal debt issuances. We start our hypothesis development generally. To the extent that entities value flexibility, an optimal contract gives either party the right to renegotiate the contract in certain states of the world (Smith 1993). This is a major reason why options are written into so many kinds of contracts. We argue that options can exist explicitly within the legal terms of a contract, and options also can arise from the institutional environment in which the contract is executed and

[5] For example, general obligation bonds typically require voter approval. However, some utility revenue bonds do not require voter approval. Requirements vary by state.

enforced. We follow convention and refer to these latter options as synthetic options. When a synthetic option that is part of a contracting environment is removed, the contracting entity's financial flexibility decreases. Therefore, both parties engaged in contracting may agree to adjust other terms of the contract to maintain a similar, mutually beneficial level of financial flexibility.

In the municipal bond market, call options are explicit options written into most debt contracts lasting more than 10 years. Since advance refunding transactions gave municipalities the option to refinance debt even in the window before the call option was available, advance refunding served as a meaningful determinant of municipalities' financial flexibility. TCJA did not disallow advance refunding transactions, but implicit tax theory would predict that it significantly increased the cost of advance refunding because bond yields became subject to explicit taxes.

To the extent that municipalities have a desired level of financial flexibility and the imposition of investor-level taxes on municipal bonds decreases that flexibility by increasing the price of an early synthetic call option, then a debt-issuing municipality may look for alternative ways to increase financial flexibility. In the realm of explicit contract terms, this flexibility could be improved by shortening the term life of bonds, accelerating the call date, or issuing a larger portion of a debt series as callable debt.

While we can think of no reason why removal of the early synthetic call option afforded by advance refunding bonds would cause municipalities to undertake measures to decrease financial flexibility, there is nonetheless theory for a credible null. Investor processing costs influence trading decisions (Blankespoor, deHaan, and Marinovic [2020]). To the extent that increased processing costs associated from atypical municipal debt terms deter investors from investing in municipal debt that does not have traditional terms, then municipalities may accept

the decreased financial flexibility resulting from investor-level taxes and not adjust the terms of their new debt issuances.

Hence, we state our third hypothesis in alternate form as follows:

H3: As the cost of an early synthetic call option on new debt increases, municipalities respond by altering explicit contracting terms to increase financial flexibility.

3. Data and Sample Selection

3.1 Sample Selection

We follow Ang et al. [2017] and collect municipal bond issuance data from Bloomberg. Because TCJA happened near the end of 2017, we collect the 24 months from January 2017 to December 2018 as our sample period. Table 1 reports our sample collection of municipal debt issuances from that period that are available on Bloomberg. During our sample period, Bloomberg has data on 209,565 issuances (both new issuance and refunding transactions). We drop issuances missing the issuance amount, coupon rate, U.S. state information, and bonds not issued in one of the 50 U.S. states or the District of Columbia.[6] This yields a sample of 203,021 bond issuances consisting of 37,355 advance refunding bonds, 141,710 new money bonds, and 23,956 current refunding bonds. Of the 37,355 advance refunding bond issuances, 18,547 of those issuances listed advance refunding as its sole-purpose.[7]

[6] Consistent with prior studies examining municipal refinancing (Ang et al. [2017]; Chen, Cohen, and Liu [2022]), we exclude US territories from our sample (i.e., Puerto Rico, American Samoa, Northern Mariana Islands, Guam, and U.S. Virgin Islands). Further, the Government Accountability Office finds that these localities face specific concerns about debt sustainability due to high costs, extreme weather events, concentrated economies, and population loss.

[7] Determining the type of debt in a bond series is difficult because municipalities frequently issue multipurpose bonds (e.g., a new bond refinances some old debt that is callable, so it is a current refunding transaction, and also some old debt that is not yet callable, so it is also an advance refunding transaction). We refer to this debt as "multipurpose" because it contains both advance and non-advance refunding transactions. In many of our analyses, we use two different treatment groups. The first group is all bond series that contain any advance refunding debt. The second, smaller group is all bond series that are solely comprised of advance refunding debt. We recognize the

Municipalities typically issue bonds in a series, which means that the municipality issued numerous bonds with various maturity dates and debt amounts in a single underwriting. As we examine different types of debt issuances (i.e., new money, current refunding, and advance refunding bonds), we refer to bonds issued on the same day by the same issuer as a "bond series" and specify the type of debt issuance. The sample contains 3,418 advance refunding bond series and 14,340 new money and current refunding bond series.

For our validation tests of implicit taxes, we examine bond trade data, and therefore merge our bond issuance sample with secondary trade transaction data from the Municipal Securities Rulemaking Board (MSRB). Shown in Panel B, we only use 2018 trading data, so for these tests, we drop 60,437 bonds that are not traded in 2018. We also drop 29,197 trades missing the trade yield of the secondary trade. Our sample contains 2,122,704 bond trades.

3.2 Sample Descriptive Information

Table 2 presents descriptive information about the sample. Panel A shows the monthly, weekly, and daily average number of individual bond issuances and total average size (in millions) of issuances in the pre-TCJA and post-TCJA periods. The average number of daily municipal bond issuances falls from 434 individual bonds in 2017 to 353 individual bonds in 2018. The average total size (in millions) of bonds issued per day also falls from $1,451 in 2017 to $1,170 in 2018. Note that these figures represent *individual* bond issuances. As noted above, municipalities generally issue bonds in a series.[8]

tradeoffs of using the two groups (e.g., sample size versus noise), and generally tabulate and draw inferences from both. Our control group is comprised of bonds that are issued as either solely new money bonds or solely current refunding, and are therefore unaffected by the changes of TCJA.

[8] In online appendix Table OA-1, we examine whether bond issuances are concentrated in certain localities. Issuers in Texas, California, New York, Wisconsin, and Minnesota issue 41.4% of individual bonds by count and 41.5% by total dollar amount. Thus, no single state dominates the sample for number of bond issuances nor size of total issuances. Table OA-2 presents univariate correlations among our variables. Table OA-2, Panel A shows bond yields and advance refunding issuances in 2018 have a significant and positive correlation. Panels B and C show bond series size and monthly state size issuances have a significant negative correlation with *Post2017*.

Panel B shows descriptive statistics for our regression variables. The average size of an individual bond issuance is $3.3 million and the median size is $615,000. The average bond series issuance is $38 million and the median is $8.8 million. The average size of total issuances occurring within a state in a month is $276 million and the median size is $54 million. Thus, large issuances skew the distributions of both individual bond issuance and total issuances occurring within a state in a month. The average yield of a secondary trade is 3.08% and the median yield is 3.15%. The average years to maturity of traded bonds is 14.5 years and the median years to maturity is 13.9 years.

Panel C compares pre- vs. post-TCJA descriptive statistics for our regression variables. The average size of an individual bond and bond series are not significantly different from each other in the full bond issuance sample. The size of monthly issuances in a state significantly declines post-TCJA. In the MSRB trade sample, both bond yields and Yrs_to_Maturity significantly increase post-TCJA.

Panel D shows descriptive statistics to examine contract terms of new money bond issuances in 2017 and 2018. The sample contains 83.9% tax-exempt bond series, each bond series has a weighted average of 7.0 years to the earliest payoff and 13.3 years to maturity, and a call provision is found for 55.5% of the debt within each bond series.

Figure 1, Panel A shows the total municipal bond issuance amount by month for *all* advance refunding compared to non-advance refunding issuances. Figure 1, Panel B shows a similar graph, but for just *sole-purpose* advance refunding vs. non-advance refunding. Thus, these two graphs are the same except for bonds included in the “advance refunding” line.

Several insights from these figures are noteworthy. First, the size of advance refunding issuances throughout 2017 were fairly constant until the passage of the TCJA at the end of 2017,

when advance refunding issuances spike. Second, throughout 2018, advance refunding issuances, especially sole-purpose advance refunding issuances, are reduced to near zero. Third, these trends appear to be pronounced beyond a trend in a combined control group that includes both new bond and current refunding issuances.

4. Empirical Tests and Results

4.1 Validation Test–Bond Yields

To validate that bond yields increase in response to investor-level taxes for advance refunding municipal bonds issued in 2018, we compare the yield of the taxable advance refunding bonds issued in 2018 to three control groups of tax-exempt bonds—new money bonds issued in 2018, current refunding bonds issued in 2018, and advance refunding bonds issued in 2017. Because implicit taxes depend on explicit taxes (Guenther and Sansing [2023]), the lower bound of the implicit tax cost is 0 percent and the upper bound is the maximum marginal individual tax rate of 40.8 percent.[9] Table 3 shows the results and follows the structure of estimating implicit taxes from Engle, Erickson, and Maydew [1998]. We find the implicit tax rate between taxable advance refunding bonds issued in 2018 and tax-exempt new money bonds issued in 2018 is 15.331%. When replacing new money bonds with current refunding bonds as the comparison, the implicit tax is slightly higher at 20.039%. Last, when replacing new money bonds with tax-exempt advance refunding bonds issued in 2017, the implicit tax rate is slightly higher at 22.480%. We estimate the magnitude of the implicit tax rate in this setting ranges between 37.6% and 55.1% of what is suggested by stylized models. These estimates come from dividing the estimated implicit tax by the highest marginal tax rate. Each estimate of the implicit tax rate is much lower than the theoretical maximum, which could suggest that some

[9] We use 40.8 percent because it is the sum of the highest Federal individual marginal tax rate of 37 percent plus the net investment income surtax of 3.8 percent.

bondholders may not be in the highest 40.8% marginal tax rate. Alternatively, we acknowledge that municipalities issuing advance refund bonds in 2018 may be unlike municipalities that issue advance refund bonds in 2017 (e.g., 2018 issuers could have greater risk of default). As such, our estimate of the implicit tax rate is potentially influenced by selection effects. Hence, we only intend to validate implicit taxes at work in our sample and do not claim that these are precise magnitude estimates.

4.2 Parallel Trends Analysis – Monthly Impact on Advance Refunding Transactions

To assess the parallel trends assumption that will be required in later tests, we examine whether municipalities exhibited similar trends in their issuance of advance refunding debt and other forms of municipal debt in the months leading up the TCJA. Specifically, we aggregate total monthly municipal debt issuances by state-month-type. (Type refers to whether debt was advance refunding or not.). For this analysis, we aggregate debt at the state level because debt issuance is lumpy at the municipality level. We then investigate parallel trends by estimating the following fixed-effects Poisson regression.[10]

$$Monthly\_State\_Size_{sit} = \sum \gamma State_s + \sum \delta Month\text{-}Year_t + \beta_0 Adv\_Refunding_i + \sum \beta_n Month\text{-}Year \times Adv\_Refunding_{it} + e_{sit} \quad (1)$$

where *s* represents the state of the issuing municipality, *i* represents whether the bond purpose is advance refunding or new money/current refunding, and *t* represents the calendar month of the bond issuance. $Monthly\_State\_Size_{sit}$ equals the log of the total size plus 1 of bond issuances (in dollars) by all issuing municipalities in a state and month. For each state *s* month-year combination, there are two observations—advance refunding and other. $Month\text{-}Year_t$ is a vector

[10] Some states, particularly small states, issue no municipal debt in some months of our sample period, which gives these data the count-like attributes described in Cohn, Liu, and Wardlaw [2022]. Therefore, we estimate Poisson regressions because they provide coefficients with natural interpretations and allow for consistent estimates when using fixed-effects. Inferences are robust to estimating linear regressions with logged dependent variables.

of 23 indicator variables equal to 1 for the corresponding calendar month. We exclude the indicator variable for October 2017 as a baseline because TCJA legislation was introduced to the House in November 2017. $Adv\_Refunding_i$ is an indicator variable equal to 1 for the advance refunding bond observation and 0 otherwise. We include state fixed effects and cluster standard errors by state.

We present the results of estimating equation (1) in Table 4, and also in Figure 2, Panels A and B. We present the results for full sample advance refunding in Table 4, column 1 (Figure 2, Panel A) and results for sole-purpose advance refunding in Table 4, column 2 (Figure 2, Panel B). In both columns of Table 4 and panels of Figure 2, coefficients estimates are generally not significant on the interactions between the month indicator variable from January 2017 to November 2017 and *Adv_Refunding*.[11]

In sum, we do not find systemic differences between advance refunding transactions and other municipal debt issuances in the time leading up to the TCJA. These results generally support the parallel trends assumption.

4.3 Hypotheses 1 and 2 – Municipal Responsiveness and Advance Refunding Transactions

4.3.1 Research Design – Tests of H1 and H2

We first investigate the impact of investor-level taxation on short-term municipal debt issuances. We examine the total amount of advance refunding debt issued from January to November 2017 versus December 2017, as compared to new money debt and current refunding debt. We estimate the following fixed-effects Poisson regression:

$$Monthly\_State\_Size_{sit} = \sum \gamma State_s + \sum \delta Month\text{-}Year_t + \beta_1 Dec2017_t + \beta_2 Adv\_Refunding_i + \beta_3 Dec2017 \times Adv\_Refunding_{it} + e_{sit} \quad (2)$$

[11] We find significant positive coefficients on the interactions for March and August 2017 in column 1 and August 2017.

where *s* represents the state of the issuing municipality, *i* represents whether the bond purpose is advance refunding or new money/current refunding, and *t* represents the issuance month-year. $Monthly\_State\_Size_{sit}$ is defined in equation 1. $Dec2017_t$ equals 1 if the bond series issuance occurs in December 2017 and 0 if the issuance occurs in other months of 2017. $Adv\_Refunding_i$ equals 1 if the bond purpose is for advance refunding and 0 otherwise. To control for the impact of macroeconomic events on bond issuance size, we include fixed effects for the month-year of issuance (i.e., indicator variables for each month of 2017 in this test) and the state. We cluster standard errors by issuer (i.e., unique 6-digit CUSIP).

For *H1*, our coefficient of interest is the interaction term of $Dec2017 \times Adv\_Refunding_{it}$. Relative to earlier months in 2017, a positive coefficient on the interaction term suggests municipalities issue more advance refunding debt in December 2017 prior to investor-level taxation on advance refunding bonds, relative to the concurrent change in December 2017 issuances of new money or current refunding bonds.

To examine the longer-run impacts in *H2*, we conduct similar analyses, but extend our sample to include data from 2018. We then confirm these findings using multivariate analysis by examining the total amount of advance refunding debt issued from January to November 2017 versus January to December 2018, as compared to new money debt and current refunding debt. We exclude bond issuances occurring in December 2017 because our prior results show that month contained an abnormally high amount of advance refunding issuances, and we don't want a potential anticipation-based spike in December 2017 to influence our comparison of pre-TCJA and post-TCJA longer-run effects. Hence, we estimate the following fixed-effects Poisson regression:

$$Monthly\_State\_Size_{sit} = \sum \gamma State_s + \sum \delta Month\text{-}Year_t + \beta_1 Post2017_t$$
$$+ \beta_2 Adv\_Refunding_i + \beta_3 Post2017 \times Adv\_Refunding_{it} + e_{sit} \quad (3)$$

where the variables and controls are similar to equation (2) with differences highlighted as follows. Equation (3)'s sample contains 23 months of bond issuance data from January 2017 to December 2018 (excluding December 2017) and we include indicator variables for each in the vector *Month-Year*. $Post2017_{sit}$ equals 1 if the bond series issuance occurs in 2018 and 0 if the issuance occurs in 2017.

Our coefficient of interest for *H2* is the interaction term of $Post2017 \times Adv\_Refunding_{it}$. A negative coefficient on the interaction term, suggests municipalities issue less advance refunding debt after TCJA's implementation of investor-level taxation on advance refunding bonds, relative to issuances of new money or current refunding bonds in 2017.

4.3.2 Results –Tests of H1 and H2

Table 5 tabulates the results of estimating equation (2), which tests *H1* using a difference-in-difference regression analysis. Columns 1 and 2 show estimates using a "treatment group" comprised of the full sample of issuances that contained *any* advance refunding bonds and columns 3 and 4 show estimates using a "treatment group" comprised of issuance that contained *only* advance refunding bonds. (As previously noted, the classification of treated bonds expands depending on whether we examine the full or sole-purpose advance refunding sample, but the control sample remains the same regardless). We exclude fixed effects in columns 1 and 3 and include month-year fixed effects in columns 2 and 4.

In all columns, we find a significantly positive value on the interaction of *Dec2017* and *Adv_Refunding*, showing that municipalities issued more advance refunding debt in the short December window before the implementation of investor-level taxes on advance refunding debt.

Our results in columns 1 and 2 indicate the December 2017 increase in the average size of an advance refunding bond series (relative to earlier months) was between 3.02 and 3.57 times greater than the contemporaneous December 2017 increase in the size of other municipal debt.[12] In short, these results are consistent with our prediction in *H1* that municipalities accelerate advance refunding transactions to avoid the effects of a tax law shock. Given the foresight and flexibility needed to anticipate and/or respond quickly to changes created by TCJA—during the holiday season no less—these tests provide evidence of a baseline level of municipality flexibility.

Table 6 tabulates the results estimating equation (3), which is our test of *H2*. Columns 1 and 2 show the full sample of advance refunding bonds and columns 3 and 4 show the sole-purpose advance refunding bonds. We exclude fixed effects in columns 1 and 3 and include fixed effects for Month-Year and State in columns 2 and 4. In all columns, we find a significantly negative value on the interaction of *Post2017* and *Adv_Refunding*, which shows that the incidence rate ratio for a municipality's 2018 advanced refunding issuances declined to only 0.091 to 0.195 times the advance refunding debt issuances in 2017. In summary, the introduction of investor-level taxes severely curtailed municipalities' use of advance refunding transactions after TCJA in 2018.[13]

To better understand the longer-run trends in advance refunding, we plot the amount of municipal debt issued by issuance type for years 2015-2020 in Figure 3. Municipalities behaviors at the extreme ends of this figure are likely to be confounded by events other than TCJA (e.g.,

[12] The incidence rate ratio (IRR) equals the exponentiated coefficient estimate.
[13] We note that other major events after 2018 (e.g., the COVID-19 pandemic) have subsequently affected the municipal financing landscape. In fact, some reports indicate a subsequent resurgence in advance refunding transactions (Hernandez Barcena and Wessel [2020]). Because our study focusses primarily on municipal responsiveness to a legislative shock, we choose not to use longer sample periods wherein the effects of other confounding trends or events could be misattributed to the legislative shock we are interested in studying.

the COVID 19 pandemic); however, visualizing the longer-term trends does help set our sample period in its broader historical context. Several new insights from Figure 3 are worth mentioning. First, the December 2017 spike in advanced refunding is greater than any other time in the sample. Second, the severe decline in advanced refunding documented earlier persist until approximately mid-2019 (i.e., 19 months). Based on Figure 3, the approximately $40 billion advanced refunded in December 2017 represents approximately 3-months of normal advance refunding transactions. This suggests that some of the 2018 effect could have been accelerating advance transactions that would have happened in 2019, but much of the 2018 effect is a curtailment in the practice. Third, advance refunding did begin again mid-2019, which predates the COVID-19 pandemic. What makes this result even more puzzling is that the resurgence in advance refunding documented in 2019 and 2020 is much more costly for municipalities because it requires using taxable bonds that that are more costly for municipalities to issue.

4.4 Hypothesis 3 – New Issuance Contracting Terms

4.4.1 Research Design – Test of H3

In *H3*, we examine whether municipalities change original tax-exempt issuance contracting terms to retain flexibility in response to an increase in the cost of advance refunding transactions. We expect the imposition of investor-level taxes on advance refunding interest income should primarily impact contracting terms of new tax-exempt debt issuances. In contrast, we do not expect an impact to contracting terms of new taxable debt, which are primarily bonds that meet the private activity bond tests (Atwood [2003]; Liu and Denison [2014]; Chen, Hutchens, and Xia [2023]).[14] Thus, we estimate the following ordinary least squares regression:

$$Contract\ Term_{mjt} = \sum \gamma State_s + \sum \delta Month\text{-}Year_t + \beta_1 Post\_2017_t + \beta_2 TaxExempt_j$$

[14] IRC Section 141 explains tests to identify private activity bonds, such as examining if more than 10% of the proceeds of an issue are to be used for private business use.

$$+ \beta_3 Post\_2017 \times TaxExempt_{jt} + e_{mjt} \quad (4)$$

where *s* represents the state, *m* represents the municipality of issuance, *j* represents whether the bond series is tax-exempt or taxable, and *t* represents the bond series issuance date. *Contract* $Term_{mjt}$ reflects the contract terms on each bond issuance and equals either: (1) $YrsToPayoff_{mjt}$, (2) $YrsToMaturity_{mjt}$, or (3) $\%Callable_{mjt}$. For each variable, the unit of observation is a bond series, which consists of many individual bonds, so we calculate a weighted average for each bond series by weighting each individual bond by its issuance size relative to the total issuance size of the bond series. For clarity, we define variables based on their definition for an individual bond. $YrsToPayoff_{mjt}$ equals the earliest payoff year (call year or maturity year) minus the issuance year. $YrsToMaturity_{mjt}$ equals the bond's maturity year minus the issuance year. $\%Callable_{mjt}$ is the ratio of callable debt to total debt. In contrast to previous regressions where we aggregate debt issued by municipalities within a state, we examine debt issuances at the issuance-level because we are interested in whether municipalities change contract terms. Further, because we are interested in examining how contracting terms changed for new tax-exempt municipal debt issuances, we exclude refunding (current and advance) transactions and exclude bond series where Bloomberg does not provide a tax-exempt designation.

$Post\_2017_t$ is an indicator variable equal to 1 if the bond series is issued in 2018 and 0 otherwise. $TaxExempt_j$ is an indicator variable equal to 1 if the bond series is a tax-exempt bond and 0 if the bond is taxable.

The coefficient of interest is β_3, the interaction $Post\_2017 \times TaxExempt_{jt}$. Based on *H3*, we expect a negative value on β_3 for $YrsToPayoff_{mjt}$ and $YrsToMaturity_{mjt}$ and positive values on β_3 for $\%Callable_{mjt}$ as we predict municipalities desire more debt contract flexibility.

4.4.2 Results – Tests of H3

In Table 7, Panel A, we estimate the difference-in-difference regression in equation (4). We find that the change in contracting terms on tax-exempt original municipal debt issuance before and after TCJA is not significantly different than the contemporaneous change in the contracting terms of taxable forms of original municipal debt issuances (e.g., private activity bonds). Specifically, we do not find significant differences in the number of years to first payoff (column 1), the number of years to maturity (column 2), and the percentage of debt that is issued as callable (column 3). These findings are consistent with the notion that municipalities appear to lack the ability or incentives to alter the terms of their debt issuances, even in the face of a significant reduction in their ability to flexibly refinance on favorable terms.

Table 7, Panel B and Figure 4 break out this analysis in event time and check the parallel trends assumption. The contracting terms of tax-exempt and taxable forms of municipal debt appear to follow parallel trends before TCJA. We also do not observe even short-term differences in the contracting terms of the two different types of debt. This suggests that municipalities do not use explicit contracting provisions to compensate for the loss of financial flexibility created by the elimination of the early synthetic call option afforded by advance refunding transactions. Our data is not detailed enough to disentangle why, but one plausible and potential reason suggested by a practitioner is that there is a large amount of convention in the municipal debt market. Hence, the information processing costs required to understand irregular and non-standard municipal debt contracts may drive away potential investors in these bonds.

5. Additional Analyses

5.1 TCJA's Impact on the Number of Advance Refunding Bond Series Issuances (Alt Test of H2)

Our longer-term results show a substantial decline in the total amount of advance

refunding debt. However, advanced refunding bond series could still have been widely used by municipalities, but for smaller-sized bond series. Table 8, Panel A presents changes in the number of bond series issuances and univariate t-test comparisons on the difference-in-differences of the mean size of bond series issued using bond series that included any advance refunding bonds as the treatment group. Panel B presents a similar analysis using the narrower group of series that contained sole-purpose advance refunding bonds as the treatment group. In short, municipalities issued fewer advance refunding bond series and the issuance size of advanced refunding bonds declined in the post-TCJA tax regime.

5.2 Moderating Role of Internal Constraints on Municipal Responsiveness

Chen, Cohen, and Liu [2022] argue that internal resource constraints, expertise, and workload driven inattentiveness to be associated municipal responsiveness (i.e., small city managers wear more hats than those who work for larger cities). However, municipalities generally assemble external teams of advisers that could consist of bond counsels (e.g., attorneys knowledgeable in federal and local regulations), fiduciary municipal and financial advisors registered with the SEC and MSRB, and underwriters or investment bankers (GFOA 2020). While the typical government compensation structure of municipal employees does not explicitly reward them for responsiveness, the deal- and fee-based compensation structure of banks and advisers may incentivize these other actors to help municipalities overcome resource constraints.

We next examine the potentially moderating role of internal resource constraints on municipal responsiveness. We follow the intuition in Chen, Cohen, and Liu [2022] and use a size-based proxy for internal resource constraints.[15] Specifically, we identify municipalities located within the 50 largest counties (measured by Census population estimates for July 2022)

[15] Chen et al. [2022] define a small issuer as one that issues fewer than five bonds over their 18-year sample. We are not able to adopt this exact definition in our study because we examine only two years of data.

as less resource constrained, and all remaining counties as more resource constrained. We exclude state-issued debt from this analysis (i.e., if issuer type in Bloomberg is "state" or "state enterprise fund").[16]

$Issued\_Adv\_Refunding_{mt}$ is an indicator variable equal to 1 if the municipality issues advanced refunding debt in the month and 0 otherwise. $Large_m$ is an indicator variable equal to 1 if the issuing municipality is located within the largest 50 counties and 0 otherwise. We estimate the following equation using Logit, Probit, and linear probability model:

$$Issued\_Adv\_Refunding_{mt} = \sum \gamma State_s + \sum \delta Month\text{-}Year_t + \beta_1 Large_m + \beta_2 Dec2017 \times Large_{mt} + e_{mt} \quad (5)$$

where *s* represents the state, *m* represents the municipality of issuance and *t* represents the bond series issuance date. Table 9, Panel A tabulates the results. In columns 1-3, the interaction of $Dec2017 \times Large_{it}$ is positive and significant, which suggests that the responsiveness to the shock created by TCJA was moderated for internally resource constrained municipalities relative to larger municipalities with more resources. Column 3 (the linear probability model) suggests that the change in December 2017 advance refunding issuances was 3.1% greater for a large municipality than a small municipality. Columns 4-6 show the interaction coefficients of our sole-purpose sample are positive in all columns and statistically significant in columns 5 and 6.

To validate these findings, we reduce measurement error in our non-Large control observation in two important ways. First, to ensure we are comparing just county and city issued debt, we remove debt issued at the state level. Second, to ensure internal constraints of our control group are sufficiently different from our treatment group, we exclude debt issued by the

[16] We omit state debt for two reasons. First, we expect states to generally have adequate and high internal resources dedicated to managing public finances. Second, comparing states to cities and counties would therefore add non-comparable noise and reduce statistical power relative to comparing resource constraints within the cross section of municipalities.

next largest 50 counties (i.e., second largest 50 counties). This exclusion reduces the number of observations to 80,652 and estimate equation 5. In Panel B, we find each of our tests is not only consistent, but increases in significance, confirming our prior results showing that large municipalities were more likely to issue advance refunding debt in December 2017 than small municipalities. Overall, the results suggest that the lag between the passage and effective date for TCJA's removal of tax-exempt interest income disfavored small municipalities, who face higher resource constraints than large municipalities.

5.3 Bookrunner Resource Constraints and Advance Refunding Issuances

Although municipalities face internal constraints, external parties could help them to issue advance refunding debt in the short window before TCJA became effective. We examine bookrunner resource constraints (i.e., size) to consider the influence of external advisors on municipal advance refunding issuances.[17] We gather bookrunners for debt issuances from Bloomberg. *Top5Bookerrunner* is an indicator variable equal to 1 if the bond series was issued by one of the five bookrunners to issue the most municipal debt in dollars in 2016 and zero otherwise. We use the same regression as equation (5) and replace Large with an indicator variable *Top5Bookrunner*.

Table 10 presents the results. In columns 1-3, we find significantly positive coefficients on the interaction of *Dec2017* and *Top5Bookrunner*, showing that municipalities hiring a top five bookrunner were more likely to issue advance refunding debt in December 2017 than

[17] The bookrunner is the lead underwriter on a municipal debt issuance. Our sample contains 136 unique bookrunners in 2017. The Daily Bond Buyer, a century-old daily newspaper focusing on municipal bonds, reported that in 2016 between one-third and one-half of the municipal debt market was underwritten by five firms—Bank of America Merrill Lynch, Citigroup Global Markets, JP Morgan Securities, Morgan Stanely & Company, and Wells Fargo Bank. In our sample for 2017, these five bookrunners underwrote 37.9% of the number of bond series issued and 56.3% of the total debt issued.

municipalities who did not hire top five bookrunners.[18] Column 3 suggests that the change in December 2017 advance refunding issuances was 5.2% greater for a municipality employing a top five bookrunner than a municipality employing a non-top five bookrunner. In columns 4-6, we continue to find positive coefficients, but the coefficients in column 4 is not significant at conventional levels. Overall, the results suggest that external advisors helped municipalities to issue advance refunding debt in the short window before TCJA became effective.

5.4 Bond Sale Method and Advance Refunding Issuances

Our final analysis is to examine the relation between the method of bond sales and advance refunding issuances in the short-window of December 2017. Bond sale methods influence municipality debt costs where negotiated sales are associated with higher interest costs than competitive sales (Liu [2017]; Robbins [2002]). In a negotiated sale, the price of the municipal debt is decided through discussions between the municipality and the underwriter. Despite municipalities potentially paying higher interest costs, negotiated sales dominate the municipal debt issuance market, possibly because the debt issuances are considered too complex to receive efficient competitive bidding, issuers have poor credit ratings, issues are of unusual size, and other reasons (Robbins [2002]). Given that municipalities had a short-window to issue debt, we predict that negotiated sales will be the primary method to issue debt in December 2017. We gather the bond sale method for each bond series from Bloomberg. We estimate equation 5 after replacing *Large* with indicator variable *Negotiated_Sale* equal to 1 if the municipality issues a negotiated bond in the month and 0 otherwise.

Table 11 presents the results. Our results suggest December 2017 advance refunding

[18] These findings are directionally robust to defining our top bookrunner indicator variable as the largest three, ten, or twelve bookrunners based on total debt underwritten in 2016. Statistical significance varies across these specifications, but typical remains significant at least at the 10 percent level.

transactions were more likely to be negotiated sales, which trade off cost for speed. Column 3 suggests that the change in December 2017 advance refunding issuances was 6.7% greater for a negotiated sale than a non-negotiated sale (e.g., competitive sale, private placement, etc.). This test shows one way that municipalities were able to increase their financing responsiveness.[19]

6. Conclusion

We use the TCJA as a setting to examine municipal financing responsiveness. In contrast with recent and concurrent studies that suggest municipalities are unresponsive, constrained, and inefficient, we find a large spike in the frequency of advance refunding transactions in the short, holiday window between when TCJA was passed and took effect at the end of 2017. Large municipalities, which generally face fewer resource constraints compared to small municipalities, were more likely to issue advance refunding debt during this prime transaction window. We also find a severe reduction in the prevalence of advance refunding transactions following their taxation. Finally, we do not find significant changes in the contracting terms of original municipal debt issuances following the taxation of advance refunding. This lack of spillovers between the advance refunding market and the market for original municipal debt suggests that resource constraints, market power, or some other friction prevents interplay between those two markets.

We offer two potential explanations for why our study finds that municipal financing practice is responsive to a legislative shock, but other studies document that individual municipal financing decisions are poorly timed (e.g., Ang et al. 2017 and Chen et al. 2022) and

[19] For simplicity, we estimate equation 5 with a dependent variable equal to whether the municipality issues advance refunding debt in the month. However, a negotiated sale is a choice of the municipality and thus could be a dependent variable. In the online appendix Table OA-3, we tabulate results to examining negotiated sale regressed on Dec2017, advanced refunding, and the interaction of Dec 2017 and advanced refunding. The full sample results show negotiated sales for advance refunding debt increased in December 2017.

undisciplined (e.g., Gao et al. 2020).[20] First, municipal financing practice could be more responsive to legislative shocks than to individual bond dates due to the information dissemination and advising role of investment banks and bond advisers. An investment banker's marginal cost of reminding a small town that a bond is callable may be high; however, the marginal cost of informing all clients of an upcoming legislative shocks is lower because of the systemic nature of the shock. Second, municipalities could be more responsive to legislative shocks than key dates of their own individual bonds because of the discrete and expiring nature of legislative shocks. If a municipality did not advance refund a bond prior to TCJA, the consequence for not acting is potentially very large. However, if a municipality does not refinance callable debt when market rates are more favorable than the original terms, the cost of waiting a month might simply be a single month of interest differential. Regardless, of the specific reasons, our study provides countervailing evidence relative to the prior literature.

Overall, our study provides new insights on municipal financing responsiveness. Our evidence suggests municipalities are nimble and have adequate incentives and resources to respond on some dimensions to large legislative shocks. However, our evidence also suggests that municipalities did not impound these changes into new contracting decisions. In sum, our study offers additional nuance to the mosaic of studies examining municipal financing practice.

[20] The true answer is likely multifactorial and could be broader than just these two reasons.

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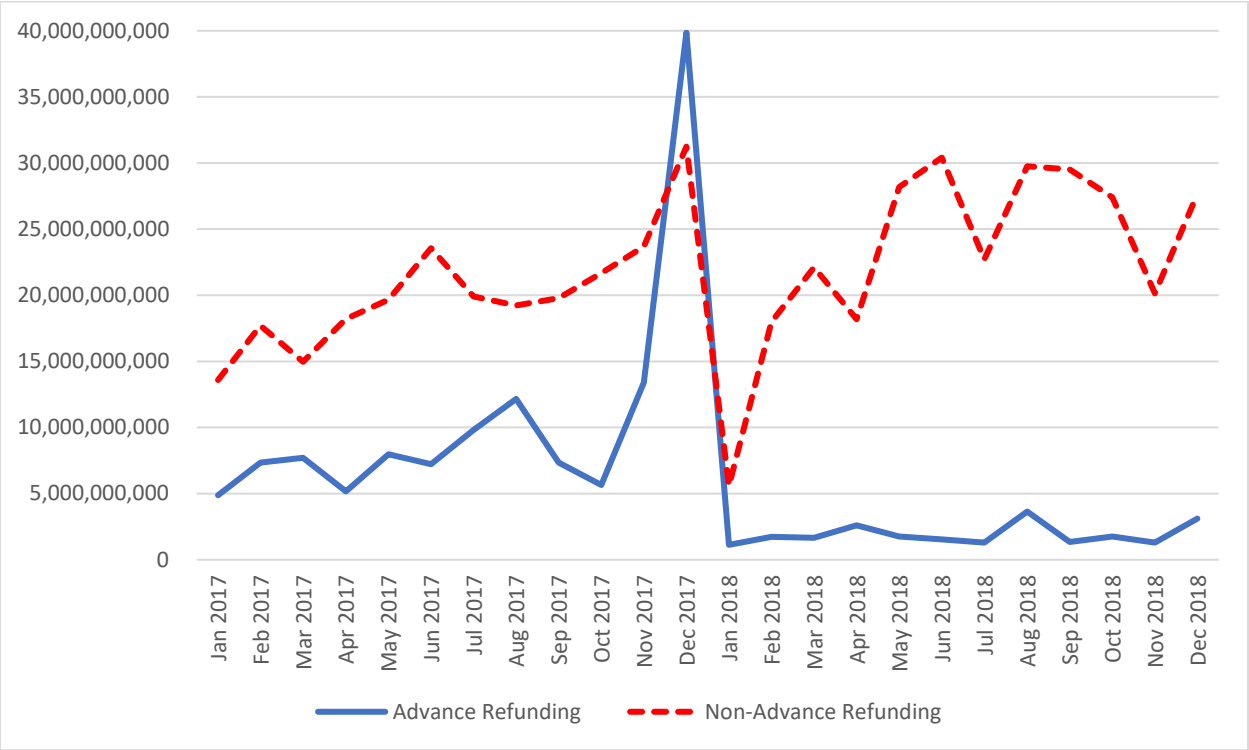
Appendix A

Variable Name	Variable Definitions	Source
Bond Size	Size of the individual bond issued (SIZE), stated in millions.	Bloomberg
Bond Series Size	Total amount of debt issued in a bond series, calculated as the sum of all Bond Size amounts that were issued on the same day, by the same issuer, of the same issuance type (adv_refunding vs non-adv_refunding), and from the same state, stated in millions.	Bloomberg
Monthly State Size	Total amount of state debt issued per month, calculated as the sum of Bond Series Size by state and month, stated in millions.	Bloomberg
Adv_Refunding	Indicator variable equal to 1 if Bloomberg's muni bond purpose (MUNI_BOND_PURPOSE) is Advance Refunding, 0 otherwise.	Bloomberg
Yield	Bond Yield from trade data in MSRB.	MSRB
Yrs_to_Maturity	Year of maturity (MATURITY_DATE) less the year issuance (DATED_DATE) from Bloomberg.	Bloomberg
Yrs_to_Payoff	Year of first available payoff date [lessor of year of first call date (CALL_DATE) or year of maturity (MATURITY_DATE)] less the year issuance (DATED_DATE) from Bloomberg.	Bloomberg
%Callable	Percent Callable Year of maturity (MATURITY_DATE) less the year issuance (DATED_DATE) from Bloomberg.	Bloomberg
Issued_2018	Indicator variable equal to 1 if the bond's issuance date (DATED_DATE) is in 2018.	Bloomberg
Post_2017	Indicator variable equal to 1 if the bond's issuance date (DATED_DATE) is after 2017.	Bloomberg
TaxExempt	Indicator variable equal to 1 if the bond is designated in Bloomberg (TAX_FEDERAL) as Tax-Exempt, 0 if Taxable, and dropped if missing.	Bloomberg
Large	Indicator variable equal to 1 if the bond was issued by or within one of the largest 50 counties in the U.S. and 0 otherwise. We obtain bond location from Bloomberg and county size from U.S. Census.	Bloomberg & U.S. Census
Top5Bookrunner	Indicator variable equal to 1 if the bond series was issued by one of the five bookrunners to issue the largest amount, in dollars, of municipal debt in 2016 and 0 otherwise. We obtain bookrunner firm from Bloomberg and largest bookrunners in 2016 from the Daily Bond Buyer.	Bloomberg & The Daily Bond Buyer

Negotiated	Indicator variable equal to 1 if the bond series sale method is negotiated and 0 otherwise.	Bloomberg
Issued_Adv_Refunding	Indicator variable equal to 1 if an issuer issued advance refunding	Bloomberg

Figure 1
Total Monthly Bond Issuance Amount by Category

Panel A: Full Sample



Panel B: Sole-purpose Sample

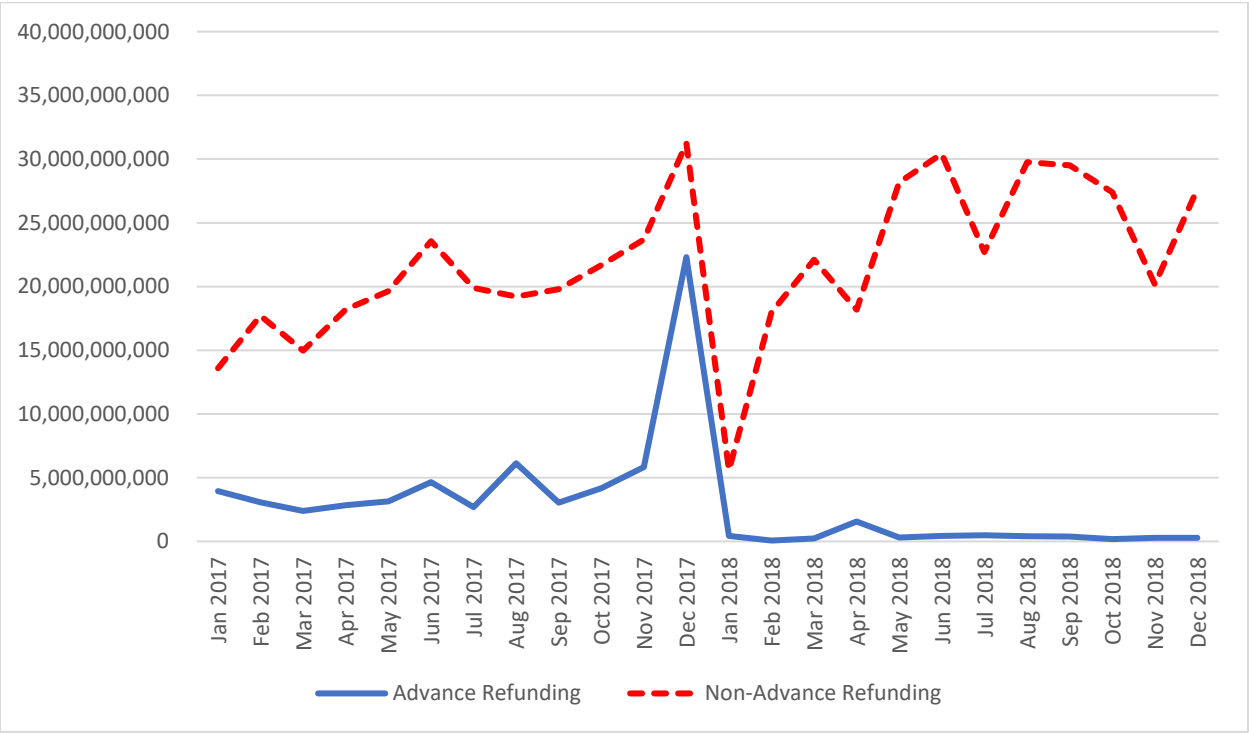
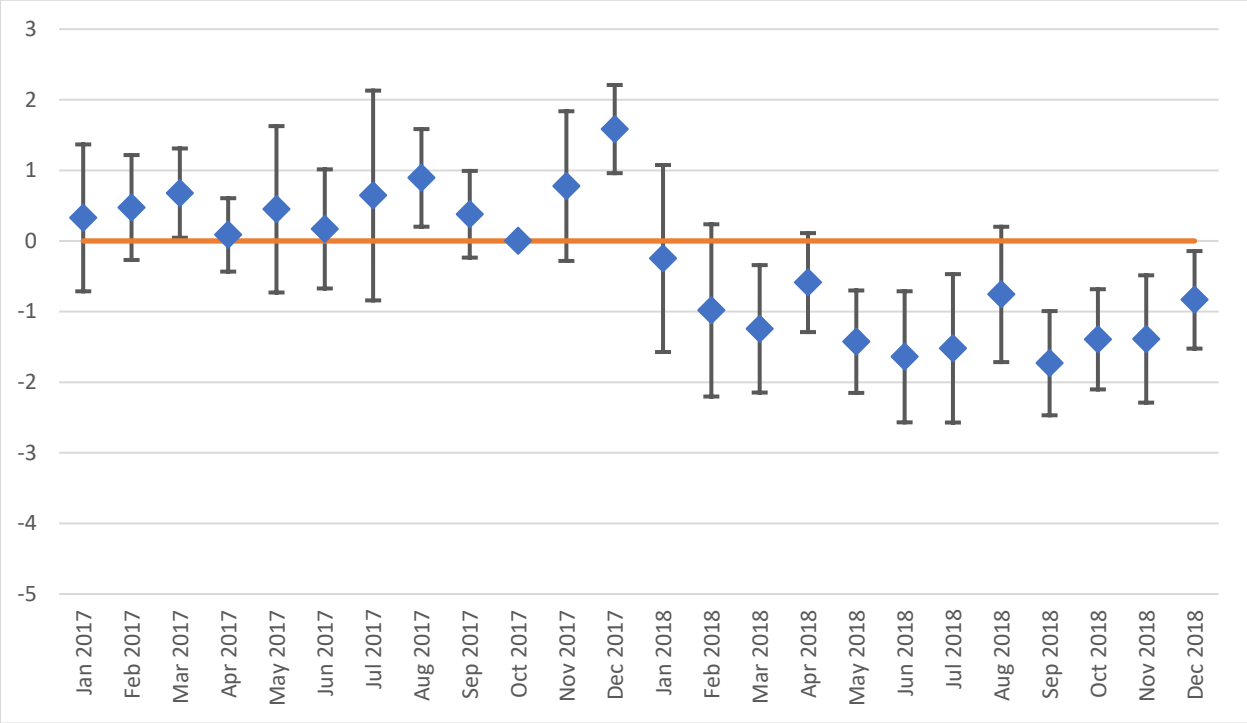


Figure 1 presents the total dollar amount of municipal bond issuances each month by bond categorization from January 2017 to December 2018. In Panel A, the total value of bond issuances in the *Advance Refunding* group includes the *full* sample of all issuances that included at least one advance refunding bond. In other words, Bloomberg designates advance refunding as *one of* the purposes for these issuances, so there are other types of non-refunding bonds included in the issuance. The *Non-advance Refunding* line is comprised of issuances that Bloomberg designates the purpose as either *solely* new money issuances or *solely* current refunding. In Panel B, the total dollar amount of Advance Refunding bond issuances is the group of bonds comprised only of advance refunding bonds. We refer to this group as our *sole-purpose* advance refunding sample.

Figure 2
Advance Refunding Transactions in Event Time

Panel A: Advance Refunding (Full Sample) vs. Non-Advance Refunding Issuances



Panel B: Advance Refunding (Sole-purpose) vs. Non-Advance Refunding Issuances

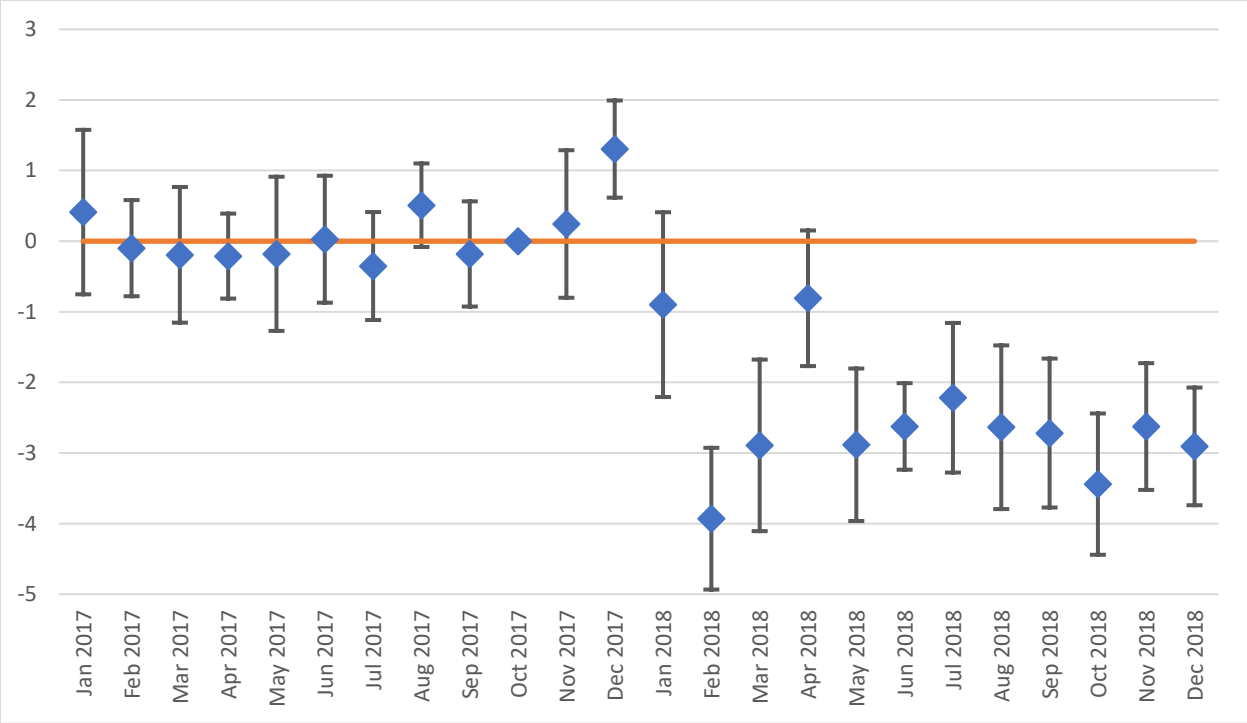


Figure 2 plots the coefficients from estimating a difference-in-differences test explaining municipal debt issuances around the passage of the TCJA. Specifically, it plots the OLS coefficient estimates tabulated in Table 4. Each coefficient estimate is also presented with a 95 percent confidence interval. In Panel A, the *Advance Refunding* sample includes the *full* sample of all issuances that included at least one advance refunding bond as designated by Bloomberg. In Panel B, the *Advance Refunding* sample includes only the issuances that were solely comprised of advance refunding bonds.

Figure 3
Extended Horizon Effects

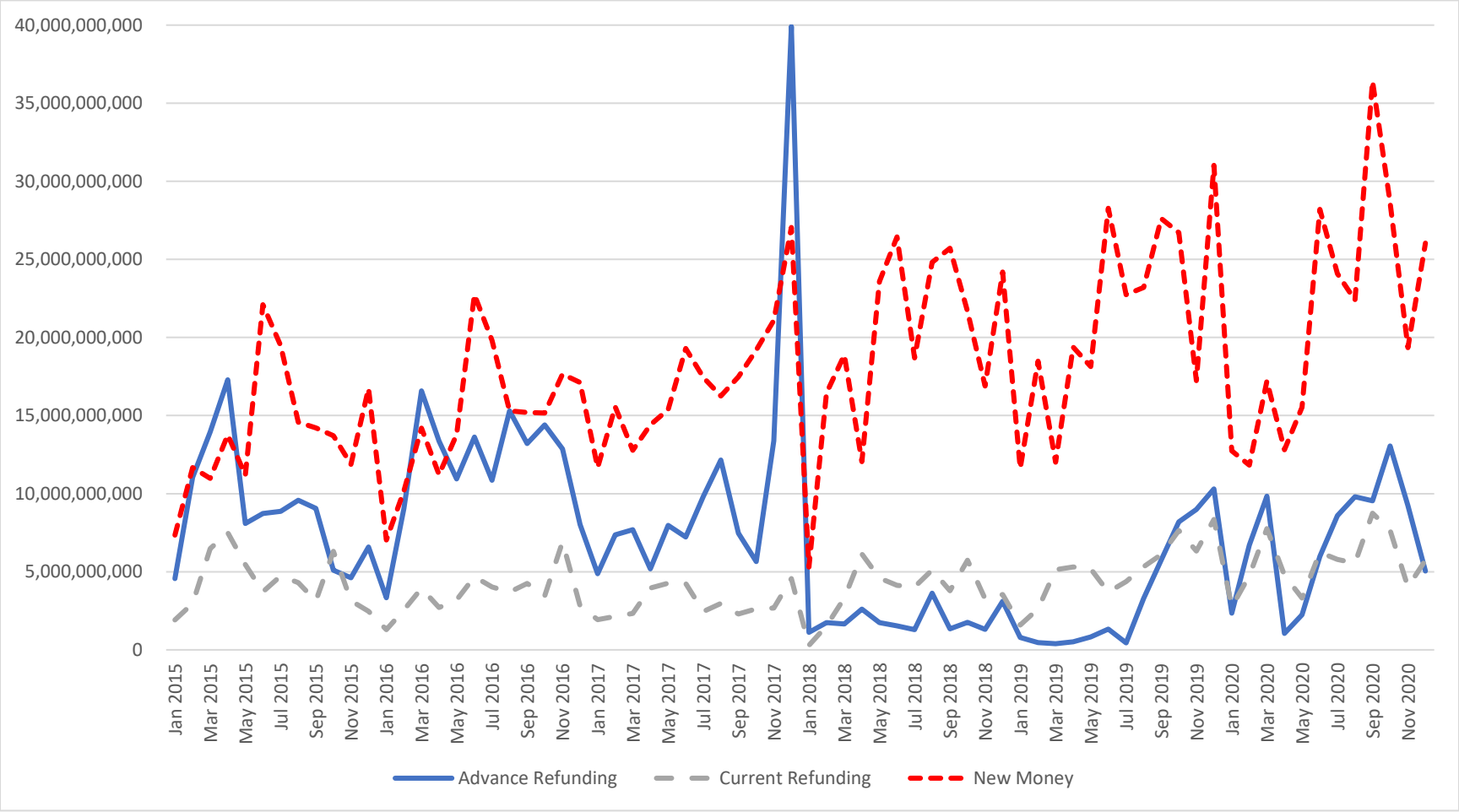
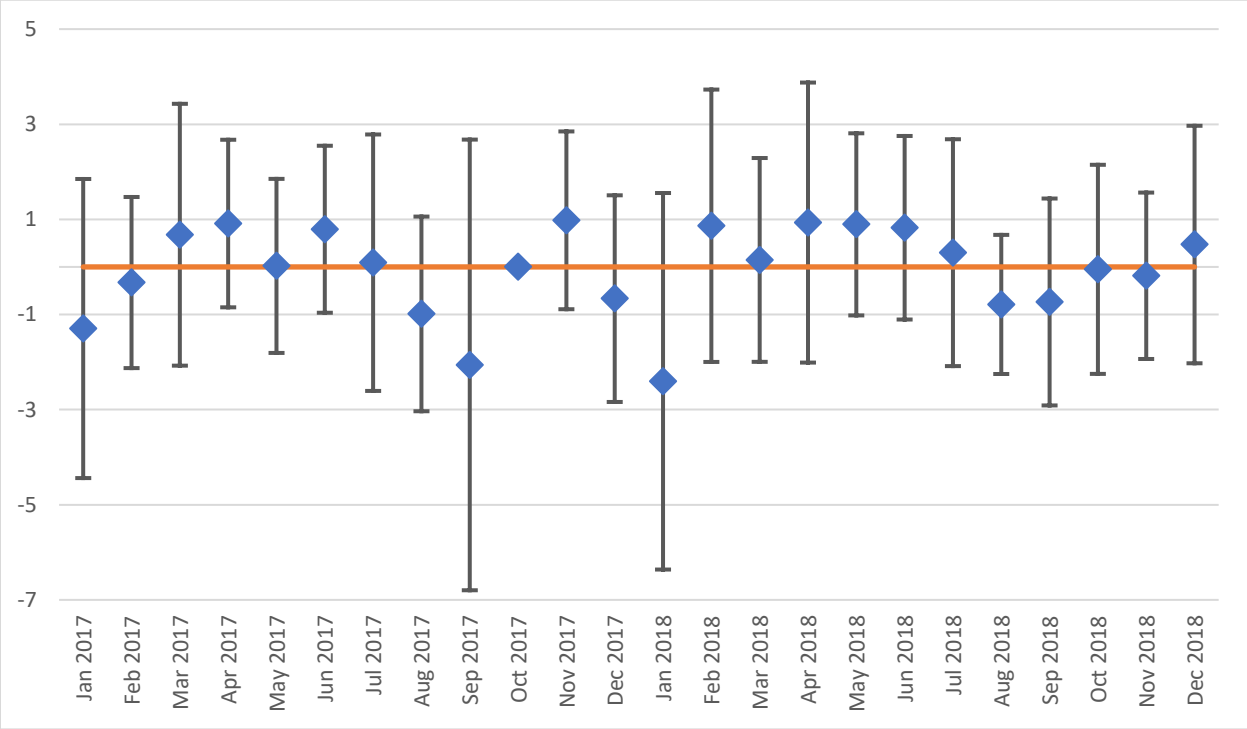


Figure 3 presents the total dollar amount of municipal bond issuances each month by bond categorization from 2015 to 2020.Tthe total value of bond issuances in the *Advance Refunding* group includes the *full* sample of all issuances that included at least one advance refunding bond. In other words, Bloomberg designates advance refunding as *one of* the purposes for these issuances, so there are other types of non-refunding bonds included in the issuance. Current Refunding and New Money Issuances are broken out separately rather than collapsed together as in Figure 1.

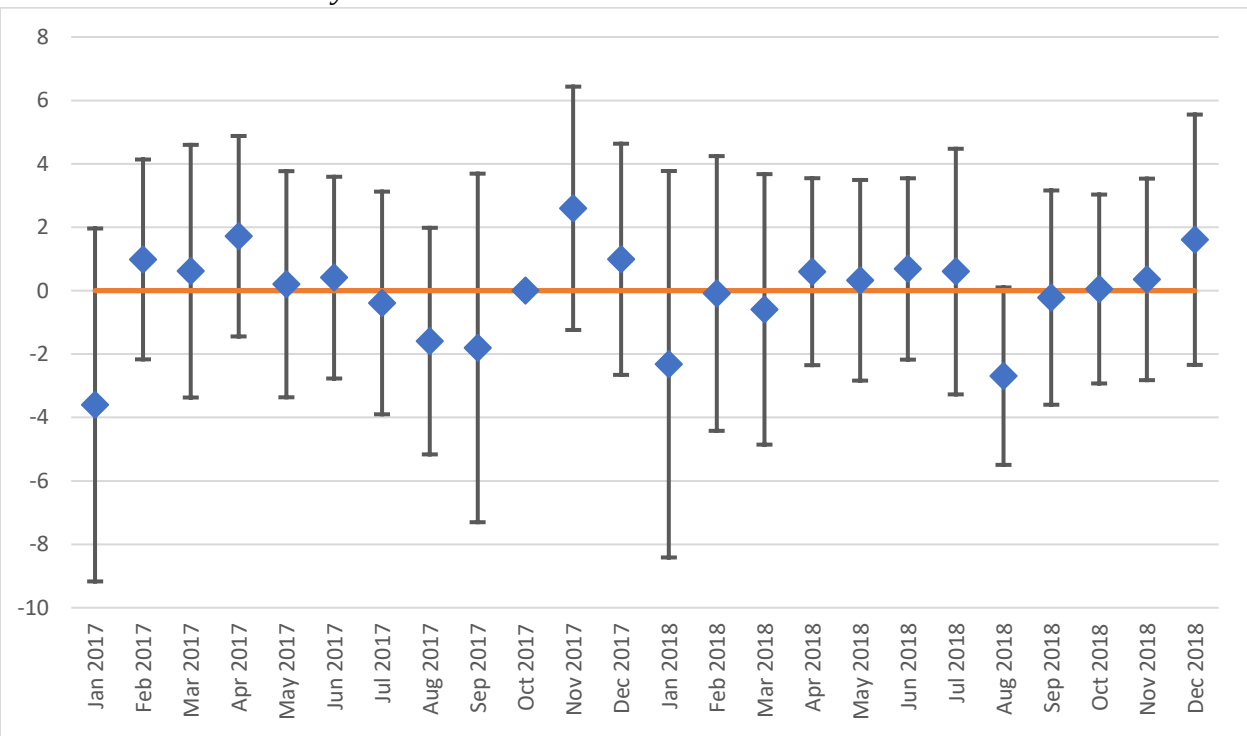
Figure 4

Original Debt Issuance Terms in Event Time

Panel A: Years to Payoff



Panel B: Years to Maturity



Panel C: Percent Callable

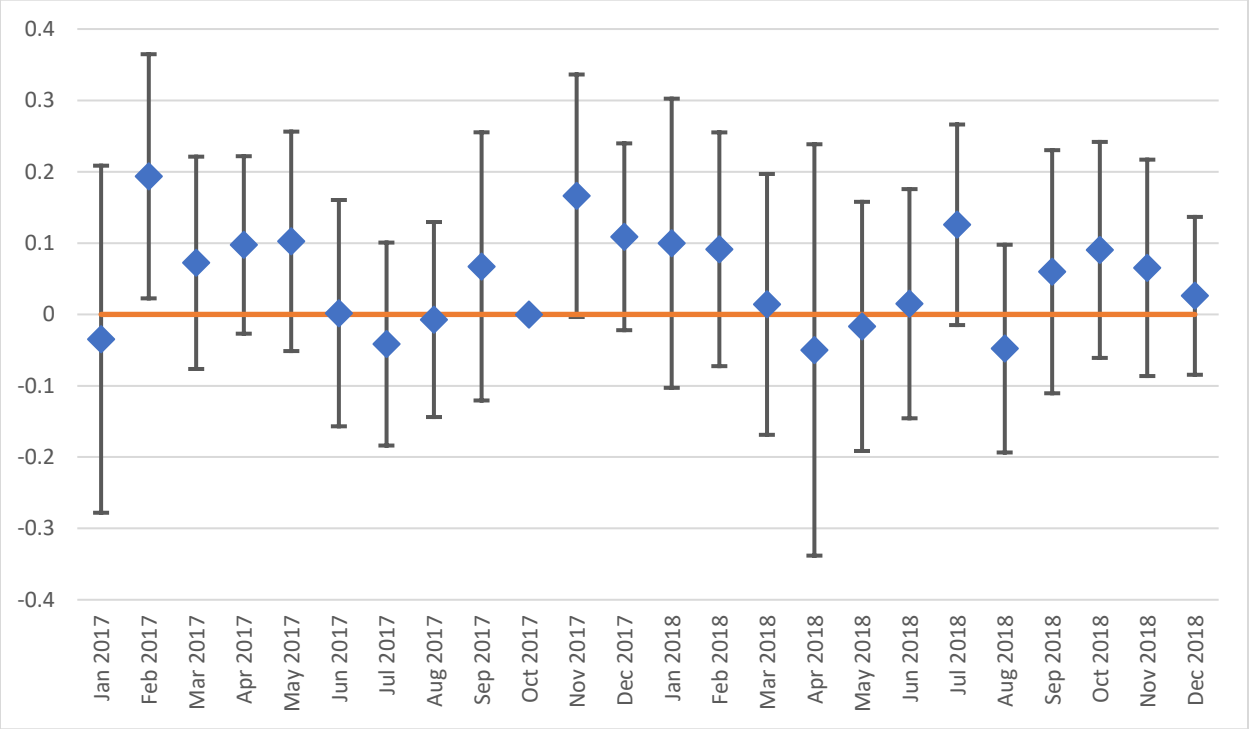


Figure 4 plots the coefficients from estimating a difference-in-differences test explaining the contract terms of original municipal debt issuances around the passage of the TCJA. Specifically, it plots the OLS coefficient estimates tabulated in Table 11. Each coefficient estimate is also presented with a 95 percent confidence interval. In this analysis, the treatment group is tax-exempt new municipal debt issuances and the control group is taxable new municipal debt issuances. Panel A examines the *Years to Payoff* of new municipal debt issuances. Panel B examines the *Years to Maturity*. Panel C examines the proportion of new debt that is callable (*Percent Callable*).

Table 1
Panel A – Sample Selection

Municipal Bond Issuance Sample - *Individual Bonds Issued*	**Advance Refunding** (1) ***All*** **Advance Refunding**	(2) ***Solely*** **Advance Refunding**	**Non-Advance Refunding** (3) ***Solely*** **New Money**	(4) ***Solely*** **Current Refunding**	(5) **Total** †(1)+(3)+(4)
Bloomberg Database – Issuances of New Money Only or Refunding Only	40,158	19,882	143,595	25,812	209,565†
Less: Missing Issue Amount	(2,255)	(1,117)	(335)	(1,726)	(4,316)†
Less: Missing Coupon Rate	(510)	(181)	(1,480)	(128)	(2,118)†
Less: US Territories	(38)	(37)	(70)	(2)	(110)†
Total Individual Bond Issuances	**37,355**	**18,547**	**141,710**	**23,956**	**203,021**†
Daily Bond Series Issued	**3,418**	**1,512**	**14,340**		**17,758**†
Monthly Bonds Issued in each State (50 states & DC × 24 months)	**1,224**	**1,224**	**1,224**		**2,448**†

Tests of H1 & H2 – Short- & Long-Term Impacts on Total Monthly State Issuances						
Table 4	Full Sample	(50 states & DC × 24 months)	1,224		1,224	**2,448**
	Sole-Purpose Sample			1,224		
Table 5	Full Sample	(50 states & DC × 12 months)	612		612	**1,224**
	Sole-Purpose Sample			612		
Table 6	Full Sample	(50 states & DC × 23 months)	1,173		1,173	**2,346**
	Sole Purpose Sample			1,173		
Test of H3 – Impact on New Money Issuance Contracting Terms						
New Money Bond Issuances					141,710	
Daily New Money Bond Series Issued					13,032	
Less: Missing Bloomberg Federal Tax-Exempt Status					(5,295)	
Tables 7– New Money Bond Series Issuance Sample					**7,737**	

Table 1
Panel A – Sample Selection (Continued)

	Advance Refunding		Non-Advance Refunding		
	(1)	(2)	(3)	(4)	(5)
	All **Advance Refunding**	***Solely*** **Advance Refunding**	***Solely*** **New Money**	***Solely*** **Current Refunding**	**Total**
Table 8 – Additional Analysis – Difference in Difference Tests					
Daily Bond Series Issued in 2017	**2,581**	**1,370**	**7,045**		
Daily Bond Series Issued in 2018	**837**	**142**	**7,295**		
Total Daily Bond Series Issuances in 2017 & 2018	3,418	1,512	14,340		
Tables 9, 10, & 11 – Additional Analysis					
Full Sample – Daily Bond Series Issued in 2017	2,581		7,045		**9,626**
Full Sample – Unique Municipal Bond Issuers					**7,551**
Full Sample – Monthly Issuer Panel Dataset (×12)					**90,612**
Sole-Purpose Sample – Daily Bond Series Issued 2017		1,370	7,045		**8,415**
Sole-Purpose Sample – Unique Municipal Bond Issuers					**6,839**
Sole-Purpose Sample – Monthly Issuer Panel Dataset (×12)					**82,068**

Table 1 – Panel B
Sample Selection

MSRB Trade Sample	***Solely* Advance Refunding**	***Solely* New Money**	***Solely* Current Refunding**	**Total**
Total Bond Issuances (from Panel A)	18,547	141,710	23,956	184,213
Less: Missing from MSRB 2018 Trade Data	(8,766)	(42,713)	(8,958)	(60,437)
Municipal Bonds Issued in 2017-2108 merged with MSRB	9,781	98,997	14,998	123,776
MSRB Database – Merged Trades occurring in 2018	256,149	1,644,045	251,707	2,151,901
Less: Missing Yield	(276)	(25,063)	(3,858)	(29,197)
Total 2018 Municipal Trades	**255,873**	**1,618,982**	**247,849**	2,122,704
Subsets of 2018 Municipal Trade Yields				
Taxable Bonds Issued in 2018 (Table 3)	**7,410**			
Tax-Exempt Bonds Issued in 2018 (Table 3)		**937,546**	**126,341**	
Tax-Exempt Bonds Issued in 2017 (Table 3)	**230,839**			

Table 1 shows sample selection procedure for municipal bond issuances of new money, current refunding, and advance refunding bonds from January 1, 2017-December 31, 2018 and yields from secondary trades from MSRB for bonds issued in 2018. The 'All Advance Refunding' column shows all bond issuances in Bloomberg with an advance refunding purpose. The 'Solely Advance Refunding' column is a subset of 'All Advance Refunding' where advance refunding was the only purpose listed. 'New Money' and 'Current Refunding' columns show bond issuances in Bloomberg with new money and current refunding, respectively, as the only purpose listed.

Table 2
Descriptive Statistics

Panel A

Averages by Period

	Average Number of Issuances		Average Total Size Issued (millions)	
	Pre-TCJA	Post-TCJA	Pre-TCJA	Post-TCJA
Monthly	9,301	7,618	$31,066	$25,252
Weekly	2,146	1,758	7,169	5,827
Daily	434	353	1,451	1,170

Panel B

Descriptive Statistics

	N	Mean	SD	p25	Median	p75
Bond Size (Millions)	203,021	3.329	25.261	0.250	0.615	1.860
Bond Series Size (Millions)	17,758	38.057	140.750	3.380	8.815	25.000
Monthly State Size (Millions)	2,448	276.066	643.650	0.000	54.108	262.041
Yield	2,375,135	3.084	0.846	2.583	3.146	3.572
Yrs_to_Maturity	2,375,135	14.529	8.459	7.863	13.863	19.984

Table 2 (continued) – Panel C

Descriptive statistics – Pre Vs. Post

	N	Mean	SD	p25	Median	p75	Diff		t-stat
Pre–TCJA									
Bond Size (Millions)	111,606	3.340	21.797	0.255	0.635	1.955	-0.025		(-0.23)
Bond Series Size (Millions)	9,626	38.727	142.399	3.500	8.993	26.000	-1.465		(-0.69)
Monthly State Size (Millions)	1,224	304.567	657.353	10.658	83.341	287.755	-57.002	**	(-2.19)
Yield	1,020,813	2.958	0.707	2.470	2.964	3.426	0.221	***	(200)
Yrs_to_Maturity	1,020,813	13.413	8.229	7.145	11.879	18.764	1.958	***	(180)
Post–TCJA									
Bond Size (Millions)	91,415	3.315	28.934	0.235	0.585	1.740			
Bond Series Size (Millions)	8,132	37.263	138.778	3.275	8.538	23.627			
Monthly State Size (Millions)	1,224	247.565	628.626	0.000	26.311	223.878			
Yield	1,354,322	3.179	0.925	2.730	3.273	3.647			
Yrs_to_Maturity	1,354,322	15.371	8.533	8.803	15.027	20.534			

Table 2 (continued) – Panel D

Contract Terms Sample Selection

Descriptive Statistics – Contract Terms Analysis						
	N	Mean	SD	p25	Median	p75
Dependent Variables						
TaxExempt	7,737	0.839	0.367	1.000	1.000	1.000
YrsToPayoff	7,737	6.993	4.772	4.362	7.404	8.942
YrsToMaturity	7,737	13.282	9.163	5.625	12.147	19.686
%Callable	7,737	0.555	0.382	0.000	0.661	0.887
Post2017	7,737	0.531	0.499	0.000	1.000	1.000

Table 2 shows descriptive statistics of municipal bond issuances. Panel A shows average number of issuances and size in millions of dollars by month, week, and daily in the pre- and post-TCJA periods. Panel B shows descriptive statistics on bond size, bond series size, monthly state size of issuances, bond trade yield, and years to maturity. Panel C shows descriptive statistics in the pre- and post-TCJA periods with differences in means and t-statistics reported in parentheses. Panel D shows descriptive statistics to examine contract terms of new money bond issuances in 2017 and 2018. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 3
Validating Implicit Taxes

	Yield of Adv Refund Bonds issued in 2018	Yield of New Money Bonds issued in 2018	Estimated Implicit Tax Cost	Estimated Implicit Tax Cost Expressed as a Rate
	(1)	(2)	(1)-(2)	[(1)-(2)]÷(1)
Mean	3.786%	3.206%	0.581%	15.331%
Median	3.839%	3.305%	0.534%	13.910%
Standard Deviation	0.679%	0.687%		
# Observations	7,410	937,546		
	Yield of Adv Refund Bonds issued in 2018	Yield of Current Refund Bonds issued in 2018		
	(1)	(3)	(1)-(3)	[(1)-(3)]÷(1)
Mean	3.786%	3.028%	0.759%	20.039%
Median	3.839%	3.112%	0.727%	18.937%
Standard Deviation	0.679%	2.105%		
# Observations	7,410	126,341		
	Yield of Adv Refund Bonds issued in 2018	Yield of Adv Refund Bonds issued in 2017		
	(1)	(4)	(1)-(4)	[(1)-(4)]÷(1)
Mean	3.786%	2.935%	0.851%	22.480%
Median	3.839%	2.935%	0.904%	23.548%
Standard Deviation	0.679%	0.575%		
# Observations	7,410	230,839		

Table 3 shows the yield calculated from bond trades occurring in 2018. Column 1 contains taxable bonds (i.e., advance refund bonds issued in 2018) and Columns 2, 3, and 4 contain a subset of tax-exempt bonds (new money bonds issued in 2018, current refunding bonds issued in 2018, or advance refund bonds issued in 2017). The Estimated Implicit Tax Cost equals the taxable bond yield in Column 1 minus the tax-exempt bond yield in Column 2, 3, or 4. The Estimated Implicit Tax Cost Expressed as a Rate equals the Estimated Implicit Tax Cost divided by the taxable bond yield in Column 1.

Table 4
Testing parallel trends: monthly changes in advance refunding

	Full Sample	Sole-Purpose Sample
	(1)	(2)
DV	Monthly State Size	Monthly State Size
Jan_2017 × Adv_Refunding	0.327	0.412
	(0.62)	(0.69)
Feb_2017 × Adv_Refunding	0.474	-0.099
	(1.25)	(-0.29)
Mar_2017 × Adv_Refunding	0.678**	-0.193
	(2.10)	(-0.39)
Apr_2017 × Adv_Refunding	0.086	-0.211
	(0.32)	(-0.69)
May_2017 × Adv_Refunding	0.448	-0.179
	(0.75)	(-0.32)
Jun_2017 × Adv_Refunding	0.170	0.027
	(0.40)	(0.06)
Jul_2017 × Adv_Refunding	0.644	-0.352
	(0.85)	(-0.90)
Aug_2017 × Adv_Refunding	0.893**	0.509*
	(2.53)	(1.69)
Sep_2017 × Adv_Refunding	0.378	-0.181
	(1.21)	(-0.48)
Nov_2017 × Adv_Refunding	0.777	0.243
	(1.44)	(0.46)
Dec_2017 × Adv_Refunding	1.585***	1.304***
	(4.97)	(3.72)
Jan_2018 × Adv_Refunding	-0.249	-0.899
	(-0.37)	(-1.35)
Feb_2018 × Adv_Refunding	-0.984	-3.930***
	(-1.58)	(-7.68)
Mar_2018 × Adv_Refunding	-1.244***	-2.892***
	(-2.70)	(-4.67)
Apr_2018 × Adv_Refunding	-0.590*	-0.809*
	(-1.65)	(-1.65)
May_2018 × Adv_Refunding	-1.427***	-2.883***
	(-3.85)	(-5.23)
Jun_2018 × Adv_Refunding	-1.641***	-2.624***

	(-3.47)	(-8.39)
Jul_2018 × Adv_Refunding	-1.520***	-2.217***
	(-2.84)	(-4.10)
Aug_2018 × Adv_Refunding	-0.757	-2.635***
	(-1.55)	(-4.46)
Sep_2018 × Adv_Refunding	-1.731***	-2.717***
	(-4.60)	(-5.05)
Oct_2018 × Adv_Refunding	-1.393***	-3.441***
	(-3.85)	(-6.74)
Nov_2018 × Adv_Refunding	-1.388***	-2.625***
	(-3.02)	(-5.73)
Dec_2018 × Adv_Refunding	-0.834**	-2.906***
	(-2.37)	(-6.84)
State Fixed Effect	Y	Y
Month Main Effect	Y	Y
Adv_Refunding Main Effect	Y	Y
Constant	Y	Y
Observations	2,448	2,448
Pseudo R-squared	0.753	0.778

Table 4 shows the results of estimating Equation (1) with a fixed-effects Poisson regression for bond issuances in 2017 and 2018. Adv_Refunding is an indicator variable equal to 1 if the bond is an advance refunding bond and 0 otherwise. We include the main effects for month and Adv_Refunding, but do not tabulate for brevity. We include state fixed effects. Standard errors are clustered by State. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 5
Test of Municipalities' Short-term Responsiveness (Test of H1)

DV	Full Sample Size of State Monthly Issuance				Sole-Purpose Sample Size of State Monthly Issuance			
	(1)		(2)		(3)		(4)	
	Coef.	IRR	Coef.	IRR	Coef.	IRR	Coef.	IRR
Dec2017	0.493***	1.636			0.493***	1.636		
	(3.88)				(3.88)			
Adv_Refunding	-0.873***	0.418	-0.873***	0.418	-1.620***	0.198	-1.620***	0.198
	(-8.50)		(-8.50)		(-18.20)		(-18.20)	
Dec2017 × Adv_Refunding	1.106***	3.022	1.106***	3.022	1.273***	3.573	1.273***	3.573
	(5.98)		(5.98)		(6.56)		(6.56)	
Month-Year Fixed Effect			Y				Y	
State Fixed Effect			Y				Y	
Constant	Y		Y		Y		Y	
Observations	1,224		1,224		1,224		1,224	
Adj R-Squared	0.114		0.712		0.203		0.719	

Table 5 shows the results of estimating Equation (2) with a fixed-effects Poisson regression for bond issuances from January to December of 2017. Adv_Refunding is an indicator variable equal to 1 if the bond is an advance refunding bond and 0 otherwise. Dec2017 is an indicator variable equal to 1 for month of December in 2017 and 0 otherwise. We include Month and State of issuer fixed effects in Columns 2 and 4. Standard errors are clustered by state in Columns 1 and 3 and by issuer in Columns 2 and 4. Incidence rate ratios (IRR) equal the exponentiated coefficient and are presented next to the coefficient. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 6
Impact of Investor-level Taxation on Issuances of Bond Series (Test of H2)

DV	Full Sample Size of State Monthly Issuance				Sole-Purpose Sample Size of State Monthly Issuance			
	(1)		(2)		(3)		(4)	
	Coef.	IRR	Coef.	IRR	Coef.	IRR	Coef.	IRR
Post2017	0.189**	1.209			0.189**	1.209		
	(2.57)				(2.57)			
Adv_Refunding	-0.873***	0.418	-0.873***	0.418	-1.620***	0.198	-1.620***	0.198
	(-8.50)		(-8.50)		(-18.20)		(-18.20)	
Post2017 × Adv_Refunding	-1.633***	0.195	-1.633***	0.195	-2.401***	0.091	-2.401***	0.091
	(-9.12)		(-9.12)		(-7.71)		(-7.70)	
Month-Year Fixed Effect			Y				Y	
State Fixed Effect			Y				Y	
Constant	Y		Y		Y		Y	
Observations	2,346		2,346		2,346		2,346	
Adj R-Squared	0.199		0.744		0.306		0.778	

Table 6 shows the results of estimating Equation (3) with a fixed-effects Poisson regression for bond issuances from January to November of 2017 and January to December of 2018. We exclude December 2017 because municipalities issued an abnormally high amount of advance refunding debt in that month. Adv_Refunding is an indicator variable equal to 1 if the bond is an advance refunding bond and 0 otherwise. Post_2017 is an indicator variable equal to 1 for months in 2018 and 0 otherwise. We include Month-Year and State of issuer fixed effects for Columns 2 and 4. Standard errors are clustered by state in Columns 1 and 3 and by issuer in Columns 2 and 4. Incidence rate ratios (IRR) equal the exponentiated coefficient and are presented next to the coefficient. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 7 – Panel A
Impact of Investor-level Taxation on Contract Terms (Test of H3)

	Contract Terms Sample – New Money Issuances Only		
	(1)	(2)	(3)
DV	YrsToPayoff	YrsToMaturity	%Callable
TaxExempt	0.810	4.592***	0.256***
	(1.66)	(5.89)	(7.48)
Post2017	-0.413	0.098	0.033
	(-0.96)	(0.19)	(1.26)
Post2017 × TaxExempt	0.272	-0.128	-0.027
	(0.59)	(-0.24)	(-1.05)
State Fixed Effects	Y	Y	Y
Constant	Y	Y	Y
Observations	7,737	7,737	7,737
Adjusted R-squared	0.106	0.178	0.194

Table 7, Panel A shows the results of estimating Equation (4) with an ordinary least squares regression for new money bond issuances in 2017 and 2018. TaxExempt is an indicator variable equal to 1 if the bond is designated in Bloomberg as TaxExempt and 0 if the bond is designated in Bloomberg as Taxable. We include state fixed effects. Standard errors are clustered by State. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 7 (continued) – Panel B
Impact of Investor-level Taxation on Original Issuance Municipal Debt Contracting Terms by Month (Alternative Test of H3)

	(1)	(2)	(3)
DV	YrsToPayoff	YrsToMaturity	%Callable
Jan_2017 × TaxExempt	-1.295	-3.605	-0.035
	(-0.81)	(-1.27)	(-0.28)
Feb_2017 × TaxExempt	-0.328	0.985	0.194**
	(-0.36)	(0.61)	(2.22)
Mar_2017 × TaxExempt	0.713	0.677	0.072
	(0.51)	(0.33)	(0.95)
Apr_2017 × TaxExempt	0.887	1.671	0.094
	(0.99)	(1.04)	(1.48)
May_2017 × TaxExempt	0.022	0.203	0.102
	(0.02)	(0.11)	(1.31)
Jun_2017 × TaxExempt	0.792	0.410	0.002
	(0.88)	(0.25)	(0.02)
Jul_2017 × TaxExempt	0.101	-0.382	-0.043
	(0.07)	(-0.21)	(-0.60)
Aug_2017 × TaxExempt	-0.988	-1.591	-0.007
	(-0.95)	(-0.87)	(-0.10)
Sep_2017 × TaxExempt	-2.060	-1.806	0.067
	(-0.85)	(-0.64)	(0.70)
Nov_2017 × TaxExempt	0.976	2.586	0.167*
	(1.02)	(1.32)	(1.93)
Dec_2017 × TaxExempt	-0.693	0.934	0.108
	(-0.63)	(0.50)	(1.62)
Jan_2018 × TaxExempt	-2.404	-2.320	0.100
	(-1.19)	(-0.75)	(0.96)
Feb_2018 × TaxExempt	0.865	-0.089	0.091
	(0.59)	(-0.04)	(1.09)
Mar_2018 × TaxExempt	0.127	-0.621	0.012
	(0.12)	(-0.29)	(0.13)
Apr_2018 × TaxExempt	0.933	0.599	-0.050
	(0.62)	(0.40)	(-0.34)
May_2018 × TaxExempt	0.895	0.327	-0.017
	(0.92)	(0.20)	(-0.19)
Jun_2018 × TaxExempt	0.832	0.695	0.015

	(0.85)	(0.48)	(0.19)
Jul_2018 × TaxExempt	0.300	0.601	0.126*
	(0.25)	(0.30)	(1.75)
Aug_2018 × TaxExempt	-0.780	-2.665*	-0.047
	(-1.05)	(-1.87)	(-0.63)
Sep_2018 × TaxExempt	-0.737	-0.219	0.060
	(-0.66)	(-0.13)	(0.69)
Oct_2018 × TaxExempt	-0.050	0.052	0.090
	(-0.05)	(0.03)	(1.17)
Nov_2018 × TaxExempt	-0.186	0.355	0.065
	(-0.21)	(0.22)	(0.84)
Dec_2018 × TaxExempt	0.462	1.591	0.026
	(0.36)	(0.79)	(0.47)
State Fixed Effect	Y	Y	Y
Month Main Effect	Y	Y	Y
TaxExempt Main Effect	Y	Y	Y
Constant	Y	Y	Y
Observations	7,737	7,737	7,737
Adjusted R-squared	0.109	0.183	0.199

Table 7, Panel B shows the results of a monthly analysis for Equation (1) with an ordinary least squares regression for bond issuances in 2017 and 2018, where we replace the DV with contracting terms. TaxExempt is an indicator variable equal to 1 if the bond is indicated by Bloomberg as Tax Exempt, 0 if Taxable, and dropped if missing the designation. We include the main effects for month and TaxExempt, but do not display brevity. We include state fixed effects. Standard errors are clustered by State. t-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 8
Descriptive Statistics of Issuance Frequency and Amount

Panel A
Full Sample
Descriptive Statistics – Mean Bond Series Size Issued by Period

	Number of Issuances			Size of Advance Refunding vs. Non-Advance Refunding		
	(1) Pre-TCJA	(2) Post-TCJA	(3) Diff	(4) Pre-TCJA	(5) Post-TCJA	(6) *Difference (t-stat)*
Bond Series Issuances						
Advance Refunding	2,581	837	-1,744	49.864	27.330	-22.535*** (-3.88)
Non-Advance Refunding	7,045	7,295	250	34.647	38.402	3.755 (1.61)
Difference (t-stat)				15.217*** (4.65)	-11.072** (-2.19)	
Diff in Diff (t-stat)						-26.290*** (-4.33)

Table 8 continued – Panel B
Sole-Purpose Sample
Descriptive Statistics – Mean Bond Series Size Issued by Period

	Number of Issuances			Size of Advance Refunding vs. Non-Advance Refunding		
	(1) Pre-TCJA	(2) Post-TCJA	(3) Diff	(4) Pre-TCJA	(5) Post-TCJA	(6) *Difference (t-stat)*
Bond Series Issuances						
Advance Refunding	1,370	142	-1,228	47.006	35.367	-11.639
						(-1.27)
Non-Advance Refunding	7,045	7,295	250	34.647	38.402	3.755
						(1.61)
Difference				12.359***	-3.035	
(t-stat)				(3.22)	(-0.25)	
Diff in Diff						-15.394
(t-stat)						(-1.26)

Table 8, Panel A shows the univariate difference-in-differences descriptive statistics for mean bond issuance (in millions of dollars) for all advance refunding bonds and non-advance refunding (i.e., new money and current refunding) bonds in 2017 and 2018. Panel B shows the univariate difference-in-differences descriptive statistics for mean bond issuance (in millions of dollars) for sole-purpose advance refunding bonds and non-advance refunding (i.e., new money and current refunding) bonds in 2017 and 2018. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 9 – Panel A
The Moderating Role of Internal Constraints on Municipal Responsiveness

DV	Full Sample Issued_Adv_Refunding			Sole-Purpose Sample Issued_Adv_Refunding		
	Logit	Probit	LPM	Logit	Probit	LPM
	(1)	(2)	(3)	(4)	(5)	(6)
Large	-0.334*	-0.140*	-0.008*	-0.399	-0.168	-0.006*
	(-1.65)	(-1.69)	(-1.88)	(-1.45)	(-1.59)	(-1.69)
Dec2017 × Large	0.577**	0.267***	0.031***	0.492	0.219*	0.015*
	(2.54)	(2.73)	(3.31)	(1.62)	(1.80)	(1.93)
Month-Year Fixed Effect	Y	Y	Y	Y	Y	Y
State Fixed Effect	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	90,612	90,612	90,612	81,900	81,900	82,068
Pseudo R-Squared	0.047	0.047		0.049	0.049	
Adj R-Squared			0.013			0.011

Table 9, Panel A shows the results of estimating Equation (5) for bond issuances from January to December of 2017. Issued_Adv_Refunding is an indicator variable equal to 1 if the municipality issued an advance refunding bond in the month and 0 otherwise. Dec2017 is an indicator variable equal to 1 for month of December in 2017 and 0 otherwise. Large is an indicator variable equal to 1 if the bond was issued by or within one of the largest 50 counties in the U.S. (per census data) and zero otherwise. We include Month-Year and State of issuer fixed effects in all columns. Standard errors are clustered by issuer. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 9 (continued) – Panel B
The Moderating Role of Internal Constraints on Municipal Responsiveness

DV	Full Sample Issued_Adv_Refunding			Sole-Purpose Sample Issued_Adv_Refunding		
	Logit	Probit	LPM	Logit	Probit	LPM
	(1)	(2)	(3)	(4)	(5)	(6)
Large	-0.464**	-0.194**	-0.010**	-0.611**	-0.250**	-0.008**
	(-2.13)	(-2.20)	(-2.48)	(-2.01)	(-2.18)	(-2.43)
Dec2017 × Large	0.690***	0.313***	0.032***	0.666**	0.283**	0.015*
	(2.84)	(3.03)	(3.38)	(1.99)	(2.16)	(1.88)
Month-Year Fixed Effect	Y	Y	Y	Y	Y	Y
State Fixed Effect	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	80,652	80,652	80,652	73,032	73,032	73,188
Pseudo R-Squared	0.049	0.049		0.014	0.014	
Adj R-Squared			0.013			0.011

Table 9, Panel B shows the results of estimating Equation (5) for bond issuances from January to December of 2017. Issued_Adv_Refunding is an indicator variable equal to 1 if the municipality issued an advance refunding bond in the month and 0 otherwise. Dec2017 is an indicator variable equal to 1 for month of December in 2017 and 0 otherwise. Large is an indicator variable equal to 1 if the bond was issued by or within one of the largest 50 counties in the U.S. (per census data) and zero otherwise. We exclude state-issued debt from this analysis and focus only on sub-state-level jurisdictions. We also exclude the next largest 50 counties in the U.S. from the sample to ensure separation between large and non-large municipalities. We include Month-Year and State of issuer fixed effects in all columns. Standard errors are clustered by issuer. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 10
Cross-Sectional Test – Top5 vs. Non-Top5 Bookrunners

DV	Full Sample Issued_Adv_Refunding			Sole-Purpose Sample Issued_Adv_Refunding		
	Logit	Probit	LPM	Logit	Probit	LPM
	(1)	(2)	(3)	(4)	(5)	(6)
Top5Bookrunner	0.099	0.049	0.002	0.327	0.134	0.005
	(0.46)	(0.55)	(0.43)	(1.26)	(1.27)	(1.09)
Dec2017 × Top5Bookrunner	0.515**	0.269**	0.052***	0.365	0.217*	0.044***
	(2.13)	(2.49)	(4.16)	(1.26)	(1.76)	(3.86)
Month-Year Fixed Effect	Y	Y	Y	Y	Y	Y
State Fixed Effect	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	90,612	90,612	90,612	81,900	81,900	82,068
Pseudo R-Squared	0.048	0.048		0.062	0.062	
Adj R-Squared			0.014			0.012

Table 10 shows the results of estimating Equation (5) for bond issuances from January to December of 2017, where we replace Large with Top 5. Issued_Adv_Refunding is an indicator variable equal to 1 if the municipality issued an advance refunding bond in the month and 0 otherwise. Dec2017 is an indicator variable equal to 1 for month of December in 2017 and 0 otherwise. Top5Bookrunner is an indicator variable equal to 1 if the bond series was issued by one of the five bookrunners to issue the most municipal debt in dollars in 2016 and zero otherwise. We exclude state-issued debt from this analysis and focus only on sub-state-level jurisdictions. We include Month-Year and State of issuer fixed effects in all columns. Standard errors are clustered by issuer. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Table 11
Cross-Sectional Test - Sales Method

DV	Full Sample Issued_Adv_Refunding			Sole-Purpose Sample Issued_Adv_Refunding		
	Logit	Probit	LPM	Logit	Probit	LPM
	(1)	(2)	(3)	(4)	(5)	(6)
Negotiated_Sale	0.599***	0.252***	0.014***	0.810***	0.312***	0.012***
	(3.81)	(3.82)	(3.95)	(3.57)	(3.58)	(4.00)
Dec2017 × Negotiated_Sale	0.868***	0.433***	0.067***	0.874***	0.436***	0.055***
	(4.66)	(5.37)	(9.70)	(3.37)	(4.24)	(9.29)
Month-Year Fixed Effect	Y	Y	Y	Y	Y	Y
State Fixed Effect	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	90,612	90,612	90,612	81,900	81,900	82,068
Pseudo R-Squared	0.062	0.062		0.084	0.083	
Adj R-Squared			0.019			0.018

Table 11 shows the results of estimating Equation (5) for bond issuances from January to December of 2017 and including bond sale method. Issued_Adv_Refunding is an indicator variable equal to 1 if the municipality issued an advance refunding bond in the month and 0 otherwise. Dec2017 is an indicator variable equal to 1 for month of December in 2017 and 0 otherwise. Negotiated is an indicator variable equal to 1 if the bond series is negotiated and 0 otherwise. We include Month-Year and State of issuer fixed effects. Standard errors are clustered by issuer. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.

Online Appendix

Online Appendix

Table OA-1: Descriptive statistics of debt issuances by top 5 states

	Total Number of Issuances		Total Size Issued (millions)	
State	Pre-TCJA	Post-TCJA	Pre-TCJA	Post-TCJA
Texas	17,250	14,310	$37,763	$39,179
California	12,855	9,181	57,084	37,734
New York	6,953	5,931	41,757	37,209
Wisconsin	4,671	4,318	10,624	7,537
Minnesota	4,327	4,349	5,413	6,237
Other	65,550	53,326	220,149	175,123
Total	111,606	91,415	372,790	303,019

Table OA-1 shows descriptive statistics of debt issuances by top 5 states and all other states combined for the number of issuances and total size of debt issued by all municipalities in a state.

Table OA-2: Correlation table of variables by sample

		N	(1)	(2)	(3)	(4)	(5)
	Panel A - MRSB Bond Trades						
(1)	*Yield*	2,375,135	1				
(2)	*Adv_Refunding*	2,375,135	-0.0860*	1			
(3)	*Issued_2018*	2,375,135	0.1295*	-0.4329*	1		
(4)	*Adv_Refunding × Issued_2018*	2,375,135	0.0182*	0.3602*	0.1632*	1	
(5)	*Years_to_Maturity*	2,375,135	0.6330*	-0.1068*	0.1146*	-0.0306*	1
	Panel B - Bond Series Issuances						
(1)	*Bond Series Size (Millions)*	17,758	1				
(2)	*Adv_Refunding*	17,758	0.0516*	1			
(3)	*Post2017*	17,758	-0.0161*	-0.2088*	1		
(4)	*Adv_Refunding × Post2017*	17,758	-0.0311*	0.4556*	0.2420*	1	
	Panel C - State Bond Issuances						
(1)	*Montly State Size (Millions)*	2,448	1				
(2)	*Adv_Refunding*	2,448	-0.4437*	1			
(3)	*Post2017*	2,448	-0.5037*	0.1048*	1		
(4)	*Adv_Refunding × Post2017*	2,448	-0.6890*	0.6909*	0.5703*	1	

Table OA-2 shows the correlations between variables by sample.

Table OA-3: Cross-sectional test for sales method

DV	Full Sample Negotiated Sale			Sole-Purpose Sample Negotiated Sale		
	Logit	Probit	LPM	Logit	Probit	LPM
	(1)	(2)	(3)	(4)	(5)	(6)
Adv_Refunding	0.739***	0.424***	0.133***	1.255***	0.723***	0.234***
	(9.46)	(9.53)	(10.56)	(10.53)	(10.73)	(12.98)
Dec2017 × Adv_Refunding	0.605***	0.335***	0.095***	0.264	0.131	0.019
	(4.07)	(3.84)	(3.80)	(1.33)	(1.13)	(0.60)
Month-Year Fixed Effect	Y	Y	Y	Y	Y	Y
State Fixed Effect	Y	Y	Y	Y	Y	Y
Constant	Y	Y	Y	Y	Y	Y
Observations	17,758	17,758	17,758	15,852	15,852	15,852
Pseudo R-Squared	0.208	0.207		0.203	0.202	
Adj R-Squared			0.253			0.248

Table OA-3 shows the results of regressing Negotiated Sale on Adv_Refunding, Dec2017, and the interaction of Adv_Refunding and Dec2017. Adv_Refunding is an indicator variable equal to 1 if the bond is an advance refunding bond and 0 otherwise. Dec2017 is an indicator variable equal to 1 for month of December in 2017 and 0 otherwise. Negotiated is an indicator variable equal to 1 if the bond series is negotiated and 0 otherwise. We include Month-Year and State of issuer fixed effects. Standard errors are clustered by issuer. T-statistics are reported in parentheses. ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent levels (two-tailed), respectively.