Regulatory Spillover: Evidence from Classifying Municipal Bonds as High-Quality Liquid Assets*

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Abstract: Basel III introduced the first global banking liquidity standard: the liquidity coverage ratio (LCR). This paper examines if changing the regulatory accounting for the LCR by including certain municipal bonds in its computation has a spillover effect on the municipal bond market. In contrast to statements made by regulators, I find that the rule decreases the affected bonds' yield spread, relative to unaffected bonds, due to an increase in bank demand for the affected bonds. Importantly, I am unable to find evidence that this change in the yield spread is due to a change in risk. Consistent with a decrease in yields, I document that municipalities who are able to issue either affected or unaffected bonds change their *real behavior* by issuing more of the affected bonds in the aftermath of the rule change. These results provide evidence that changing the measurement of the LCR from banks' perspective did have a spillover effect on the municipal bond market.

Keywords: Municipal Bonds, Liquidity Regulation, High-Quality Liquid Assets, Regulatory Spillover, Measurement Changes
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1. Introduction

This paper examines the spillover effect of changing the measurement of a bank liquidity ratio on the municipal bond market. In the aftermath of the most recent financial crisis, the Basel Committee on Banking Supervision (BCBS) strengthened banks' liquidity regulation by requiring banks to maintain a minimum liquidity coverage ratio (LCR), defined as *high-quality liquid assets* (HQLA) divided by estimated total net cash outflows during a 30-day stress period.[1] Whether municipal bonds should be classified as HQLA in computing this ratio and the resulting economic consequences are subject to intense debate. Issuers of municipal bonds contend that municipal bonds should be classified as HQLA based upon their safety and liquidity profiles and that excluding municipal bonds from the ratio would have a detrimental impact on municipalities and "*hurt the real engines of the U.S. economy*", because banks would be less willing to hold municipal bonds (Arrieta-Candelaria, 2014). In contrast, the U.S. banking regulators questioned both the liquidity of these bonds and the claim that municipalities would be affected and excluded municipal bonds from HQLA in the final rule issued in 2014. However, less than a year later, in an abrupt reversal, the Federal Reserve Board (FRB) unilaterally decided to include general obligation municipal bonds in the measurement of HQLA while continuing to exclude revenue municipal bonds.[2] Exploiting this policy reversal, I examine two potential spillover effects of the classification of general obligation municipal bonds as HQLA. First, I examine if there is a change in the yield spread of general obligation bonds relative to revenue bonds. Second, I examine if municipalities change their issuances of general obligation bonds, relative to revenue bonds.

[1] The key characteristics of HQLA are that they can be rapidly monetized without significant impairment in their value during a stress period.

[2] There are two broad types of municipal bonds: general obligations and revenue bonds. General obligation municipal bonds are backed by the full faith and credit of an issuer whereas revenue bonds are backed by a specific revenue stream (e.g. a toll road, stadium, hydroelectric dam, etc.). The FRB included general obligation bonds in the calculation of HQLA, because they reasoned that they typically hold their value and have better liquidity than a revenue bond during a period of stress.

In standard asset pricing theory, the fundamental price of an asset is determined by its expected risk discounted cash flows, whereas the asset's market price is determined by market supply and demand. In an efficient market these two prices should be equivalent. If a change in supply or demand arises exogenously without a concurrent change in the underlying fundamentals, then any potential price effects should be quickly arbitraged away. Under this theory, since reclassifying municipal bonds for regulatory purposes does not affect bond fundamentals, there should be no pricing affects. On the other hand, more recent theories have augmented the standard asset pricing models to account for the specific demand for assets that are financially liquid (e.g. Holmström and Tirole, 2001; Krishnamurthy and Vissing-Jorgensen, 2012).[3] These *safe assets* are in limited supply, and therefore command a nonpecuniary premium generally referred to as the *convenience yield*.[4] Krishnamurthy and Vissing-Jorgensen (2012) empirically show that United States' treasury bonds are priced at a premium in the long run due to the high demand for them. Highly rated municipal bonds are also an example of safe assets due to their safety and moneyness (Gorton, Lewellan, and Metrick, 2012; Gorton, 2017). As a result, since safe assets are scarce, and banks own a sizeable minority of all municipal bonds, an exogenous increase in their demand for bonds could impact their yields unrelated to fundamental risk.[5] Given these countervailing theories, it is not clear if a demand change will have a spillover effect on the yield spreads of general obligation municipal bonds.

In order to answer this question, I implement a short window difference-in-differences research design centered on the relevant events to identify changes in the yield spread. The Wall

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[3] Financial liquidity refers to the capability of storing wealth through time. It is distinct from secondary market liquidity.
[4] Safe assets are money or money-like assets that do not have adverse selection concerns; the convenience yield is defined in Gorton (2017) as, "the difference between the instrument's yield and the return that that bond would pay if these nonpecuniary returns did not exist but everything else was constant."
[5] As of 2015, banking institutions owned around 13% of all U.S. municipal bonds (https://www.sifma.org/resources/research/us-municipal-securities-holders/).

Street Journal reported on April 17th, 2015 that the FRB would be switching the classification of some municipal bonds to HQLA (Ackerman and McGrane, 2015). Then, on May 21st, the FRB issued a press release proposing to include general obligation bonds as Level 2B HQLA.[6] These two events represent the first credible news to the market that a change would be made. On April 1st, 2016 the FRB issued their press release for the final rule, which was largely unchanged from the proposed rule. Since the first two events have overlapping windows, I combine them into one event. I find a decrease of about 5 basis points in the yield spreads of general obligation bonds relative to revenue bonds around the time when the news broke that there would be changes to the rule. Although this appears to be a small effect, when considering that the average yield spread in my sample is about 25 basis points, it is economically significant.[7] This effect increases to about 15 basis points when I examine a cross section of highly rated general obligation municipal bonds that are most likely to qualify for HQLA status. I do not find evidence of an additional effect around the final rule adoption. This is not surprising if the market was not expecting the FRB to deviate from its initial proposal. In order to rule out a risk-based explanation for these results, I include fixed effects for the ratings of bonds in the different periods. However, the market may anticipate credit rating changes before they happen and trade based upon that expectation. As a result, I directly test if the ratings are differentially changing for general obligation bonds subsequent to the event windows. I find evidence that general obligation credit quality is actually deteriorating relative to revenue credit quality in the months after my event windows. Importantly, this should bias against finding a decrease in general obligation yield spreads relative to revenue

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[6] HQLA are split between three categories: Level 1, Level 2A, and Level 2B with haircuts of 0%, 15%, and 50%, respectively.

[7] For a magnitude comparison, Butler et al. (2009) find that uninsured bonds in high corruption states have a higher yield of about 5.9 basis points relative to those in low corruption states.

yield spreads. In light of the above, I conclude that the banking rule change had a spillover effect on the yield spreads of general obligation municipal bonds.

The second consequence of the rule that I explore is whether it has a real spillover effect on the issuance behavior of municipalities. Since I show that there is a decline in the yield spread of general obligation bonds relative to revenue bonds, I examine if municipalities issue relatively more general obligations in the post-period. Increasing general obligation issuances relative to revenue issuances would have two important consequences for municipalities. First, general obligation bonds are usually issued at lower yields than revenue bonds. To the extent that municipalities reduce their financing costs (an activity that is excluded from GDP), they may have more room for other investments. Second, issuing general obligation bonds increases the amount of debt that a municipality will have to repay with certainty. On the other hand, if a project financed through a revenue bond does not produce a sufficient income stream, a municipality has no legal obligation to pay the bond back through other means. As a result, issuing general obligation bonds in lieu of revenue bonds will likely reduce taxpayers' short-term financing burden, but it puts the taxpayers at a greater risk of a tax raise in the long-term. However, it is not given that municipalities will change their issuance behavior. If it is sufficiently costly to switch between revenue bonds and general obligation bonds to fund a project, if the spread does not widen sufficiently to affect decision makers, or if the change in spread is only for a short time, then I would not expect a change in issuance behavior. Since there are many types of municipalities who issue either revenue or general obligation bonds, but not both, I restrict my sample to only the municipalities that issued both types of bonds in the lead up to the rule change. I find that these municipalities issue relatively more general obligation bonds in the period following the rule change. Specifically, I document that relative to the change in revenue bond issuance, general obligation bond issuance increases by about 30%. This effect is composed of a decrease in revenue issuance and an increase in general obligation issuance.

The mechanism underlying the two spillover effects that I document is that banks increase their holdings of general obligation bonds. Specifically, if there is an exogenous increase in the demand for general obligation bonds, then the equilibrium price and quantity should go up. Unfortunately, I am not able to directly provide evidence of an increase in demand for general obligation bonds, because the holdings of general obligation and revenue bonds are aggregated on the FR-Y9C report. To provide some evidence on the issue, I test how affected banks' total holdings of municipal bonds change around the implementation date relative to unaffected banks. In a related study, Roberts, Sarkar, and Shachar (2018) find an increase in municipal bond holdings after the first quarter of 2013 for banks subject to the LCR. I reexamine this result in my setting by looking at the level of municipal holdings in a short window around the effective date of the rule change.[8] I find evidence that banks subject to the rule change increase their holdings of municipal bonds by about .1% of assets relative to banks not subject to the rule. This is an economically significant amount given the average level of a treatment bank's assets in my sample is $416 billion. Based upon this result, I conjecture that the affected banks specifically changed their holdings of general obligation bonds. This provides some indirect authentication of the proposed channel.

This paper makes several contributions to the literature. First, I contribute to the literature on the economic consequences of bank liquidity regulation. There are a number of studies that have examined the impact of liquidity regulation on banks' willingness to lend or on changes to

[8] The main purpose of the Roberts et al. (2018) study is to show how the LCR affected the liquidity creation of banks. However, in one of their tables, they use a DiD framework to study changes in a number of HQLA over the period 2009-2017. The event date used in their analysis is the 2nd quarter of 2013. Unlike the rest of the assets they study, general obligation municipal bonds were not actually included in HQLA in the U.S. until the FRB's rule change.

their balance sheet (e.g. Bannerjee and Mio, 2015; Curfman and Kandrac, 2018; Roberts et al., 2018). Importantly, these papers focus on changes in bank behavior. Contrary to those studies, I examine if changing the measurement of the LCR can have a spillover effect on an entirely different sector of the economy. This is important because there is a lack of evidence on the spillovers of regulation (Leuz and Wysocki, 2016), and according to Harberger's (1971) seminal work on welfare economics, an analysis of the impact of a regulation is incomplete without considering indirect effects, regardless of who it is that is ultimately affected. This research also directly informs part of the debate concerning the decision to include/exclude municipal bonds from HQLA by showing that it did affect the municipal market.

Second, this paper contributes to the literature on the pricing of municipal bonds. There are a variety of papers that examine the determinants of yields or yield spreads. In most of these papers, the determinants can directly be traced to either risk or cash flows (e.g. Butler, Fauver, and Mortal, 2009; Baber, Gore, Rich, and Zhang, 2013). Conversely, this paper studies the effect of an event that is arguably unrelated to risk and perceived risk. Specifically, I show that the inclusion of municipal bonds in the liquidity coverage ratio of banks spills over to the municipal market by reducing yield spreads. Issuing municipal bonds is an integral part of funding infrastructure projects, and since the infrastructure of the United States is in dire need of repair (ASCE, 2017), it is essential to study the pricing of municipal bonds.

Third, this paper contributes to the literature on the real effects of accounting. According to Kanodia and Sapra (2016), the real effects hypothesis can be defined as stating, "the measurement and disclosure rules that govern the functioning of accounting systems…have significant effects on the *real* decisions that firms make." In this paper, I examine how a change in the measurement rules of a certain pool of banks' assets (i.e. HQLA) for regulatory accounting purposes affects the issuance behavior of municipalities.

The paper proceeds as follows: Section 2 discusses the institutional background. Section 3 develops the hypotheses. Section 4 presents the research design. Section 5 presents descriptive statistics and empirical results. Section 6 presents evidence on bank demand. Section 7 concludes.

2. Institutional Background

2.1 Basel III

In response to the financial crisis, the Basel Committee on Banking Supervision met and developed Basel III, which was introduced in December of 2010 (BCBS, 2010). This accord strengthened some of the capital requirements introduced in Basel II. For example, the requirement for Common Equity Tier 1 Capital was increased from 2% of risk weighted assets to 4.5% of risk weighted assets. Additionally, Tier 1 Capital was increased from 4% of risk weighted assets to 6% of risk weighted assets. The accord also introduced a new requirement for a leverage ratio and two new liquidity standards. The liquidity coverage ratio (LCR) was established to ensure that banks can withstand a 30-day period of significant stress whereas the net stable funding ratio (NSFR) was established with a longer perspective of one year. This study focuses on a measurement change to the LCR in the United States.

The revised LCR standards were issued by the BCBS in January of 2013. The LCR ratio is calculated as follows:

$$LCR = \frac{Stock\ of\ High\ Quality\ Liquid\ Assets}{Total\ net\ cash\ outflows\ over\ the\ next\ 30\ calendar\ days} \quad (1)$$

The numerator is equal to the amount of HQLA that a bank holds. In order for an asset to be counted as a HQLA it must be unencumbered and have a number of other characteristics: low risk, ease and certainty of valuation, low correlation with risky assets, listed on a developed and recognized exchange, active and sizeable market, low volatility, and flight to quality (BCBS, 2013).[9] Within the Basel III guidelines, HQLA were to be divided into Level 1, Level 2A, and Level 2B assets. Level 1 assets are the most liquid assets, such as cash and central bank reserves, and are not subject to a haircut. Level 2A assets are subject to a 15% haircut, while Level 2B assets (if permitted by the regulator) are subject to between a 25% and 50% haircut. The denominator is equal to the estimated stressed net cash outflow over the next 30 calendar days. In order to compute this value, the bank projects cash outflows and inflows for each day. The net cash inflows used in the calculation are capped at 75% of the net outflows.

2.2 United States Proposal and Implementation of Basel III

In November of 2013, the FRB, OCC, and the FDIC proposed a rule to implement the LCR requirement imposed in the Basel III accord. In general, the LCR would only apply to banking organizations with $250 billion or more in total assets. Additionally, the FRB proposed a Modified LCR (MLCR) that would apply to banking organizations with between $50 billion and $250 billion in total assets that are regulated by the FRB. The rule proposed by the U.S. regulators contained several departures from the international standards that were included in Basel III. For example, in the international standards, corporate debt and corporate securities could be classified as Level 2A or 2B depending upon their individual characteristics whereas in the U.S. proposal they could only be counted as Level 2B. Another departure was the exclusion of municipal bonds from the HQLA category altogether by the U.S. regulators although the international standards allowed municipal bonds to be treated as Level 2A HQLA.

[9] A flight to quality is when demand for a particular asset increases during crises.

The proposal was open for comments until January of 2014. Many of the hundreds of comments received by the agencies pertained to the exclusion of municipal securities from HQLA. Most of these comments recommended that municipal bonds be granted Level 2A status to be consistent with international standards. For example, a joint letter by the CFO's of 18 of the largest U.S. cities recommended Level 2A treatment and warned that failure to include municipal bonds as HQLA would increase borrowing costs and "*hurt the real engines of the U.S. economy*" (Arrieta-Candelaria, 2014).[10] Similar comments were submitted by trade groups (e.g. American Bankers Association, SIFMA, and the Financial Services Roundtable), municipal organizations (e.g. National Governors Association, National Association of Counties, and National League of Cities), banks, and politicians.

The final rule was issued in October of 2014 with an effective date of January 1, 2015. The regulators did not move from their original position on the exclusion of municipal bonds. They stated that they did not believe the rule would have a significant impact on the demand for municipal securities.

2.3 Federal Reserve Board Proposal and Implementation

The Wall Street Journal reported in April of 2015 that the Federal Reserve Board was going to propose a rule allowing some municipal bonds to be counted as HQLA (Ackerman and McGrane, 2015). A little over one month later, the FRB issued a press release regarding its proposal. The FRB proposed to include certain general obligation municipal bonds as Level 2B HQLA, while revenue municipal bonds were proposed to be excluded altogether. This was a

[10] The 18 U.S. cities are Albuquerque, Atlanta, Boston, Chicago, El Paso, Fort Worth, Houston, Indianapolis, Jacksonville, Los Angeles, Louisville, Milwaukee, Oklahoma City, Philadelphia, Phoenix, San Diego, Seattle, and Washington, D.C.

unilateral move by the FRB and as such would only affect banking organizations that were regulated by the FRB. General obligations bonds are backed by the full faith and credit of an issuer whereas revenue bonds are backed by a specific revenue stream (e.g. a toll road, stadium, hydroelectric dam, etc.). In most cases, for a given issuer, general obligations are considered safer and trade at lower yields than a revenue bond. In their decision to exclude revenue bonds, the FRB suggested that they would be less likely to hold their value and would be less liquid in a crisis period, relative to general obligation bonds.

The proposal was open for comments until July of 2015. Again, a number of commenters expressed that municipal bonds should be included as Level 2A HQLA, while one commenter advocated for the continued exclusion of municipal bonds from HQLA. The press release for the final rule was issued in April of 2016 with an effective date of July 1, 2016. It contained few substantive changes from the proposal. The events described above are summarized in Appendix A.

The initial exclusion of municipal bonds by the agencies' in their 2013 proposal does not provide an ideal scenario to identify the effects of the LCR on municipal bonds, because there is no clear control group. However, the FRB's subsequent proposal and rule change included only general obligation municipal bonds as HQLA. Since the FRB events provide a natural treatment and control group, they are the events that I examine in this study.

3. Hypotheses Development

Basel III contained the first international liquidity standard, the LCR, which is considered to be the most consequential bank regulation since the financial crisis (Gorton and Muir, 2016). However, the efficacy of liquidity regulations is not well understood (Curfman and Kandrac, 2018). As a result, there are a number of recent papers that examine their effects. Bruno, Onali, and Schaeck (2018) study how market participants react to news about the liquidity coverage ratio, while many of the other papers examine the effect of liquidity regulation on banks' behavior. For example, liquidity regulation has been found to reduce credit supply, because banks build up their HQLA reserves at the expense of making loans (Curfman and Kandrac, 2018; Roberts et al., 2018).

The tendency to study the effects on those that are directly impacted by regulation (in this case, banks) is a natural starting point and is clearly important. However, in some cases, the effects documented are not comprehensive. Ideally, from a social welfare perspective, regulators should consider the costs and benefits of implementing new regulation on all the entities that are affected — either directly or indirectly. As a result, it is also important to study the spillover effects of regulation (Harberger, 1971; Leuz and Wysocki, 2016). In this paper, I study how changes to the LCR spillover on both the pricing and issuances of municipal bonds. In subsequent analysis, I also examine the underlying mechanism: a change in bank demand.[11]

3.1 Pricing of Municipal Bonds

Under classical asset pricing theory, a shift in demand for a bond that arises exogenously should not affect the fundamental value of an asset. Only changes in the fundamentals of a bond should affect its yield. The fundamentals include expected cash flows and risk. For municipal bonds, there are three relevant categories of risk: default risk, liquidity, and taxes (Gao et al. 2020). Relative to corporate bonds, the municipal bond default rate is remarkably low, yet it still accounts for the majority of a bond's yield (Schwert, 2017). Most of the research on municipal pricing

[11] I leave this analysis to the end, because I cannot directly examine if the demand for affected bonds (general obligations) increases. Instead, I analyze the sum of general obligation and revenue bonds and make a conjecture based upon this.

examines factors that directly relate to these risks. For example, Butler, Fauver, and Mortal (2009) find a positive relationship between corruption and bond yields. Baber et al. (2013) find that the true interest cost of municipal bonds increases after a financial restatement. However, there is evidence in the municipal market that factors unrelated to a bond's fundamentals may also affect the yield at which it trades. For example, Cornaggia et al. (2018) find that when Moody's recalibrated their ratings system, yield spreads went down as a result of the upgrades. Although the recalibration was unrelated to changes in issuer fundamentals, it is plausible that retail investors' perception of risk changed due to the change in ratings. In the same spirit, if a banking regulator changes the regulatory classification of a municipal bond, there should be no impact on the underlying credit quality of the bond's issuer. Further, it is unlikely that this banking regulation will affect retail investors' perception of an issuer's risk.

Highly rated municipal bonds are an example of safe assets (Gorton et al., 2012; Gorton, 2017). Since safe assets are in limited supply and investors demand them for their safety and moneyness benefits, they are priced at a premium (Gorton, 2017). Krishnamurthy and Vissing-Jorgensen (2012) model this relationship analytically and show that non-fundamental demand can be priced. Safety and moneyness are also the key features determining whether an asset is classified as a HQLA or not. If an asset receives the HQLA label, then it provides the regulatory benefit of being included in the measurement of the LCR, which has the potential to influence the demand for that asset. To the extent that the banking industries' participation in the municipal bond market is large enough, then it is possible that an increase in demand would lead to a reduction in the spreads of general obligation bonds. However, even if the demand for municipal bonds affects their price, it is not self-evident that the FRB's rule change will affect their price. Although financial institutions collectively hold nearly 15% of the entire municipal bond market, the label change did not go as far as some commenters wanted. Therefore, it may not generate a demand change significant enough to move the market price for municipal bonds. Given these possibilities, I write my first hypothesis in null form:

H1: Relative to revenue bonds, the yield spread of general obligation bonds does not change as a result of the FRB's rule change.

3.2 Issuance of Municipal Bonds

There are issuers who issue either exclusively revenue, exclusively general obligation, or both types of bonds. For those municipalities that can issue both, they make the decision on which type to issue based on a variety of factors including the specific project they are undertaking, debt limitations, credit ratings, political considerations, and the spread between general obligation and revenue bonds at that time. In most cases, a municipality can issue general obligation bonds at a lower yield than it can issue revenue bonds. However, there are a couple drawbacks to issuing general obligations. First, issuing a general obligation bond puts the municipality's tax base at risk of having to be drawn upon. This particular risk can also be a factor in determining the credit rating of a municipality. In addition, some municipalities have statutory or constitutional limits on the amount of general obligation debt that can be outstanding. If the spread between general obligation and revenue bonds widens sufficiently as a result of the rule change, but the relative costs of issuing general obligations are unaffected, then I expect municipalities will shift their issuances towards general obligations. On the other hand, if municipalities are not able to choose freely between revenue bonds or a general obligation bonds to fund a project, if the spread does not widen sufficiently, or if the change in spread is not permanent, then I would not expect a change in issuance behavior. Given these possibilities, I write my second hypothesis in null form:

H2: Relative to revenue bond issuances, general obligation bond issuances do not change as a result of the FRB's rule change.

4. Research Design and Sample Construction

4.1 Pricing of Municipal Bonds

Unlike the stocks of public companies, municipal bonds do not trade on centralized exchanges. They are traded over-the-counter (OTC) by a large network of dealers and are relatively illiquid. This makes performing a typical event study analysis untenable. As a result, I perform a series of difference-in-differences around the relevant events to identify the effect of the LCR on municipal bond pricing. However, I still face the classic reliability versus long term effect tradeoff. A shorter event window is likely to produce more reliable estimates, because the parallel trend assumption is more credible in the short run. However, I am interested in the long-term effect on general obligation municipal bonds. As a result, I follow previous literature that has examined the impact of an event on municipal yields. Specifically, I use a research design similar to the one employed by Cornaggia et al. (2018) (subscripts omitted for brevity):

$$Spread = \alpha_1 + \alpha_2 GO + \alpha_3 Post + \alpha_4 Post * GO + \alpha_5 \ln(Time\ to\ Maturity) + \alpha_6 Coupon + \alpha_7 Call + \alpha_8 \ln(Par) + \alpha_8 Negotiated + \alpha_9 Volume + FIXED\ EFFECTS + \varepsilon \quad (2)$$

I average variables across a 30-day time period before and after each event.[12] The controls I use are similar to those employed in prior studies (e.g. Cornaggia et al., 2018; Gao et al., 2020). *Spread* is the average yield of a bond minus the maturity matched treasury yield. *GO* is an indicator variable that equals one for general obligation bonds, *Post* is an indicator variable that equals one during the period after an event, and the interaction term *Post*GO* is the difference-in-differences

[12] The results are similar if I average variables over a 60- or 90-day period before and after the events.

coefficient of interest. The remainder of the control variables are defined in Appendix B. In order to reduce covariate imbalance, I use an entropy balanced sample (Hainmuller, 2012). Specifically, I balance the covariates in the pre-periods, then I assign the weights to the post-periods.[13] In addition to controls, I use three separate fixed effect structures. The first fixed effects structure includes state, issuer type, and credit rating fixed effects. Next, I use issuer and credit rating fixed effects. Finally, I use bond and credit rating fixed effects. I cluster standard errors at the issuer level.

In constructing the sample, I require that a bond has at least two transactions in the period before and after the event.[14] I also include a couple of rule based filters following Green, Li, and Schurhoff (2010): I exclude bond trades that report a coupon rate greater than 20% and bonds within 180 days of issuance. Since I use the treasury matched yield spread, I remove bonds that have a time to maturity of over 30 years. Following Cornaggia, Hund, and Nguyen (2019) I exclude bonds within one year of their maturity. I also exclude taxable bonds, insured bonds, non-rated bonds, and bonds without the requisite controls.

The specific events that I study are the Wall Street Journal article (WSJ), proposal press release (PPR), and final rule press release (FRPR). The first two events have overlapping event windows. As a result, I combine them into one event with the pre-period starting 30 days prior to the WSJ article and the post-period extending to 30 days after the proposal press release (WSJ-PPR). Since the details of the proposal were not known until the proposal press release, I exclude the intermediate period.[15] This combined event represents the first news to the market that there would be a change to the LCR. As a result, if the rule change does affect pricing, then I would

[13] Since there are two events, there are two separate pre-periods and post-periods.
[14] Alternatively, the results are similar when requiring either 1 or 3 transactions in the pre- and post-period.
[15] The main results are robust to including trades in the intermediate period between the WSJ article and the FRB's announcement. However, the magnitude is weaker.

expect to find evidence for that around this event. The other event (FRPR) has a balanced 30-day pre- and post-period. There were not substantial changes from the proposal to the final rule, so it is unclear if there would be any effects around this event.

4.2 Issuance of Municipal Bonds

In order to test whether municipalities increase their issuances of general obligation bonds after the rule change, I use the following difference-in-differences specification (subscripts omitted for brevity):

$$Ln(Amount) = \beta_0 + \beta_1 Post + \beta_2 GO + \beta_3 Post * GO + \beta_4 Ln(Population) + \beta_5 Population\ Growth + \beta_6 Ln(per\ capita\ Income) + \beta_7 Unemployment\ Rate + FIXED\ EFFECTS + \varepsilon \quad (3)$$

In this analysis, I aggregate variables up to the issuer-bond type-year level. For each year a municipality is included in the analysis, there are two observations: one for revenue bond issuance and one for general obligation bond issuance. If *GO* equals zero, then *Ln(Amount)* is the log of one plus the amount (in millions) of revenue bonds issued. If *GO* equals one, then *Ln(Amount)* is the log of one plus the amount (in millions) of general obligation bonds issued. *Post* is equal to one during the years of 2016 and 2017, and it is set to zero for 2013 and 2014. I exclude 2015 from the analysis, because the proposed LCR change was announced during mid-2015, and it takes time for municipalities to adjust their issuance behavior. Following Gao et al. (2020), I include county-level control variables to control for the local economic conditions of municipalities.[16] I also include a variety of fixed effect structures. Since controls are defined at the issuer-year or county-year level, I am able to include state-year fixed effects. I also include credit rating fixed effects in

[16] If the issuer is a state, then I use control variables measured at the state-level. If the issuer spans multiple counties, then I average the county characteristics.

the first specification. I add in issuer fixed effects to remove any issuer level heterogeneity in the second specification. I replace state-year and issuer fixed effects with issuer-year fixed effects in the third specification. Importantly, the only variation within an issuer-year is in *Ln(Amount), GO, Post*GO, and Credit Rating*. I cluster standard errors at the issuer level. These controls are defined in more detail in Appendix B. Importantly, not all issuers have the capacity to issue both revenue and general obligation bonds. As a result, I restrict the sample to issuers who issued *both* general obligation and revenue bonds in the pre-period.[17] I am not able to control for the investment set available to individual issuers, so I make an assumption that it is similar to the pre-period. This assumption is likely reasonable, because across the country there is a pervasive need for infrastructure updates (ASCE, 2017). Further, I assume that these issuers are able to switch between general obligation and revenue funding for a specific project, because they have issued both types of bonds in the pre-period. Similar to the secondary market analysis, I exclude taxable bonds, insured bonds, issuances with maturities of less than one year, issuances with maturities greater than thirty years, and issuer-years where I am unable to assign a credit rating.

5. Descriptive Statistics and Empirical Results

5.1.1 Pricing Descriptives

For the two event periods, I obtain data on bond yields, volume, coupon rates, dated dates, and maturity dates from the Municipal Securities Rulemaking Board (MSRB) database within WRDS. I obtain a time-series of bond level credit ratings data from the Center for Municipal Finance, I obtain treasury yields from the U.S. Department of Treasury (USDT), and I obtain the

[17] Since I am interested in how behavior changes as a result of the rule change, I also require each municipality to have either a general obligation or revenue issuance in the post-period.

other bond characteristics from SDC Platinum's Global Public Finance database.[18] Table 1 Panels A and B report pre-event covariate balance before and after entropy balancing. Most of the covariate means are significantly different between general obligation and revenue bonds prior to reweighting. For example, the unweighted treasury matched yields prior to the first event are about 43 basis points and 25 basis point for revenue bonds and general obligation bonds, respectively. The unweighted rates are generally falling in this time period as they are about 16 basis points and 8 basis point for revenue bonds and general obligation bonds, respectively, prior to the second event. By construction, after entropy balancing, there are no significant differences between the means of any of the reported variables in the pre-event periods.

Table 2 Panels A and B present the entropy weighted descriptive statistics around each event, split on treatment status. In general, these descriptives are close to those reported by other studies. Table 2 Panels C and D presents the univariate results of the impact on the rule change on treasury matched yield spreads. For both events, by construction, there is no significant difference between general obligation yield spreads and revenue yield spreads prior to the event. In the WSJ-PPR event, the spread for general obligation is significantly lower in the post-period. In the FRPR event, neither the general obligation spread nor the revenue spread is significantly different in the post-period. Importantly, the difference in differences is significant for both events and points to an effect of about 3.5 basis points around WSJ-PPR and about 1 basis point around FRPR.

5.1.2 Pricing Results

In order to draw stronger inferences, I use regression equation (2) to test *H1*. The results are reported in Table 3. The difference-in-differences coefficient of interest is *Post*GO*. Panel A

[18] I am grateful to Marc Joffe and Frank Partnoy for compiling the credit ratings data and to Ryan Israelsen for pointing it out to me.

reports the results of the regression around WSJ-PPR. Across three separate fixed effect structures, the coefficient is highly significant and translates to a differential effect of about 4.5 to 5 basis points. Although this may sound small, the economic magnitude is still significant.[19] For example, an average issuance of GO bonds would yield about $730,000 less in risk premium payments.[20] Further, this effect is comparable to other studies in the literature. Gao et al. (2020) find that borrowing costs increase by 5 to 11 basis points over a period of one to three years following a newspaper closure in the issuer's county. Butler et al. (2009) find that corruption is positively associated with yields. In their sample that most closely resembles mine (i.e. uninsured bonds), they find an effect of 5.9 basis points. However, it is smaller than the effects documented in other papers. For example, Cornaggia et al. (2018) document between a 19 to 33 basis point reduction in the treasury matched yield spread as the result of a plausibly exogenous upgrade in credit risk of between 1 and 3 notches.

Panel B reports the results of the regression around the final rule's press release. Across three separate fixed effect structures, the coefficient is negative, but is not significant. Since the final rule was very similar to the proposal, it is intuitive that there is not a significant market response to its announcement.

The results around the announcement date provide evidence to reject *H1* in favor of the alternative. Consistent with the commenters' arguments, it appears that the HQLA label change does affect the pricing of bonds.

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[19] In a discussion with a professional that works for a major issuer, I was informed that they would be aware of a change in the yield spread of this magnitude.

[20] In the municipal setting, a typical issuance is composed of dozens of separate bonds. To calculate $730,000, I multiply the average par of an *issue* ($180 million) by the average maturity of a bond within the issue (9 years) and by my estimated effect (4.5 basis points). This requires making the assumption that par values are equally spread out across maturities. In reality, the par values generally rise with maturities making this figure a lower bound.

5.1.3 Pricing Additional Tests

In order to strengthen the inferences provided by Table 3, I perform several additional tests. First, I delineate the types of general obligation bonds that are most likely to be affected by the rule change. In order to count as HQLA a bond must be "investment grade and readily marketable". All bonds that appear in my sample have *at least* 2 trades in the pre- and post-periods. On average, the bonds in my sample trade between six and seven times in both the pre- and post-periods. By municipal bond standards, these are liquid bonds.[21] On the other hand, I have included all bonds that are rated by Fitch, Moody's, or Standard & Poor's. Conditional on a municipal bond being rated, most of them are investment grade. In fact, nearly 99% of my sample is investment grade when using the traditional definition (i.e. above BB+/Ba1). As a result, I use AA-/Aa3 as the cutoff for investment grade municipal bonds which is a definition proposed by the Basel Committee to define other investment grade securities (BCBS, 2013). These results are presented in Table 4. Panel A presents results around the announcement window. The triple difference term *Post*GO*AA-* is the coefficient of interest. It is significant across all three specifications at the 5% level with a coefficient that translates to a differential effect of about 15 basis points. This provides further evidence in favor of the alternate hypothesis. Although I did not find multivariate evidence for an effect around the final rule date, I explore the cross-sectional results for completeness. Panel B presents the results relating to the rule announcement. Again, since the final rule provided a limited amount of new information, it is not clear that there would be a market response. Consistent with this reasoning, the coefficient of interest is insignificant.

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[21] In a 2014 report published by the MSRB, the 90th percentile of trades per calendar year for their data set was 16.6 trades per year, while the 95th percentile was 30.6 trades. My sampling procedure requires *at least* 2 trades in consecutive months. If this is scaled up to the yearly level, then the number of trades would be between the 90th and 95th percentile (MSRB, 2014).

Although the yield spreads are weighted to be identical in the pre-periods that are examined, it is not necessarily the case that, absent treatment, they would have moved in a parallel fashion over time. The parallel trend assumption is fundamentally untestable, but in order to provide some evidence, I perform two separate pseudo analyses. Specifically, I move the treatment date back from the WSJ-PPR date by one and then two months. The results are presented in Table 5 Panels A and B. There are no statistically significant coefficients for the interaction term *Post*GO* or *Post*GO*AA-*. This provides some evidence that the yield spreads of general obligation and revenue bonds tend to move in a parallel manner.

It could be the case that the underlying quality of the general obligation bonds may be differentially changing as compared to the revenue bonds over the time periods examined. To control for this possibility, I include fixed effects for the credit rating assigned to the bond. However, it may be the case that market participants recognize a change in credit quality before credit ratings are updated. To alleviate this concern, I examine if credit ratings are changing in the couple of months after the post period. Specifically, I compare the credit rating in the post-period to the credit rating 90 days after the event date. The results are presented in Table 6 Panels A and B. In both cases, the univariate difference-in-differences is positive and significant. This provides evidence that general obligation credit quality is actually deteriorating in my sample relative to revenue bond credit quality.

Finally, I employ an alternate matching strategy to test *H1*. For a given general obligation bond, I match it with a revenue bond from the *same issuer*, same rounded years to maturity, same credit rating, with the smallest difference in pre-period yield spread. These untabulated results are similar to those reported in Table 3.

5.2.1 Issuance Descriptives

For the issuance tests, I obtain data on bond characteristics from SDC Platinum's Global Public Finance database, and I obtain county-level control variables from The Bureau of Economic Analysis and the U.S. Department of Agriculture (USDA). Table 7 presents the descriptive statistics. In this sample, when split by bond type, the average amount of issuances is around $87 million. Since each issuer-year accounts for two observations, the average total amount issued by a municipality during a year is $174 million. By construction, the average of *GO* is .5, because again, for each issuer-year there is an observation for general obligation issuance and a separate observation for revenue issuance. In order to be included in the sample, a municipality must have issued at least one revenue bond *and* one general obligation bond in the pre-period as well as an issuance of any type in the post-period. The average of *Post* is .49 which shows there are slightly more observations in the pre-period.[22] The sample credit rating average is around 3 which corresponds to a credit rating of AA. The average unemployment rate is 4.95%, which is slightly below the average national unemployment rate over the sample period of 5.28%. The average population growth is around 1.05%, which is above the national population growth over the sample period of .69%. To the extent that these municipalities are growing faster than the national average, it makes sense that they are the ones issuing debt to fund infrastructure improvements.

5.2.2 Issuance Results

The results of estimating regression equation (3) are presented in Table 8. *Post* is absorbed by fixed effects in all specifications. *GO* is positive in all specifications, but it is only statistically

[22] The analysis spans four years (2013, 2014, 2016, and 2017). If an issuer is present in the sample, it must be included for at least 2 years (one in the pre- and one in the post-period). However, depending on issuance behavior it can be included in either 2, 3, or all 4 years of the sample.

significant in the first column. This provides some weak evidence that general obligation issuances tend to be larger than revenue issuances in the pre-period. The difference-in-differences coefficient of interest is on the term *Post*GO*. Across the separate fixed effect structures, the magnitude is consistently around .33 and is statistically significant. Since the dependent variable is logged, this implies that general obligation issuances increase by about 33% around the rule change, relative to the change in revenue bonds. This provides evidence to reject *H2* in favor of the alternative that municipalities increase the amount of general obligation bonds they issue. Stated in a different way, I provide evidence that the way in which a bank is required to measure a regulatory accounting ratio has a real spillover effect on the issuance behavior of municipalities.

5.2.3 *Issuance Additional Tests*

In order to corroborate the inferences provided by Table 8, I perform a couple of other tests. First, I delineate the types of issuers who would be most likely able to issue general obligation bonds at lower yields as a result of the rule change. In the pricing analyses, I show that general obligation bonds rated at or above AA-/Aa3 experience an incremental decrease in their yields. As a result, I use the same cutoff to see if those who are most able to benefit from the inclusion of general obligation bonds in the LCR change their issuance behavior incrementally more than other issuers. Since analysis is at the issuer-bond type-year level, I also define *AA-* at the issuer-bond type-year level. Specifically, *AA-* is a binary variable equal to one when the municipality's average rating on general obligation bonds issued in a year are rated at *AA-* or above (if *GO* = 1) or equal to one if the municipality's average rating on revenue bonds issued in a year are rated at *AA-* or above (if *GO* = 0), otherwise it is equal to zero. These results are presented in Table 9. The triple difference term *Post*GO*AA-* is the coefficient of interest. It is positive and statistically significant across all specifications. This provides further evidence in favor of the alternate hypothesis that municipalities issuers do change their behavior as a result of the change to the LCR.

Much like the concern in the pricing analyses, it is not necessarily the case that, absent treatment, the issuances of revenue and general obligation bonds would have moved in a parallel fashion over time. In order to provide some evidence on the parallel trend assumption, I replace *Post* and *Post*GO* in third column with separate variables for each year in the analysis. I exclude the year prior to treatment, so the coefficients on the remaining terms are in reference to 2014. Figure 1 displays the point estimates of the *interaction terms* by year (i.e. 2013*GO, 2016*GO, and 2017*GO). There is not a clear trend over time. In fact, the interaction term in 2013 is slightly higher relative to 2014, although it is nowhere near statistical significance. There is a sizeable jump in both 2016 and 2017, relative to 2014. This provides some evidence in favor of the parallel trend assumption.

6. Additional Analysis - Bank Demand

The proposed mechanism underlying the two spillover effects that I document is an increase in demand for general obligation municipal bonds on the part of banks around the classification change. Under more recent modifications to the standard asset pricing model (e.g. Holmström and Tirole, 2001; Krishnamurthy and Vissing-Jorgensen, 2012), this shift in demand could lead to an increase in equilibrium price and quantity. In this section, my aim is to provide evidence for this mechanism.

The financial crisis exposed the tenuous liquidity positions of some banks. One of the principal reasons for the adoption of Basel III was to change banks' liquidity management behavior to require a stock of HQLA to cover a bank's expected cash outflow for one month during a crisis scenario. After this initial month, governments or central banks would be able to inject liquidity into the financial system. Specifically, banks that are subject to the LCR (MLCR) are required to hold at least 100% (70%) of their monthly expected net cash outflows in HQLA. As a result, banks are incentivized to hold assets which are labeled as HQLA in order to avoid running afoul of the regulation.

If banks already found it optimal to hold a certain HQLA before the LCR was implemented, then I expect that they would further increase their positions under two circumstances. First, if they are not in compliance with the regulation, then they would clearly be incentivized to increase their HQLA pool. Also, even if a bank is in compliance with the LCR, they may want to build a buffer in order to avoid violating the LCR under most conditions. However, if a bank has a sufficient amount of HQLA to where it is unlikely that the ratio would ever bind, then I would not expect it to impact their investment behavior. Given the point of the regulation was to change their behavior, the latter scenario is unlikely to be the case. Further, large banks have stated that the liquidity rules imposed by Basel III are more of a challenge to them than the capital rules (Killian, 2016). The preliminary evidence shows that the LCR initially was binding and changed the pool of assets that banks held. For example, Roberts et al. (2018) show that U.S. banks affected by the LCR increase (decrease) their amount of liquid (illiquid) assets relative to unaffected banks over an 8-year window. In fact, they also show that the rate of change of municipal bond ownership increases over this time period, although municipal bonds were not included as HQLA for part of the event window used in their study. As a result, I reexamine Roberts et al.'s (2018) result using a short window analysis around the actual inclusion of general obligation municipal bonds as HQLA in order to provide evidence for the mechanism in my study. While banks said the rule change would affect their demand (Ackerman, 2014), regulators explicitly said that they did not expect the rule to have a significant effect on banks' demand for municipal bonds.

6.1 Research Design

Bank holding companies report municipal bond holdings in their FR-Y9C filings, but they do not report separate amounts for total amount of general obligation bonds versus revenue bonds. In order to test whether the rule affects banks' investment behavior, I use the following specification (subscripts omitted for brevity):

$$Munis = \beta_0 + \beta_1 LCR\ Firm + \beta_2 Effective\ Date + \beta_3 LCR * Effective\ Date + \beta_4 Size + \beta_5 ROA + \beta_6 Capital\ Ratio + \beta_7 Debt + \beta_8 Deposits + FIXED\ EFFECTS + \varepsilon \quad (4)$$

I run this regression at the bank-quarter level and include controls similar to those employed by Chircop et al. (2016). *LCR Firm* is an indicator variable for firms that are subject to either the LCR or MLCR. It is equal to 1 if a bank has total assets greater than or equal to $50 billion. *Effective Date* is an indicator variable that is equal to one when the rule is effective (i.e. on and after July 1, 2016). The interaction term *LCR**Effective Date* is the difference-in-differences coefficient of interest. The remaining control variables are defined in Appendix B. In order to tighten potential inferences, I use a short window setting and focus only on municipal holdings during 2016. This provides a two quarter pre- and post-period. In order to reduce pre-treatment covariate imbalance, I use entropy balancing in the quarter prior to treatment and assign the weights to the other quarters. Since *Size* is the variable that determines treatment, it cannot be balanced. As a result, I use the largest threshold of *Size* where the other variables are still able to be balanced. This process keeps all banks above $8 billion in total assets. Standard errors are clustered by bank.

If the rule affects banks' investment decisions, they may increase their holdings of general obligation bonds and keep their level of revenue bonds constant. On the other hand, they may keep the total amount of municipal bonds that they hold constant and rebalance the portfolio to increase the share of general obligation bonds at the expense of revenue bonds. As a result, I will interpret a positive and significant coefficient on *LCR*Effective Date* as evidence in support of my proposed mechanism. However, due to the aggregation of municipal bonds, an insignificantly positive (or even negative) coefficient does not necessarily provide evidence against the mechanism.

6.2 Descriptive Statistics and Results

I obtain banking data from the Bank Holding Companies database within WRDS. In untabulated descriptives, the means of *Size*, *Debt*, *Deposits*, and *Munis* are significantly different between treatment and control prior to entropy balancing. By construction, after entropy balancing, there are no significant differences in the pre-period between the means of any of the variables that were balanced. However, *Size* is still significantly different across treatment and control. Table 10 presents descriptive statistics for the investment sample after entropy balancing. Approximately 28% of the bank holding companies in the final sample are subject to either the LCR or MCLR. Municipal bonds make up 1% of the average bank's assets. The average control bank in my sample has total assets of around $19 billion, while the average treatment firm has total assets around $416 billion. They tend to be only slightly profitable with a ROA of .2%. Although my sample is purposefully tilted towards larger banks, the descriptive statistics are reasonably similar to other studies.

6.3 Results

The results of estimating regression equation (4) are presented in Table 11. The coefficient of interest is *LCR*Effective*. The first specification is based off the sample where *Munis* is also balanced whereas the second specification is based off the sample where *Munis* is not balanced. Across the separate specifications the point estimate for *LCR*Effective* is positive and significant at the 5% level. Further, the economic magnitude of the DiD coefficient is significant. Since *Munis* is scaled by assets, the coefficient of .001 represents an increase in municipal bond holdings by about .1% of assets as a result of the rule change. The average bank subject to the rule has total assets of about $415 billion implying an increase in municipal bonds of $415 million for the average bank. Considering there are 37 banks subject to the LCR or MLCR guidelines, the estimated aggregate impact of the rule change is about $15 billion dollars. This corresponds to a little more than 2.5% of the entire amount of municipal bonds held by all banking institutions as of 2016.

7. Conclusion

This study documents that changing the measurements used in bank liquidity management can have spillover effects. Specifically, I find that classifying a general obligation municipal bond as a *high-quality liquid asset* in the regulatory accounting for the liquidity coverage ratio has a spillover effect by influencing municipal market pricing and behavior. First, I find that assigning the HQLA label to a municipal bond has an effect of between 4.5 and 5 basis points on the yield spread, an economically significant change in this market. This effect is closer to 15 basis points in the cross section of highly rated general obligation municipal bonds, which are most likely to be affected. Next, the reduction in financing costs of general obligation bonds appears to influence municipalities' real issuance decisions. Relative to revenue bond issuance, municipalities increase their issuance of general obligation bonds by about 33%. This effect is magnified in the cross section of highly rated municipalities. Finally, I find some indirect evidence for the proposed mechanism: a change in banks' real investment behavior.

This paper contributes to several veins of literature, but also has important policy implications. The effects that I document are the result of changing municipal bonds to Level 2B assets. Many different entities (e.g. banks, politicians, trade groups, etc.) have requested Level 2A treatment. It may be the case that the results of this paper would be strengthened in magnitude if this change was made. For example, municipalities could potentially be able to borrow at even lower rates under Level 2A treatment. The lack of Level 2A treatment may put U.S. domiciled municipalities at a disadvantage in maintaining and improving infrastructure relative to municipalities in other countries who do treat municipal bonds as Level 2A in their liquidity management regulations. However, it is important to note that this study does not examine if classifying general obligation bonds as *high-quality liquid assets* is an optimal decision for the purposes of liquidity management.

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Appendix A: Timeline

Event	Date	Description
Basel III Standards	12/1/2010	The Basel Committee on Banking Supervision releases their initial liquidity standards. Municipal bonds are eligible as Level 2A HQLA
Basel III Revised Standards	1/1/2013	The Basel Committee on Banking Supervision releases their revised liquidity standards. Municipal bonds are eligible as Level 2A HQLA
U.S. Proposal of Basel III	11/1/2013	U.S. regulators proposed a rule to adopt the components of Basel III. There were several modifications including the exclusion of municipal bonds from HQLA. The LCR applies to banks with more than $250 billion in total assets. In addition, bank holding companies regulated by the FRB are subject to a MLCR starting at $50 billion in total assets.
U.S. Adoption of Basel III	10/10/2014	After pushback from many commenters, municipal bonds were still left off the HQLA list.
Wall Street Journal Article	4/17/2015	This represented the first report that the FRB was going to add certain municipal bonds to the HQLA list.
FRB Press Release	5/21/2015	The FRB released a statement saying general obligation bonds meeting certain conditions will be treated as Level 2B HQLA.
FRB Rule Proposal	5/28/2015	The FRB released their long form rule proposal
FRB Press Release	4/1/2016	The FRB finalizes the rule. There were some changes from the proposal, but municipal bonds were kept as Level 2B.
FRB Final Rule	4/11/2016	The FRB released their long form final rule.
Rule Effective Date	7/1/2016	The new FRB rule takes effect.

Appendix B: Variable Definitions

Variable	Source	Definition
Yield Tests		
Spread	MSRB	The bond's average yield over an event period minus the average yield on a maturity matched treasury security. If necessary, the yield on a treasury security is linearly interpolated from the two closest available treasury yields (one above and one below).
Post	MSRB	An indicator variable that is equal to one in the period after (and including) the event and zero otherwise.
GO	SDC Platinum	An indicator variable that is equal to one if the bond is a general obligation bond and zero otherwise.
Call	MSRB	An indicator variable that is equal to one if the bond is callable and zero otherwise.
Negotiated	SDC Platinum	An indicator variable that is equal to one if the bond was issued through a negotiated offering and zero otherwise.
Rating	CMF	A numeric version of a bond's rating which ranges from 1 for the highest quality bonds to 21 for the lowest quality. Standard and Poor's ratings are used. If they are missing, Moody's ratings are used. If both Standard and Poor's and Moody's do not have information on the rating, then Fitch's ratings are used.
Volume	MSRB	The natural log of one plus the bond's buy volume over an event period.
Coupon	MSRB	The bond's average coupon rate over an event period.
Ln(Par)	SDC Platinum	The natural log of one plus the estimated par value of a bond. The estimated value is calculated as the par of the issue divided by the number of bonds in the issue.
Ln(Time)	MSRB	The natural log of one plus the time to maturity (in years).
Fixed	SDC Platinum	An indicator variable that is equal to one if the bond has a fixed coupon rate and zero otherwise.
AA-	CMF	An indicator variable that is equal to one if the bond has a credit rating at or above AA- (i.e. Rating <= 4)

Appendix B: Variable Definitions - Continued

Variable	Source	Definition
Issuance Tests		
Ln(Amount)	SDC Platinum	The natural log of one plus the amount of general obligation bonds (in million $'s) issued (if *GO*=1) or the natural log of one plus the amount of revenue bonds issued (if *GO*=0).
Post	SDC Platinum	An indicator variable that is equal to one during 2016 and 2017 and zero otherwise.
GO	SDC Platinum	An indicator variable that is equal to one for general obligation bonds and equal to zero for revenue bonds.
Ln(Pop)	BEA	The natural log of the population of the municipality's home county. If the municipality spans multiple counties, then it is the average population of those counties. If the municipality is a state, then the state's population is used.
Pop Growth	BEA	The municipality's population growth (as a %), measured as ((population(t) - population(t-1))/population(t-1)) * 100.
Ln(PC Income)	BEA	The natural log of the per capita income of the municipality's home county. If the municipality spans multiple counties, then it is the average per capita income of those counties. If the municipality is a state, then the state's per capita income is used.
Unemployment	USDA	The unemployment rate (as a %) of the municipality's home county. If the municipality spans multiple counties, then it is the average unemployment rate of those counties. If the municipality is a state, then the state's unemployment rate is used.
Rating	CMF	A numeric version of a bond's rating which ranges from 1 for the highest quality bonds to 21 for the lowest quality. This measure is aggregated up to the issuer-bond type-year level and rounded to the nearest whole number. Missing values are replaced with the previous year or two's data for the same bond type. If still missing, then it is replaced with the rating for the other bond type (i.e. GO or REV) from the same issuer.[23]
AA-	CMF	An indicator variable that is equal to one if the issuer-bond type-year has a credit rating at or above AA- (i.e. *Rating* <= 4)

[23] Due to data availability, prior to replacement, nearly all observations in 2017 have missing ratings. After replacing missing values with past years' data or other bond ratings, nearly all have available ratings.

Appendix B: Variable Definitions - Continued

Variable	Source	Definition
Bank Demand Tests		
Munis	Bank Regulatory (WRDS)	The fair value of HTM and AFS municipal bonds divided by total assets ((bhck8497 + bhck8499)/bhck2170)
LCR Firm	Bank Regulatory (WRDS)	An indicator variable that is equal to one if the bank holding company's total assets are greater than or equal to $50 billion and zero otherwise.
Size	Bank Regulatory (WRDS)	The natural log of total assets (Ln(bhck2170))
ROA	Bank Regulatory (WRDS)	Net income divided by total assets (bhck4340/bhck2170)
Capital Ratio	Bank Regulatory (WRDS)	Total equity capital divided by total assets (bhck3210/bhck2170)
Debt	Bank Regulatory (WRDS)	Non deposit liabilities divided by total assets ((bhck2948-bhdm6631 - bhdm6636)/bhck2170)
Deposits	Bank Regulatory (WRDS)	Deposits divided by total assets ((bhdm6631 + bhdm6636)/bhck2170)

Figure 1: Trend of Bond Issuance around the LCR change

This figure shows point estimates and their 90% confidence intervals for an OLS regression estimating the effect of the LCR change on municipalities' bond issuance behavior. I estimate the model from Column (3) of Table 8. However, I replace *Post*GO* with separate time dummies.

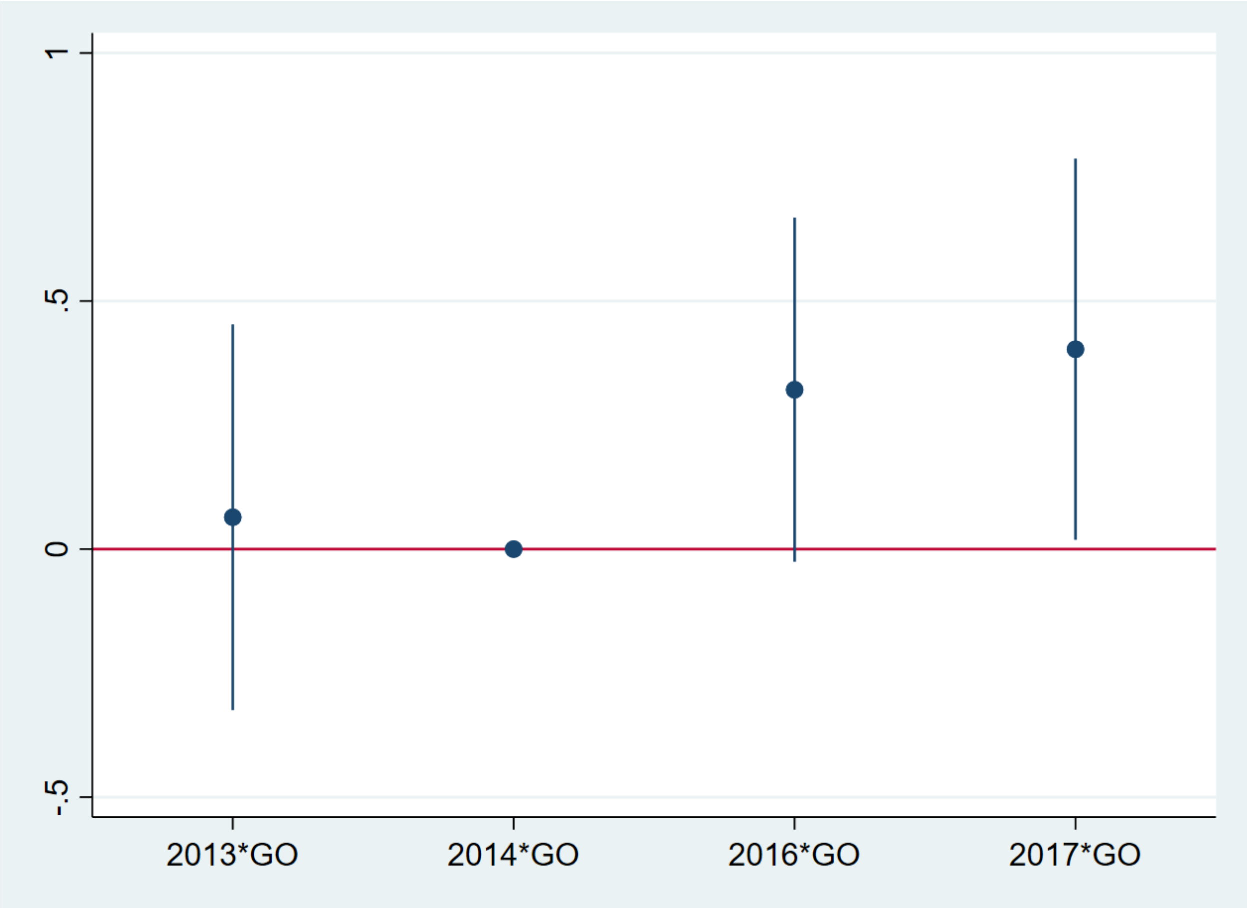

Table 1: Entropy Balancing

This table reports the mean of pre-period variables before and after entropy balancing for revenue and general obligation bonds. *T*-tests are conducted to test the difference in means between the sample of revenue and general obligation bonds. *** denotes statistical significance at the 1% level. See Appendix B for variable definitions.

Panel A: WSJ-PPR

	Before entropy balancing			After entropy balancing		
	N= 8,673	N = 5,873		N= 8,673	N = 5,873	
	REV	GO	Difference	REV	GO	Difference
$Call_{t-1}$	0.9263	0.8817	-0.0447***	0.8817	0.8817	0.0000
$Negotiated_{t-1}$	0.8555	0.5866	-0.2689***	0. 5866	0.5866	0.0000
$Rating_{t-1}$	4.0472	2.8708	-1.1764***	2.8711	2.8708	-0.0003
$Spread_{t-1}$	0.4286	0.2529	-0.1758***	0.2522	0.2529	0.0006
$Coupon_{t-1}$	4.6688	4.3579	-0.3109***	4.3576	4.3579	0.0002
$Ln(Par)_{t-1}$	2.1281	1.7652	-0.3629***	1.7649	1.7652	0.0003
$Maturity_{t-1}$	11.488	9.1688	-2.3191***	9.1690	9.1688	-0.0002
$Volume_{t-1}$	10.265	10.279	0.0133	10.279	10.279	0.0001

Panel B: FRPR

	Before entropy balancing			After entropy balancing		
	N= 9,481	N = 6,988		N= 9,481	N = 6,988	
	REV	GO	Difference	REV	GO	Difference
$Call_{t-1}$	0.9348	0.8888	-0.0460***	0.8888	0.8888	0.0000
$Negotiated_{t-1}$	0.8432	0.5897	-0.2534***	0.5897	0.5897	0.0000
$Rating_{t-1}$	4.0184	3.0173	-1.0010***	3.0174	3.0173	-0.0001
$Spread_{t-1}$	0.1584	0.0770	-0.0814***	0.0774	0.0770	-0.0005
$Coupon_{t-1}$	4.6431	4.2800	-0.3631***	4.2800	4.2800	0.0000
$Ln(Par)_{t-1}$	2.0731	1.6563	-0.4168***	1.6561	1.6563	0.0001
$Maturity_{t-1}$	10.932	8.7207	-2.2110***	8.7209	8.7207	-0.0002
$Volume_{t-1}$	9.6229	9.3545	-0.2684***	9.3545	9.3545	0.0000

Table 2: Descriptive Statistics – Bond Trades

This table presents the entropy balanced summary statistics for the municipal bond pricing tests. Panel A presents statistics related to the Wall Street Journal - Proposal Press Release event. Panel B presents statistics related to the Final Rule Press Release event. Panel C reports changes in the spread around the first event. Panel D reports changes in the spread around the second event. *T*-tests are conducted to test the difference in means. *, **, *** denotes statistical significance at the 10%, 5%, and 1% levels, respectively. See Appendix B for variable definitions.

Panel A: WSJ-PPR

	Revenue				General Obligation			
VARIABLES	N	Mean	SD	Median	N	Mean	SD	Median
Call	17,346	0.882	0.323	1.000	11,746	0.882	0.323	1.000
Negotiated	17,346	0.587	0.492	1.000	11,746	0.587	0.492	1.000
Rating	17,346	2.880	1.983	3.000	11,746	2.902	2.058	3.000
Spread	17,346	0.251	0.865	0.229	11,746	0.233	0.888	0.207
Coupon	17,346	4.358	0.993	5.000	11,746	4.358	0.993	5.000
Ln(Par)	17,346	1.765	0.858	1.705	11,746	1.765	0.859	1.677
Maturity	17,346	9.081	6.524	7.202	11,746	9.080	6.524	7.255
Volume	17,346	10.32	3.215	10.88	11,746	10.38	3.185	10.90

Panel B: FRPR

	Revenue				General Obligation			
VARIABLES	N	Mean	SD	Median	N	Mean	SD	Median
Call	18,962	0.889	0.314	1.000	13,976	0.889	0.314	1.000
Negotiated	18,962	0.590	0.492	1.000	13,976	0.590	0.492	1.000
Rating	18,962	3.017	2.094	3.000	13,976	3.016	2.089	3.000
Spread	18,962	0.073	0.647	0.040	13,976	0.068	0.646	0.031
Coupon	18,962	4.281	1.051	5.000	13,976	4.280	1.051	5.000
Ln(Par)	18,962	1.656	0.875	1.536	13,976	1.656	0.876	1.536
Maturity	18,962	8.681	6.126	7.157	13,976	8.682	6.126	7.170
Volume	18,962	9.812	3.802	10.74	13,976	9.880	3.832	10.79

Panel C: WSJ-PPR

		Pre-period	Post-period	Change (Post – Pre)
Spread	*General Obligation*	.2529	.2139	-.0389**
	Revenue	.2522	.2490	-.0032
	Difference (GO-REV)			-.0357***

Panel D: FRPR

		Pre-period	Post-period	Change (Post – Pre)
Spread	*General Obligation*	.0770	.0590	-.0179
	Revenue	.0774	.0693	-.0081
	Difference (GO-REV)			-.0098*

Table 3: Changes in Bond Yields around Events

This table presents the results from entropy balanced OLS regressions where the dependent variable is the maturity matched treasury yield spread (Spread). The independent variable of interest is the difference-in-differences term *Post*GO.* Panel A reports the results around the Wall Street Journal - Proposal Press Release event. Panel B reports the results around the Final Rule Press Release event. See Appendix B for variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels. P-values are in parentheses. Standard errors are clustered by issuer.

Panel A: WSJ-PPR

VARIABLES	(1) Spread	(2) Spread	(3) Spread
Post	-0.0008	-0.0026	-0.0321
	(0.958)	(0.863)	(0.249)
GO	0.0096	0.0444	
	(0.661)	(0.181)	
Post*GO	**-0.0500*** **	**-0.0456*** **	**-0.0454*** **
	(0.00292)	**(0.00580)**	**(0.00592)**
Maturity	0.0025*	-0.0038**	-0.174
	(0.0846)	(0.0353)	(0.254)
Volume	-0.0251***	-0.0231***	-0.0227***
	(<.0001)	(<.0001)	(<.0001)
Negotiated	0.0412**	0.0202	
	(0.0496)	(0.539)	
Coupon	-0.225***	-0.233***	
	(<.0001)	(<.0001)	
Ln(Par)	-0.0196*	-0.0312**	
	(0.0994)	(0.0417)	
Call	-0.142***	-0.172***	
	(<.0001)	(<.0001)	
Observations	29,092	29,092	29,092
R-squared	0.627	0.757	0.950
Bond FE	NO	NO	YES
Issuer FE	NO	YES	NO
Ratings FE	YES	YES	YES
State FE	YES	NO	NO
Issuer Type FE	YES	NO	NO

Panel B: FRPR

VARIABLES	(1) Spread	(2) Spread	(3) Spread
Post	0.0077	0.0063	0.0114
	(0.186)	(0.282)	(0.297)
GO	0.00878	0.0324	
	(0.570)	(0.145)	
Post*GO	**-0.0071**	**-0.0071**	**-0.0068**
	(0.328)	**(0.328)**	**(0.344)**
Maturity	0.0013	-0.0047***	0.0287
	(0.264)	(0.00110)	(0.802)
Volume	-0.0172***	-0.0163***	-0.0195***
	(<.0001)	(<.0001)	(<.0001)
Negotiated	0.00148	-0.0115	
	(0.924)	(0.579)	
Coupon	-0.191***	-0.203***	
	(<.0001)	(<.0001)	
Ln(Par)	-0.0073	0.0030	
	(0.453)	(0.800)	
Call	-0.116***	-0.137***	
	(<.0001)	(<.0001)	
Observations	32,938	32,938	32,938
R-squared	0.515	0.700	0.944
Bond FE	NO	NO	YES
Issuer FE	NO	YES	NO
Ratings FE	YES	YES	YES
State FE	YES	NO	NO
Issuer Type FE	YES	NO	NO

Table 4: Changes in Bond Yields around Events - Triple Difference

This table presents the results from entropy balanced OLS regressions where the dependent variable is the maturity matched treasury yield spread (Spread). *AA-* is a binary variable equal to one when the bond is rated at *AA-* or above, otherwise it is equal to zero. The independent variable of interest is the triple difference term *Post*GO*AA-*. Panel A reports the results around the Wall Street Journal - Proposal Press Release event. Panel B reports the results around the Final Rule Press Release event. See Appendix B for variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels. P-values are in parentheses. Standard errors are clustered by issuer.

Panel A: WSJ-PPR

VARIABLES	(1) Spread	(2) Spread	(3) Spread
AA-	-0.366***	-0.294***	-0.0158
	(<.0001)	(<.0001)	(0.661)
Post	-0.0117	-0.0131	-0.0249
	(0.362)	(0.306)	(0.444)
*AA-*Post*	0.0139	0.0136	0.0141
	(0.502)	(0.512)	(0.496)
GO	-0.0374	-0.142	
	(0.594)	(0.414)	
*AA-*GO*	0.0468	0.181	0.112
	(0.508)	(0.292)	(0.225)
*POST*GO*	0.100	0.0999	0.103
	(0.150)	(0.153)	(0.145)
AA-*Post*GO	**-0.153****	**-0.152****	**-0.155****
	(0.0330)	**(0.0345)**	**(0.0327)**
Maturity	0.0044***	-0.0036*	-0.0657
	(0.00357)	(0.0501)	(0.686)
Volume	-0.0251***	-0.0234***	-0.0231***
	(<.0001)	(<.0001)	(<.0001)
Negotiated	0.0704***	0.0340	
	(0.00132)	(0.301)	
Coupon	-0.222***	-0.228***	
	(<.0001)	(<.0001)	
Ln(Par)	-0.0215	-0.0353**	
	(0.136)	(0.0268)	
Call	-0.128***	-0.168***	
	(<.0001)	(<.0001)	
Observations	29,092	29,092	29,092
R-squared	0.587	0.751	0.948
Bond FE	NO	NO	YES
Issuer FE	NO	YES	NO
Ratings FE	NO	NO	NO
State FE	YES	NO	NO
Issuer Type FE	YES	NO	NO

Panel B: FRPR

VARIABLES	(1) Spread	(2) Spread	(3) Spread
AA-	-0.382***	-0.330***	-0.203***
	(<.0001)	(<.0001)	(<.0001)
Post	-0.0159	-0.0168*	-0.0097
	(0.106)	(0.0887)	(0.473)
*AA-*Post*	0.0271**	0.0272**	0.0269**
	(0.0218)	(0.0216)	(0.0225)
GO	0.0075	0.0061	
	(0.922)	(0.973)	
*AA-*GO*	0.0057	0.0235	0.470**
	(0.941)	(0.895)	(0.0457)
*POST*GO*	-0.0207	-0.0185	-0.0203
	(0.164)	(0.220)	(0.171)
AA-*Post*GO	**0.0151**	**0.0124**	**0.0140**
	(0.375)	**(0.472)**	**(0.410)**
Maturity	0.0035***	-0.0044***	0.0426
	(0.0072)	(0.0028)	(0.711)
Volume	-0.0164***	-0.0161***	-0.0195***
	(<.0001)	(<.0001)	(<.0001)
Negotiated	0.0218	-0.0055	
	(0.203)	(0.791)	
Coupon	-0.188***	-0.199***	
	(<.0001)	(<.0001)	
Ln(Par)	-0.0022	-0.0031	
	(0.871)	(0.793)	
Call	-0.105***	-0.134***	
	(<.0001)	(<.0001)	
Observations	32,938	32,938	32,938
R-squared	0.434	0.693	0.944
Bond FE	NO	NO	YES
Issuer FE	NO	YES	NO
Ratings FE	NO	NO	NO
State FE	YES	NO	NO
Issuer Type FE	YES	NO	NO

Table 5: Pseudo Events

This table presents the results from entropy balanced OLS regressions where the dependent variable is the maturity matched treasury yield spread (Spread). The independent variables of interest are the difference-in-differences term *Post*GO* and the triple difference term *Post*GO*AA-*. Panel A reports the results around the first pseudo-event. Panel B reports the results around the second pseudo-event. See Appendix B for variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels. P-values are in parentheses. Standard errors are clustered by issuer.

Panel A: March 17th, 2015

VARIABLES	(1) Spread	(2) Spread	(3) Spread	(4) Spread	(5) Spread	(6) Spread
Post	0.150***	0.149***	-0.0131	0.149***	0.148***	-0.0135
	(0)	(0)	(0.175)	(0)	(0)	(0.308)
GO	0.0117	0.0606*		-0.0553	-0.0876	
	(0.555)	(0.0503)		(0.357)	(0.621)	
Post*GO	**-0.00369**	**-0.00401**	**0.000497**	0.00537	0.00456	0.00854
	(0.585)	**(0.552)**	**(0.939)**	(0.829)	(0.854)	(0.729)
AA-				-0.347***	-0.299***	0.0595***
				(0)	(1.06e-09)	(1.85e-05)
*AA-*Post*				0.00104	0.000570	-0.000549
				(0.927)	(0.960)	(0.962)
*AA-*GO*				0.0768	0.128	0.00959
				(0.205)	(0.473)	(0.860)
AA-*Post*GO				**-0.00944**	**-0.00850**	**-0.00825**
				(0.713)	**(0.741)**	**(0.746)**
Observations	30,780	30,780	30,780	30,780	30,780	30,780
R-squared	0.636	0.772	0.972	0.599	0.768	0.972
Controls	YES	YES	YES	YES	YES	YES
Bond FE	NO	NO	YES	NO	NO	YES
Issuer FE	NO	YES	NO	NO	YES	NO
Ratings FE	YES	YES	YES	NO	NO	NO
State FE	YES	NO	NO	YES	NO	NO
Issuer Type FE	YES	NO	NO	YES	NO	NO

Panel B: February 17th, 2015

VARIABLES	(1) Spread	(2) Spread	(3) Spread	(4) Spread	(5) Spread	(6) Spread
Post	-0.0586***	-0.0580***	-0.159***	-0.0877***	-0.0880***	-0.190***
	(6.05e-08)	(9.54e-08)	(0)	(0)	(0)	(0)
GO	0.00414	0.0448		-0.0118	-0.0728	
	(0.838)	(0.175)		(0.852)	(0.539)	
Post*GO	**-0.00946**	**-0.00834**	**-0.00637**	0.00763	0.00906	0.0133
	(0.420)	**(0.470)**	**(0.564)**	(0.687)	(0.629)	(0.458)
AA-				-0.333***	-0.285***	-0.160*
				(0)	(6.09e-06)	(0.0646)
*AA-*Post*				0.0360**	0.0357**	0.0351**
				(0.0200)	(0.0211)	(0.0197)
*AA-*GO*				0.0343	0.106	0.180
				(0.586)	(0.376)	(0.127)
AA-*Post*GO				**-0.0174**	**-0.0188**	**-0.0214**
				(0.451)	**(0.414)**	**(0.336)**
Observations	29,108	29,108	29,108	29,108	29,108	29,108
R-squared	0.641	0.775	0.969	0.603	0.772	0.969
Controls	YES	YES	YES	YES	YES	YES
Bond FE	NO	NO	YES	NO	NO	YES
Issuer FE	NO	YES	NO	NO	YES	NO
Ratings FE	YES	YES	YES	NO	NO	NO
State FE	YES	NO	NO	YES	NO	NO
Issuer Type FE	YES	NO	NO	YES	NO	NO

Table 6: Credit Ratings after the Events

This table presents univariate changes in the credit rating of bonds subsequent to the *post-period* for each event window. A rating of "1" corresponds to "AAA". Panel A reports the results following the Wall Street Journal - Proposal Press Release event. Panel B reports the results following the Final Rule Press Release event. See Appendix A for variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels.

Panel A: WSJ-PPR

		Post-period	90 Days after Event	Change (90 Days - Post)
Rating	*General Obligation*	2.940	2.960	.020
	Revenue	2.891	2.900	.009
	Difference (GO-REV)			.011**

Panel B: FRPR

		Post-period	90 Days after Event	Change (90 Days - Post)
Rating	*General Obligation*	3.018	3.046	.028
	Revenue	3.019	3.030	.011
	Difference (GO-REV)			.016***

Table 7: Descriptive Statistics – Issuances

This table presents the summary statistics for the issuance analysis. See Appendix B for variable definitions.

VARIABLES	N	Mean	SD	25th pct.	p50	75th pct.
Ln(Amount)	1,922	2.567	2.045	0.000	2.614	4.127
Post	1,922	0.490	0.500	0.000	0.000	1.000
GO	1,922	0.500	0.500	0.000	0.500	1.000
Rating	1,922	3.075	1.644	2.000	3.000	4.000
Ln(Pop)	1,922	13.146	1.481	12.093	13.203	13.996
Ln(PC Income)	1,922	10.778	0.194	10.643	10.759	10.905
Unemployment	1,922	4.952	1.521	3.700	4.700	5.900
Pop Growth	1,922	1.051	0.942	0.337	0.993	1.657

Table 8: Issuance Behavior

This table presents the results from OLS regressions where the dependent variable is either the log of one plus the amount of general obligation municipal bonds issued (if *GO* = 1) or the log of one plus the amount of revenue municipal bonds issued (if *GO* = 0). The independent variable of interest is the difference-in-differences term *Post*GO*. See Appendix B for all variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels. P-values are in parentheses. Standard errors are clustered by issuer.

VARIABLES	(1) Ln(Amount)	(2) Ln(Amount)	(3) Ln(Amount)
GO	0.220*	0.163	0.127
	(0.0670)	(0.207)	(0.314)
Post*GO	**0.321***	**0.334****	**0.332****
	(0.0582)	**(0.0488)**	**(0.0407)**
Ln(Pop)	0.413***	4.658	
	(0)	(0.107)	
Pop Growth	-0.0322	-0.0568	
	(0.688)	(0.612)	
Ln(PC Income)	-0.209	-1.385	
	(0.671)	(0.400)	
Unemployment	-0.0647	0.148	
	(0.488)	(0.312)	
Observations	1,922	1,922	1,922
R-squared	0.256	0.422	0.537
Ratings FE	YES	YES	YES
Issuer FE	NO	YES	NO
State-Year FE	YES	YES	NO
Issuer-Year FE	NO	NO	YES

Table 9: Issuance Behavior - Triple Difference

This table presents the results from OLS regressions where the dependent variable is either the log of one plus the amount of general obligation municipal bonds issued (if *GO* = 1) or the log of one plus the amount of revenue municipal bonds issued (if *GO* = 0). *AA-* is a binary variable equal to one when the municipality's average rating on general obligation bonds issued in a year are *AA-* or above (if *GO* = 1) or equal to one if the municipality's average rating on revenue bonds issued in a year are *AA-* or above (if *GO* = 0), otherwise it is equal to zero. The independent variable of interest is the triple difference term *Post*GO*AA-*. See Appendix B for all variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels. P-values are in parentheses. Standard errors are clustered by issuer.

	(1)	(2)	(3)
VARIABLES	Ln(Amount)	Ln(Amount)	Ln(Amount)
AA-	0.0577	0.412*	0.553*
	(0.776)	(0.0853)	(0.0511)
*AA-*Post*	-0.538*	-0.377	-0.122
	(0.0839)	(0.222)	(0.817)
GO	-0.491*	-0.634**	-0.746**
	(0.0721)	(0.0496)	(0.0140)
*AA-*GO*	0.826***	0.948***	1.058***
	(0.00727)	(0.00815)	(0.00191)
*Post*GO*	-0.516	-0.733	-0.732
	(0.267)	(0.124)	(0.140)
Post*GO*AA-	**0.981***	**1.203****	**1.171****
	(0.0512)	**(0.0198)**	**(0.0293)**
Ln(Pop)	0.415***	4.856	
	(0)	(0.122)	
Pop Growth	-0.0331	-0.0862	
	(0.667)	(0.454)	
Ln(PC Income)	-0.202	-2.788	
	(0.678)	(0.147)	
Unemployment	-0.0450	0.0704	
	(0.621)	(0.634)	
Observations	1,922	1,922	1,922
R-squared	0.265	0.435	0.550
Ratings FE	NO	NO	NO
Issuer-Type FE	NO	NO	NO
Issuer FE	NO	YES	NO
State-Year FE	YES	YES	NO
Issuer-Year FE	NO	NO	YES

Table 10: Descriptive Statistics – Bank Demand

This table presents the entropy weighted summary statistics for the bank demand analysis. See Appendix B for all variable definitions.

	Non-LCR Bank				LCR Bank			
VARIABLES	N	Mean	SD	Median	N	Mean	SD	Median
Size	384	16.617	0.513	16.403	148	19.090	0.807	18.830
ROA	384	0.003	0.002	0.003	148	0.002	0.002	0.002
Capital Ratio	384	0.122	0.027	0.115	148	0.120	0.025	0.122
Debt	384	0.301	0.208	0.275	148	0.310	0.201	0.267
Deposits	384	0.576	0.201	0.595	148	0.568	0.194	0.617
Munis	384	0.010	0.014	0.002	148	0.010	0.014	0.005

Table 11: Bank Demand

This table presents the results from entropy balanced OLS regressions where the dependent variable is the fair value of HTM and AFS municipal holdings divided by total assets (Munis). Munis is (not) balanced in the first (second) specification. The independent variable of interest is the difference-in-differences term *LCR*Effective*. See Appendix B for all variable definitions. *, **, and *** Indicate significance at the 10, 5, and 1% levels. P-values are in parentheses. Standard errors are clustered by bank.

VARIABLES	(1) Munis	(2) Munis
LCR Firm	-0.000711	-0.00378
	(0.911)	(0.602)
LCR*Effective	**0.00108****	**0.00144****
	(0.0476)	**(0.0103)**
Size	0.000247	-3.08e-05
	(0.915)	(0.990)
ROA	0.766	0.673
	(0.448)	(0.553)
Capital Ratio	0.504**	0.623**
	(0.0156)	(0.0115)
Debt	0.444***	0.556***
	(0.00147)	(0.00238)
Deposits	0.457***	0.577***
	(0.000864)	(0.00147)
Constant	-0.455***	-0.564***
	(0.000776)	(0.00180)
Observations	532	532
R-squared	0.087	0.092
Quarter FE	YES	YES
Munis Balanced	YES	NO