From Arm's Length to Arm in Arm: Banks and Municipal Bond Financing*

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Abstract

This paper provides the first detailed examination of banks' municipal bond portfolios using novel regulatory data. We present causal evidence that relationships significantly influence banks' municipal bond investment decisions. Our results challenge the view that issuers and banks derive minimal benefits from relationships in arm's length transactions. Banking relationships benefit issuers by enhancing issuance characteristics in good times and acting as stabilizers during crises. For banks, these relationships provide a substantial informational advantage, leading to superior investment performance. Our findings highlight the unexpected importance of banking relationships in municipal markets and their role in market stability and resilience.

KEYWORDS: Banking relationships, municipal bonds, financial constraints, municipal debt
JEL CLASSIFICATION: G12, G18, G21, G28, H74

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1 Introduction

Banks play a significant role in the municipal bond market, holding a substantial portion of outstanding municipal bonds in their investment portfolios. Recent literature has demonstrated a compelling link between banks' demand for municipal bonds and several important outcomes, including lower costs of capital, increased bond issuances, longer bond maturity, and improvements in local economic conditions and public service quality. However, the literature lacks granular insight into banks' specific municipal bond holdings. The effects documented in the literature are derived from comparative analyses of municipal bonds that meet specific bank investment eligibility criteria against those that do not. These studies lack precise data on which bonds banks hold in their portfolios. This limitation creates a potential gap between the assumed and actual bank holdings, constraining researchers' ability to fully explore the factors influencing banks' municipal bond purchase decisions and the mechanisms driving banks' influence on municipalities.

This paper provides the first detailed examination of the internal composition of banks' municipal bond portfolios. We leverage a unique and comprehensive regulatory dataset from the Federal Reserve's Y-14Q collection, offering unprecedented visibility into the municipal bond holdings of the largest U.S. banks and loan-level data on bank lending to state and local governments. The Fed's Y-14Q data, primarily used for stress testing, allows us to analyze banks' municipal bond purchasing decisions and explore their implications for issuers, investors, and the broader financial ecosystem.

Our study of banks' municipal bond-holding decisions and their impact on municipalities draws lessons from a substantial body of literature examining bank–firm relationships. Extensive research demonstrates that banks can reduce lending costs for small firms by leveraging proximity, relationships, and superior information gathering and processing capabilities (e.g., Berger and Udell (1992, 1995, 2006), Petersen and Rajan (1994, 1995)). Recent studies further highlight the enhanced importance of these relationships during periods of financial crisis (Bolton, Freixas, Gambacorta, and Mistrulli (2016)).

While the corporate relationship banking literature offers valuable insights, it is premature to assume these findings translate seamlessly to bank relationships in the municipal bond market. Two fundamental differences challenge such direct comparisons. First, the public

nature of municipal bonds contrasts the private small business loans typically studied in relationship banking literature. This public trading environment potentially undermines banks' ability to extract surplus from issuers, a key feature of relationship-based corporate lending. Second, municipal issuers often enjoy implicit guarantees from higher levels of government, effectively positioning them as larger, safer borrowers. This enhanced creditworthiness may significantly reduce the impact of relationship lending typically observed with smaller, riskier corporate borrowers. These distinctive features of the municipal bond market suggest that the benefits of relationship lending—well-documented in corporate finance—may not matter to the same extent or manifest at all in municipal finance.

We start our analysis by offering novel evidence of the importance of banks from the perspective of the stability and resilience of municipal bond markets. Banks currently hold approximately 20% of the total municipal bonds outstanding. Our analysis reveals that banks purchase a substantial portion of the issuances they retain in their balance sheets——approximately 60 percent. Banks also present a prolonged holding period for these bonds, maintaining a comparable share in their portfolio even five years post-issuance. This strong influence positions banks as key players in the market's stability, wielding significant impact through their substantial holdings and potential shifts in demand for newly issued bonds.

Our findings highlight the crucial role of relationships in banks' municipal bond investment decisions. We investigate the determinants of banks' municipal bond holdings using linear probability models. Our dependent variable is an indicator for bank bond purchase, regressed on various bond characteristics. The analysis incorporates an extensive set of fixed effects to enhance comparability between bank-held and non-bank-held bonds, including rating times year-quarter and state times year-quarter times issuer-type fixed effects. This approach allows us to interpret our estimates as the differences in the probability of banks holding two bonds with similar characteristics (same type, state, in the same year, and with the same rating). We find that underwriting experience and previous holding relationships significantly increase the likelihood of a bank holding a bond.

Issuer quality and regulations also significantly influence banks' decisions to purchase bonds. We show that banks tend to favor bonds from larger issuances, with longer maturities, and higher credit ratings in their municipal portfolios. Additionally, banks are more inclined to hold bank-

qualified bonds that offer higher tax exemptions.[1] Moreover, municipal bonds designated as High-Quality Liquid Assets (HQLA) for capital requirement purposes are prominently featured in banks' portfolios due to regulatory considerations.

However, relationships reduce the importance of issuer quality and regulatory constraints in banks' decision to hold a bond. We examine how relationships interact with the other factors banks consider when acquiring bonds. We investigate whether relationships make banks more lenient in these criteria. Banks with strong issuer relationships may be more willing to invest in lower-quality bonds, possibly due to better information and monitoring capabilities. Alternatively, relationships might not significantly impact arm's length transactions with market-determined prices, where banks cannot extract special benefits from issuers. We find that after interacting with banking relationships, issuer quality and regulation no longer significantly influence banks' decisions to purchase bonds.

While our analysis employs a stringent specification with granular fixed effects, unobserved factors could still account for this observed relationship. A key challenge is the possibility of unobserved factors influencing the observed relationship between banks and bond issuers. Specifically, the process of bank-issuer matching may be endogenous: banks might possess information not captured in our data that simultaneously increases their likelihood of forming a relationship with an issuer and holding that issuer's bonds. In such cases, banks would maintain these bond holdings regardless of the relationship's existence. This scenario introduces a potential bias in our estimates, complicating our ability to distinguish the true impact of relationships from the underlying attractiveness of the issuer.

To address the endogeneity challenge and provide causal evidence of the influence of banking relationships on municipal bond holdings, we employ an identification strategy akin to Khwaja and Mian (2008). Our approach introduces issuer-year-quarter specific fixed effects into our regressions. These specifications allow us to compare two banks considering retaining bonds from the same issuer. One of the banks has a preexisting connection with the issuer (e.g., a credit relationship), while the other lacks such a relationship. The rationale behind this approach is straightforward: if the sole determinant of the decision to hold a bond is the issuer's quality,

[1] Municipalities that issue less than $10 million in bonds within a calendar year can designate them as bank-qualified bonds. These bonds not only offer tax-exempt interest payments to banks but also allow banks to deduct 80% of the interest expenses incurred in purchasing and carrying these bonds.

we anticipate both banks to exhibit identical decisions. Otherwise, a different likelihood to hold would suggest that banking relationships play a role in these choices.

We apply our identification strategy to study the effects of regulatory shifts on municipal bond holdings. Specifically, we consider the 2015:Q2 amendment in the High-Quality Liquid Assets (HQLA) eligibility criteria, which is known to have had a notable impact on banks' municipal bond holdings (Yi (2021)). The Liquidity Coverage Ratio (LCR) rule, implemented as part of post-Global Financial Crisis reforms, aimed to bolster short-term liquidity in the banking sector. Banks must maintain a reserve of HQLAs exceeding projected cash outflows over a 30-day stress scenario. Municipal securities were initially excluded from HQLA classification. An amendment in 2015 allowed some higher-quality municipal bonds to qualify as HQLA, significantly increasing banks' demand for municipal bonds. We explore the differential behavior of banks with and without a relationship to this change in HQLA criteria to identify the effects of relationships on banks' municipal bond holdings.

Our findings highlight the substantial influence of relationships on a bank's bond-holding decisions. We find that banks with existing relationships with bond issuers tend to purchase substantially larger amounts of those bonds than banks without such connections. Following the reclassification of municipal bonds as High-Quality Liquid Assets (HQLA), banks with underwriting ties to an issuer increased their holdings of that issuer's municipal bonds by approximately 40% more than banks without such relationships. The impact is even stronger for credit relationships. After the HQLA reclassification, banks with credit ties to an issuer increased their holdings of that issuer's municipal bonds by 60% to 70% more than banks without these relationships.

Our dataset enables banks to differentiate between bonds categorized as "Available-for-Sale" (AFS) and "Hold-to-Maturity" (HTM). This distinction is important due to significant accounting implications (e.g., Flannery and Sorescu (2023)). AFS bonds require constant mark-to-market adjustments, whereas HTM bonds only need remarking if banks change their status to AFS. For instance, if interest rates rise and bond values decrease, banks only recognize losses on HTM bonds if their status is changed. Thus, banks have strong incentives to classify bonds as HTM only if they plan to hold them for a long period, indicating a stronger commitment to those bonds.

We revisit our identification strategy, now evaluating the banks' decision to classify bonds as HTM following the HQLA. We find that banks with credit relationships mark approximately

1.6 times more connected municipal bonds as HTM than banks lacking these relationships after HQLA. The underwriter relationship does not impact the banks' decision to hold a bond to maturity. When a bank serves solely as an underwriter, most of its information gathering occurs before the issuance, and it has weaker incentives to monitor the issuer post-issuance (Butler (2008)). Conversely, when banks have a lending relationship, they have more incentives to monitor these issuers, thereby continuously improving their information sets. Our results are stronger for credit relationships, supporting the interpretation that lending relationships enhance investment decisions by providing valuable issuer information.

Banks can derive various benefits from their municipal bond holdings, both indirectly and directly. A key advantage of these relationships is the potential for banks to leverage additional information gained through their interactions with issuers. This informational edge could allow banks to more accurately price bond issuances and identify undervalued opportunities. To test this hypothesis, we analyze the buy-and-hold returns of banks' municipal bond holdings, comparing bonds from issuers with which the bank has a relationship to those without such connections.

Our findings reveal a significant performance difference: bonds associated with a credit relationship have a 30% higher return than similar bonds without such a relationship. Our regressions include rating-by-year-quarter fixed effects and issuer-type-by-year-quarter fixed effects. Our results should be interpreted as the differences in returns of bonds of the same type and rating within the same time period, isolating the impact of the credit relationship on returns. These results suggest that banks' relationships with issuers provide them with valuable insights that translate into superior investment performance.

We finalize our analysis by investigating whether bank relationships have discernible consequences for municipal bond issuers. At first glance, one might assume that large issuers, such as states and major cities, should be unaffected by banking relationships. They benefit from a strong market reputation, high credit quality, stable revenue streams, and implicit guarantees from the federal government. Furthermore, they often employ a competitive issuance process where relationships may hold less sway compared to competitive pricing and effective bond marketing.

However, it is also essential to consider how banking relationships may affect these issuers. Over time, such relationships can offer several advantages. Issuers may benefit from preferred access to capital, more favorable financing terms, lower borrowing costs, market

insights, streamlined issuance processes, and risk mitigation (Bolton, Freixas, Gambacorta, and Mistrulli (2016)). These relationships instill confidence among investors and provide customized financial solutions, enhancing issuer flexibility. While our issuers are generally robust, these potential benefits underscore the need to explore whether these dynamics leave discernible marks on the municipal bond market.

We show that bank relationships enhance bond issuance characteristics in good and bad times. We first revisit the 2015:Q2 HQLA eligibility change as a positive shock to municipal bond demand. After the regulatory change, offer yields of bonds issued by bank-connected issuers declined relative to non-connected issuers, showing that bank relationships affect the cost of debt in good times.

We then examine whether banking relationships act as a stabilizer in adverse times. We explore the Global Financial Crisis (GFC) as a backdrop for this investigation, as its severity challenged even robust issuers. This setting allows us to examine the importance of banking relationships in distressed times. For the subset of bonds in our sample issued during the GFC, we find that issuers with established banking credit relationships issued bonds at yields approximately 3 basis points lower during the crisis, highlighting the favorable cost of capital. Intriguingly, in non-crisis periods, issuers with credit relationships tend to have higher yields around 2 basis points, indicating a potential trade-off between economic conditions. Our results suggest that banks are more likely to retain bonds from issuers with whom they have established relationships in normal times and financial crises. These findings suggest that banking relationships can grant issuers favorable financing terms during economic turmoil, and banks are more inclined to support these entities. Despite the potential trade-offs in non-crisis periods, these relationships can play an important role in stabilizing the municipal bond market in times of high distress.

Our paper is closest to the literature exploring bank holdings' effects on municipal financing (Bergstresser and Orr (2014); Cortes, Cunha, and Barbosa (2023)). Dagostino (2022) and Yi (2021) exploit variation in bank holdings stemming from regulatory constraints. They find that an increase in bank demand for municipal bonds affects issuers through lower cost of capital, more issuance, improvements in local economic conditions, and higher-quality provision of public goods. Garrett and Ivanov (2022) show that laws prohibiting issuers from contracting with banks with certain ESG policies increased municipal borrowing costs in Texas. Other studies show the di-

rect influence of banks in the municipal issuance process through their underwriting and lending activities (Garrett (2021) and Ivanov and Zimmermann (2021)). Our paper adds to the existing literature by introducing a novel dataset that provides unprecedented granularity regarding banks' holdings of municipal bonds. Unlike previous studies that relied on indirect evidence, our work offers a unique opportunity to observe the specific bonds held by banks directly. Our findings shed light on the critical role of banking relationships in influencing a bank's decision to hold a bond, which is particularly surprising in the context of arm's length transactions.

We also contribute to the literature on the effects of banking relationships in alleviating financial constraints. There is abundant evidence that having a banking relationship can reduce lending costs for firms (e.g., Berger and Udell (1992, 1995, 2006), Petersen and Rajan (1994, 1995), and Bolton, Freixas, Gambacorta, and Mistrulli (2016)). Butler (2008) shows that municipal bond issuers closer to their underwriter pay lower fees and enjoy lower yields in their issuances. Adelino, Cheong, Choi, and Oh (2021) show that relationships between the municipal bond issuer, underwriter, and mutual fund play a crucial role in mediating mutual funds' demand for municipal bonds. This paper provides two significant contributions relative to the literature on relationship banking. First, it reveals the surprising importance of relationships in municipal bond issuances, a domain traditionally characterized by large-scale issuers with strong market reputations. Second, it breaks away from the prevailing focus on bank loans, exploring the impact of relationships on bond issuances, where market prices play a more pronounced role, and banks are conventionally thought to derive fewer benefits from their relationships with issuers.

Our results also inform the policy debate on the stability of large-scale asset markets. As a response to the COVID–19 crisis, the Fed intervened for the first time in history in municipal bond markets by directly purchasing munis to support the flow of credit and liquidity to state and local governments through the Municipal Liquidity Facility (e.g., Bordo and Duca (2021); O'Hara and Zhou (2023)). These actions highlight the importance of understanding the conditions that foster stability in this market during times of distress. Our paper shows the role of banks in sustaining issuers they are connected with through their bond-holding decisions. Our results add to a growing body of evidence indicating that the participation of banks in this market could increase its resilience.

2 Data and Sample Characterization

We now describe the various sources of data used in our tests. For brevity, all variables and their detailed definitions are in Appendix A.

The Federal Reserve's Y-14Q Municipal Bond Holdings Data. Our main dataset is the Y-14Q data collected from Bank Holding Companies (BHC) for the Federal Reserve's Comprehensive Capital Analysis and Review (CCAR) process. Specifically, we use the Securities Schedule (B.1), which contains a BHC's data for individual securities that are held-to-maturity (HTM) or available-for-sale (AFS). The BHC securities positions are reported at the CUSIP level each quarter as amortized cost, market value, current face value, and original face value. We also observe the date the security was purchased and book yield, defined in Appendix A. Although there is no material threshold for securities reporting at the individual borrower level, BHCs must provide information on their securities holdings if the entire portfolio is greater than either $5 billion or five percent of Tier 1 capital on average for the four quarters preceding the reporting quarter (Caglio, Darst, and Parolin (2019)).

The reporting period of the holdings data is from 2014 to 2022, i.e., banks report their entire securities holdings from 2014:Q2 onwards in our sample. However, a crucial feature of the Y-14Q data is that it allows us to observe securities purchased as far back as 2000. Consequently, we can use the purchase date to attribute a significant share of banks' holdings from circa 2010 onwards since many bonds are held for over 5 years. We exploit this information in several of our formal tests.

For each holding in a bank's securities portfolio, we can observe whether it is a municipal bond or another asset class.[2] We also observe if the muni is a revenue or general obligation bond, along with secondary details, which we report in subsequent sections.

The Federal Reserve's H.1 Corporate Loan Schedule. We use the Corporate Loan Schedule (H.1) from the Y-14Q. The H.1 dataset provides granular borrower and loan-level information on all credit facilities with over $ 1 million in the committed amount held by BHCs.

[2]Securities other than municipal bonds held by banks include Agency MBS, Treasuries, Collateralized Debt Obligations, Collateralized Loan Obligations, etc. For details, see Krainer and Paul (2023).

It covers nearly 75% of total U.S. commercial and industrial (C&I) lending (e.g., Favara, Ivanov, and Rezende (2021)) and has been widely used in prior studies (e.g., Chodorow-Reich, Darmouni, Luck, and Plosser (2022), Haque, Jang, and Mayer (2022)). We use the H.1 data to identify loans made by U.S. banks to municipalities, which allows us to define issuers with a credit relationship with their banks.

Municipal Bond Issue and Issuer Fundamentals. Finally, using the CUSIP identifier of each bond, we merge the securities schedule with municipal bond market data from the Ipreo/i-Deal new issues database. Ipreo/i-Deal covers the universe of municipal bond issuances and has been used in several articles, including Adelino, Cunha, and Ferreira (2017), Cornaggia, Cornaggia, and Israelsen (2018), Dagostino (2022), and Cortes, Cunha, and Barbosa (2023), among others. The dataset contains information on bond size, offering type, type of bid, underwriter, sale date, dated date, and maturity date, as well as coupon value, yield, and ratings from S&P, Moody's, and Fitch. Beyond using the bond fundamentals in our empirical tests, the Ipreo data is critical for identifying the underwriting relationship between a bank and an issuer.

Summary Statistics. Our combined dataset has nearly 500,000 bank-security-quarter observations of municipal bond holdings containing detailed issuance-level data with a reporting sample from 2014 to 2022. We observe 40,063 distinct municipal bonds in the cross-section with 6,494 unique issuers. This sample of bond issuers comprises 1,049 counties, and there are between 15,000 and 20,000 unique municipal bond holdings in any given year.

We begin our data exploration by documenting novel facts that motivate our empirical analysis. The Y-14 banks currently hold about 20% of the total municipal bonds outstanding held by banks in general, as reported by the Federal Reserve's Flow of Funds. Figure 1 shows that banks in our sample held, on average, about 30% of the total bank muni holdings. Specifically, the figure illustrates that, over the last decade, Y-14 banks consistently maintained a significant portion of banks' total municipal bond holdings. Their share never fell below one-fifth of the market. This substantial and persistent representation ensures that our sample reflects broader trends in the role of banks in the municipal bond market,

[INSERT FIGURE 1 ABOUT HERE]

We start our analysis of banks' municipal bond purchase behavior by exploring the size of their trades relative to the total amount issued. Figure 2 shows the evolution of ratio of the current amount held by banks to the total amount issued by the municipality under the respective CUSIP number during the quarters following the bond's sale date.[3] The chart plots the ratio for all bonds (dark gray) and those that banks mark as AFS (light gray), which can be sold before maturity.[4]

[INSERT FIGURE 2 ABOUT HERE]

Figure 2 shows that for the set of bonds that banks retain, they acquire around 60 percent of the total amount issued for that term. Banks tend to keep these bonds for an extended period, and our observation reveals that they maintain a consistent fraction of the issuance even eight years after the initial issuance. We also note that banks divest a portion of bonds categorized as Available for Sale (AFS). However, even for those bonds designated for potential sale, banks retain approximately 50 percent of the total amount issued as of the eighth year. These patterns confirm that banks are the largest holders of the bonds they choose to hold on their balance sheets.

[INSERT TABLE 1 ABOUT HERE]

Table 1 presents summary statistics for municipal bonds held by banks at the bond-bank-quarter level. Panel A uses the full matched sample at the Bank-Bond-Quarter level. The average market value of a bank's municipal bond holdings is $6.8 million, with a book yield of 3.2% and a credit rating close to *Aa2* in the Moody's scale. Panel B presents the holdings at the issuance level, the sample we rely on for most of our analysis. The panel shows that banks hold fairly long-maturity municipal bonds with maturity averaging 12.6 years, offer a yield of 2.6 percent, and a numerical credit rating of 19.6, closest to a *Aa2* in Moody's scale.

We also explore the differences in the holdings labeled available-for-sale and hold-to-maturity. Panels C and D then split the sample into bonds that banks mark as Hold-to-Maturity, where such acquisitions are recorded at purchasing cost, and those they mark as Available-for-Sale are marked to current market prices. We observe that, relative to AFS holdings, HTM holdings have

[3] To ensure a fairly balanced panel, we choose a time horizon of 30 quarters post-sale since the sample period spans approximately 32 quarters (eight years).

[4] By definition, Schedule B.1 in the Y-14Q data will only capture bonds that banks intend to hold over a long period and will not capture bonds that banks choose to hold for short-term resale purposes.

longer maturities, higher offer yields, and better credit ratings. The median credit rating of an HTM municipal bond is *Aa1*, while that of AFS is *Aa2*.

Banks in our sample typically lend to the largest municipal bond issuers. In Panel E of Table 1, we observe the characteristics of bonds *not held* by banks using the unmatched sample from the Ipreo dataset. Comparing the distribution of the term amount or amount in Panel B with those in Panel E, we see that banks hold bonds of relatively larger issuers. For example, the mean and median term amounts in Panel B are $ 15.3 and 2.1 million, respectively, while the same in Panel E are only $ 2.4 and 0.6 million, respectively. Thus, the mean bond size of an issue that banks hold is around 7 times larger than issues not held by banks.

[INSERT FIGURE 3 ABOUT HERE]

We find evidence consistent with large banks matching with large issuers when we list the banks' top holdings by size and by the amount held. In Panel A of Figure 3, we plot the top municipal bond issuers that banks hold as ranked by their total issuance. We identify the top issuers over the entire sample period collapsed at the issuer-year level and see that large banks in the U.S. tend to hold bonds of large issuers on average, such as highly populated states and cities. The largest issuer is the State of California. We also see New York City, a historically significant issuer by economic size, as one of the top issuers above many states.

We observe a significant overlap of the largest issuers in our sample with the largest holdings of the Y-14 banks. In Panel B of Figure 3, we plot the largest holdings of the Y-14 banks. We show that six of the top holdings are among the largest issuers in our sample. Analyzing both panels, we can also observe that Y-14 banks hold a significant portion of the amount issued by large issuers. Notably, the State of Washington exhibits a remarkably high concentration of its bonds in Y-14 bank holdings. Of its $1.04 billion average annual issuance, approximately $0.63 billion, or about 60.6%, is held by Y-14 banks. Similarly, the Commonwealth of Massachusetts demonstrates a substantial presence in Y-14 bank portfolios, with $0.55 billion of its $1.48 billion issuance, or roughly 37.2%, held by these institutions. The pattern of solid ties between large banks and the largest borrowers has also been observed in the corporate loan market (e.g., Chodorow-Reich, Darmouni, Luck, and Plosser (2022)) and has implications for financial stability and overall bond market liquidity.

[INSERT TABLE 2 ABOUT HERE]

Table 2 collapses the matched sample at the issuer-type level, showing that almost half (46%) of the holdings (as a share of term amount) come from states. Noteworthy groups reaching more than 10% shares are Cities (17%), Other Entities (13%), and School Districts (10%). This is again consistent with large banks matching with the largest issuers.

We now analyze time-series variation in the bond holdings of banks. Figure 4 compares the book yields for municipal and non-municipal bond holdings over time. Looking at the median yields in Panel A, we see that the trend in book yield for municipal bonds consistently exhibits lower yield values compared to non-municipal holdings, underscoring the tax-exempt advantage of municipal bonds. However, this pattern changes when looking at value-weighted averages in Panel B.

[INSERT FIGURE 4 ABOUT HERE]

We find that the maturities of municipal bond holdings are long, which could be a reason for higher yields in value-weighted municipal bonds over other asset classes. The maturities of municipal bonds of different sizes (i.e., term amounts) depicted in Figure 5 confirm this insight. The figure distinguishes between small and large bonds according to their market value. Bonds with larger denominations tend to have longer maturities, which observation aligns with the risk-return trade-off, where larger bonds, typically issued by more established entities, offer longer maturities.

[INSERT FIGURE 5 ABOUT HERE]

Interestingly, Figure 6 contrasts the maturity distributions based on bank size, revealing that larger banks tend to hold bonds with longer maturities. This difference in investment strategy could be attributed to larger banks' capacity to manage long-term risks. This is consistent with a secular trend documented in Cortes, Cunha, and Barbosa (2023) that banks tend to hold bonds with longer maturities, impacting the aggregate maturity observed in municipal securities.

[INSERT FIGURE 6 ABOUT HERE]

3 The Determinants of Banks' Municipal Bond Holdings

We employ a regression framework incorporating various combinations of time, issuer-type, issuer-state, and rating-time fixed effects to formally examine the determinants of banks' municipal bond holdings. We estimate the following linear probability model specifications:

$$\begin{aligned}\mathbb{1}\{Purchase_{b,i,j,t}\} = \mathbf{\Gamma}_1' \cdot Bank\ Relationships_{b,i,j,t} + \mathbf{\Gamma}_2' \cdot Characteristics_{b,i,j,t} + \mathbf{\Gamma}_3' \cdot Regulation_{b,i,j,t} + \\ + \lambda_{rating,t} + \lambda_{state,type,t} + \epsilon_{b,i,j,t},\end{aligned} \tag{1}$$

where $\mathbb{1}\{Purchase\}$ is an indicator taking value one if bond b from issuer i is acquired by bank j at year-quarter t, and zero otherwise.

Our study of banks' municipal bond-holding decisions and their impact on municipalities draws upon a substantial body of literature examining bank-corporate relationships. Extensive research demonstrates that banks can reduce lending costs for small firms by leveraging proximity, relationships, and superior information gathering and processing capabilities (e.g., Berger and Udell (1992, 1995, 2006), Petersen and Rajan (1994, 1995)). Recent studies further highlight the enhanced importance of these relationships during crises (Bolton, Freixas, Gambacorta, and Mistrulli (2016)). We therefore include *Bank Relationships*, a vector of indicators for each type of relationship an issuer has with its banks (Underwriter, Credit Relationship, and Repeat-Holder). *Underwriter* equals one if the bank is part of the underwriting syndicate in the bond's primary market issuance, zero otherwise. *Credit Relationship* equals one if the bank has an outstanding loan balance with the issuer, zero otherwise. Finally, *Repeat-Holder* equals one if the bank previously held bonds of the issuer.

We also study how other characteristics relate to the bank's decision to hold a municipal bond. *Characteristics* is a vector of characteristics for a given bond observed at sale date t. These include the bond's term amount, offer yield, maturity, an indicator variable for high rating (above median), and an indicator for whether it is insured. *Regulation* is a set of indicator variables related to regulatory requirements. These include indicator variables for whether the bond is bank-qualified (if the local government issues a total amount below $10 million per year) and if it satisfies the HQLA criteria (i.e., a general obligation bond with an investment-grade rating).

To absorb time-invariant unobserved issuer-specific factors, our baseline specification includes *Credit Rating* $\times$ *Year-Quarter* ($\lambda_{rating,t}$) fixed effects; and *State* $\times$ *Issuer-Type* $\times$ *Year-Quarter* ($\lambda_{state,type,t}$) fixed effects.[5] Standard errors are double-clustered at the state and (sale date) year-quarter level.

Table 3 reports estimates of Equation (1). Our results indicate that if a bond is actively held in the bank's book, there is a 40 percent probability that the bank was the underwriter for that bond. This effect is considerably stronger *vis-à-vis* all other determinants. If a bank has held a bond issued by a given issuer in the past, it is highly likely to hold a bond by the same issuer again.

[INSERT TABLE 3 ABOUT HERE]

When we explore other characteristics that correlate with banks' decision to hold bonds, we show that banks hold larger bonds, with longer maturities and high credit ratings, that are insured. Regulation also plays an important role in the bank's decision to buy and hold a municipal bond. Our regressions show that banks prefer bonds that qualify as High-Quality Liquid Assets or Bank-Qualified for tax-exemption purposes.

4 The Effects of Relationships on Banks Bond Holdings

The evidence above suggests that banks prefer municipal bonds with high-quality attributes, such as high credit ratings and longer maturities. Additionally, we highlighted the significant role of regulatory factors in shaping banks' investment decisions in the municipal bond market. In this section, we further explore how banking relationships interact with the banks' preference for issuer quality and regulation compliance. Understanding how these factors interact will allow us to discern whether relationships actively shape, moderate, or even override the influence of issuer quality and regulatory constraints.

Strong banking relationships can lead to a reduced sensitivity to the quality and regulatory constraints of the bonds. Banks with long-standing relationships with municipal issuers may be more willing to invest in bonds issued by these entities, even when they do not meet the strin-

[5] We also show results for several combinations of less restrictive fixed effects: *Year-Quarter* fixed effects (λ_t) corresponding to the date of the bond sale to capture aggregate conditions that could be correlated with the decision to buy a municipal bond; *Issuer-Type* (λ_{type}); and *State* (λ_{state}).

gent criteria. For instance, when the bank has a credit relationship with the issuer, it is already incentivized to monitor the borrower continuously. The additional information may help them correctly price the bonds of these issuers and identify better opportunities.

Conversely, it is also conceivable that banking relationships should not significantly influence investment decisions, mainly when bonds are acquired through open-market transactions. These are arm's length transactions involving market-determined prices. Therefore, banks may be unable to extract any rents from the relationship. Banks may prefer higher-quality bonds and comply with regulatory constraints more consistently. In such cases, the absence of rent-extraction opportunities from issuers might render relationships less influential, aligning decisions more closely with objective financial criteria.

4.1 Cross-Sectional Evidence

We start our analysis by examining cross-sectional variation incorporating interaction terms involving our relationship variables, issuer characteristics, and regulatory incentives. Table 4 presents the results from a linear probability model featuring these interactions. In columns (1) to (3), we interact the main covariates in Table 3 with an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. Underwriting relationships diminish the significance of issuer quality and regulatory constraints in determining a bank's bond-holding choices. The interaction terms display negative values larger in magnitude than the baseline estimates. These coefficients suggest that—conditional on an underwriting relationship—issuer quality and regulation no longer positively influence the banks' decisions to purchase a bond.

[INSERT TABLE 4 ABOUT HERE]

In columns (4) to (6), we interact the main covariates in Table 3 with an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. The results reveal that credit relationships do not seem to mitigate the effects of other characteristics on the banks' decisions to retain a bond in these specifications. In columns (7) to (9), we interact the main covariates in Table 3 with an indicator variable that takes the value of one if the bank previously held bonds of the issuer. Similar to the results for the underwriter

relationship, the interaction estimates are marked by their negative values and greater magnitude compared to the baseline results. The interaction estimates lead us to conclude that issuer quality and regulatory constraints do not impact the banks' decisions to retain a bond if they have previously held a bond from the same issuer.

4.2 Causal Evidence: Disentangling the Impact of Bank Relationships on Holdings

While our analysis in the previous section employs a stringent specification with granular fixed effects, unobserved factors could still account for this observed relationship. A key challenge is the possibility of unobserved factors influencing the observed relationship between banks and bond issuers. Specifically, the process of bank-issuer matching may be endogenous: banks might possess information not captured in our data that simultaneously increases their likelihood of forming a relationship with an issuer and holding that issuer's bonds. In such cases, banks would maintain these bond holdings regardless of the relationship's existence. This scenario introduces a potential bias in our estimates, complicating our ability to distinguish the true impact of relationships from the underlying attractiveness of the issuer.

To mitigate the endogeneity challenge and unravel the true causal influence of banking relationships in municipal bond holdings, we employ a strategy similar to that of Khwaja and Mian (2008). Our approach introduces issuer-year-specific fixed effects into our regressions. This is equivalent to comparing two banks deciding on the retention of bonds from the same issuer. One of these banks has a pre-existing relationship with the issuer, while the other does not. The rationale behind this approach is straightforward: if the sole determinant of the decision to hold a bond is the inherent quality of the issuer, we anticipate both banks to exhibit identical bond-holding decisions. Conversely, we should observe a distinction if banking relationships play a substantive role in these choices. Banks with established connections with the issuer are expected to be more inclined to retain these bonds, even when considering bonds from the same issuer and accounting for their quality.

4.2.1 Institutional Background: HQLA Eligibility Changes

We apply Khwaja and Mian's (2008) framework to a crucial institutional change that affected the banks' holdings of municipal bonds. A series of regulation shifts between 2014 and 2017 changed the appeal of municipal bonds to banks. Yi (2021) and Ott (2020) offer detailed explanations of the rule changes and extensively explores it to study the effects of bank demand on municipal bond issues. This section summarizes the institutional details presented in Yi (2021), focusing on the features more relevant to our analysis.

The Liquidity Coverage Ratio (LCR) rule aimed to enhance short-term liquidity in the banking sector and is part of the Basel Committee's post-Great Recession reforms. Banks must maintain a reserve of high-quality liquid assets (HQLAs) exceeding projected cash outflows over a 30-day stress scenario. The formula for the Liquidity Coverage Ratio is:

$$LCR = \frac{\textit{High-Quality Liquid Assets}}{\textit{Total Net Cash Outflow in 30 Days}} \geq 100\%. \tag{2}$$

HQLAs are assets readily convertible to cash with minimal price depreciation during financial crises. HQLAs are categorized into three levels. Level 1 HQLAs are the most liquid assets, including Treasury securities and the Federal Reserve Bank balances. Level 2A HQLAs comprise public sector securities, government-sponsored entities (e.g., Fannie Mae, Freddie Mac), and foreign sovereign securities. These assets face a 15% haircut due to higher liquidity risks than Level 1. Level 2B HQLAs consist of investment-grade corporate bonds and Russell 1000 Index equity securities, subject to a 40% haircut.

The Basel framework provides regulatory standards, enabling each member country's financial regulators to tailor rules to their banks. In 2014, U.S. regulatory authorities, including the Federal Reserve, the Office of the Comptroller of the Currency (OCC), and the Federal Deposit Insurance Corporation (FDIC), implemented a more stringent version of the LCR rule. Notably, this rule excluded municipal securities from HQLA classification, raising concerns about unintended market consequences among municipal issuers. The LCR rule does not apply universally: it impacted bank holding companies, depository institutions, and savings and loan holding companies with at least $250 billion in assets or $10 billion in (on-balance sheet) foreign exposure. For these entities, the LCR must be at least 100% with daily calculations, encompassing all banks in our study.

Our empirical design explores the amendments to the HQLA rules that affected the municipal bond market. First, on May 21, 2015, the Federal Reserve proposed including a fraction of the municipal bond market as Level 2B HQLA, effective July 1, 2016.[6] The qualification criteria were stringent: municipal bonds had to be general obligation bonds, investment-grade, from entities with a proven liquidity track record, and not exceeding 5% of a bank's HQLA. Second, in 2017, the Economic Growth, Regulatory Relief, and Consumer Protection Act (EGRRCPA) mandated all investment-grade municipal bonds as HQLA for banks. This second amendment expanded the scope of eligible municipal bonds, was adopted by all three bank regulators, and was positively received by industry experts and local governments.

4.2.2 Main Results: Within-Issuer Evidence

We use an identification strategy similar to Khwaja and Mian (2008) to disentangle the effects of bank relationships in municipal security holdings. Focusing on issuers with bonds held by multiple banks, we add *Issuer* $\times$ *Year-Quarter* fixed effects, allowing us to see the impact of an existing bank relationship on the amount held by bank j of bonds issued by issuer i at year-quarter t. Formally, we estimate the following regression:

$$\begin{aligned} \log\left(Holdings_{i,j,t}\right) = \beta_1 \cdot \left[Bank\ Relationship_{i,j} \times Post\ HQLA_t\right] \\ + \beta_2 \cdot Bank\ Relationship_{i,j} + \beta_3 \cdot \mathbf{X}_{i,j,t} + \lambda_{i,t} + \epsilon_{i,j,t}, \end{aligned} \tag{3}$$

where the dependent variable is the log of the total amount of bonds from issuer i held by bank j at year-quarter t. By design, we now aggregate our data at the issuer-bank level, resulting in a smaller sample size relative to results reported in the previous section, where the analysis was at the *bond-level* and included bonds held by other (non-Y-14) banks. Similarly to Equation (1), *Bank Relationship* is an indicator variable for each type of relationship: underwriter, credit relationship, or repeat holder. $\mathbf{X}_{i,j,t}$ is a vector of controls that includes maturity, yield, and amounts. As in Khwaja and Mian (2008), regressions include *Issuer* $\times$ *Year-Quarter* fixed effects represented by $\lambda_{i,t}$. This specification allows us to compare the bond purchasing decisions of two banks regarding

[6] For details, see the Press Release by the Federal Reserve Board on May 21, 2015.

bonds from the same issuer: one bank has a preexisting relationship with the issuer, while the other does not. Table 5 presents the results from estimating Equation (3).

[INSERT TABLE 5 ABOUT HERE]

Our findings underscore the substantial influence of relationships on a bank's bond-holding decisions. In columns (1) to (3), we show that banks with underwriter relationships increase their holdings of bonds from issuers they have a relationship with by approximately 40% more than banks without affiliations. The impact is even stronger when we use credit relationships. In columns (4) to (6), we observe that banks with a credit relationship purchase between 60% and 70% more related bonds than banks lacking this relationship. In columns (7) to (9), examining banks that previously held bonds from the same issuer does not reveal a significant relationship effect. This distinction in our findings relative to the cross-sectional evidence shows the importance of controlling for issuer quality to disentangle the impact of relationships. However, a more rigorous econometric identification comes at the cost of sample size: the Khwaja and Mian (2008) identification strategy imposes that only issuers whose bonds are held by multiple banks with varying relationship status (i.e., with and without relationship) remain in the sample. This results in a smaller sample relative to our cross-sectional tests.

Our dataset enables banks to differentiate between bonds categorized as "Available-for-Sale" (AFS) and "Hold-to-Maturity" (HTM). This distinction is important due to significant accounting implications. AFS bonds require constant mark-to-market adjustments, whereas HTM bonds only need remarking if banks change their status to AFS. For instance, if interest rates rise and bond values decrease, banks only recognize losses on HTM bonds if their status is changed. Thus, banks have strong incentives to classify bonds as HTM only if they plan to hold them for a long period, indicating a stronger commitment to those bonds.

We revisit our identification strategy akin to Khwaja and Mian (2008), now evaluating the banks' decision to classify bonds as HTM following the HQLA reclassification. This confines our sample to only issuers whose bonds are marked as HTM and have multiple bank relationship status, i.e., a subset of the restricted sample required by the Khwaja and Mian (2008) methodology. This additional restriction explains the drop in the number

of observations. Table 6 shows the importance of credit relationships in determining a bank's decision to classify a municipal bond as HTM.

[INSERT TABLE 6 ABOUT HERE]

The estimates in columns (4) to (6) suggest that banks increase their holdings marked as HTM of issuers with a credit relationship 1.6 times more than banks without these relationships following the HQLA reclassification of municipal bonds. In these tests, underwriting relationships and previous holdings do not predict significantly higher bond holdings by the bank. Our results support the interpretation that lending relationships enhance investment decisions by providing valuable issuer information. Unlike underwriting activities, lending relationships involve continuous issuer monitoring, which equips banks to better discipline issuers and make informed pricing decisions, increasing the likelihood of holding the bond.

5 Benefits for Banks

Banks can derive various benefits from holding municipal bonds issued by entities with which they have established relationships. Indirect benefits include increased revenue through expanded business opportunities, cross-selling to issuers, and enhanced issuer loyalty, potentially leading to recurring business.

A key direct advantage of these relationships is the potential for banks to leverage additional information gained through their interactions with issuers. This informational edge allows banks to more accurately price bond issuances and identify undervalued opportunities, enhancing their investment decisions.

To test this hypothesis, we analyze the buy-and-hold returns of banks' municipal bond holdings, comparing bonds from issuers with which the bank has a relationship to those without such connections. To do so, we compute a variable we defined as $Bond\ Return_{b,t}$, calculated as the change in the market value of bond b between quarters $t-1$ and t: $Bond\ Return_{b,t} = (Market\ Value_{b,t}/Market\ Value_{b,t-1}) - 1$. To exploit greater heterogeneity within the sample, we collapse this variable to the bond-year level, essentially capturing the *within-year* average return of a given bond. We then regress our relationship measure on $Bond\ Return_{b,t}$.

[INSERT TABLE 7 ABOUT HERE]

The results in Table 7 reveal a significant performance difference: bonds associated with a credit relationship have a 30% higher return than similar bonds without such a relationship. We control for *Credit Rating*$\times$ *Year-Quarter* fixed effects and *Issuer-Type* $\times$ *Year-Quarter* fixed effects in our regressions. This ensures that our estimates reflect differences in returns of bonds of the same type and rating within the same time period, isolating the impact of the credit relationship on returns. These results suggest that banks' relationships with issuers provide them with valuable insights that translate into superior investment performance.

6 Benefits for Municipal Bond Issuers

So far, we have provided evidence indicating that banking relationships significantly influence banks' decisions to hold municipal bonds. When bond issuers experience a positive demand shock—the HQLA eligibility shift boosting banks' demand for munis—banks with pre-existing relationships with the issuer demonstrate a greater propensity to purchase bonds from that issuer. However, a critical question is if these relationship dynamics have any discernible consequences for municipal bond issuers.

There are reasons to expect that a banking relationship may not affect these issuers. The entities within our sample represent large-scale issuers, encompassing states and major cities. They boast high credit quality, a strong market reputation, a consistent source of tax revenue income, and the implicit backing of the federal government. These characteristics effectively make them robust and reliable players in capital markets. Moreover, these issuers typically issue using a competitive issuance process. In such a process, relationships might carry less weight than competitive pricing and the underwriter's ability to successfully market the bonds.

However, while our study centers on large, creditworthy municipal bond issuers, there are compelling reasons to consider the potential influence of banking relationships on these entities. Banking relationships, particularly those cultivated over time, can offer several advantages to issuers. These relationships may grant issuers preferred access to capital and more favorable financing terms, thereby reducing their borrowing costs (e.g., Bolton, Freixas, Gambacorta, and Mistrulli (2016)). Banks' market knowledge and expertise can provide issuers valuable in-

sights, streamlining the issuance process and enhancing investor relations. Furthermore, strong relationships might offer risk mitigation and a safety net during market uncertainties, instilling confidence among investors. Customized financial solutions tailored to the issuer's unique needs could also emerge from such relationships, increasing issuer flexibility and access to innovative financing structures. While our issuers are generally robust, these potential benefits of banking relationships underscore the need to explore whether these dynamics leave discernible marks on the municipal bond market landscape.

This section further investigates the interaction between banking relationships and financial outcomes of municipal bond issuers. We examine whether a banking relationship bears any significant impact in the context of these large and creditworthy issuers. Our analysis aims to answer whether these issuers, typically well-positioned in the capital market, experience substantial consequences from their relationships with banks. We investigate the effect of banking relationships on muni issues by exploring two shocks—one positive and one negative—to municipal bond demand.

6.1 The Effects of Banking Relationship During Positive Shocks

We first explore the effects of proposed changes adopted in 2015 on the HQLA eligibility criteria for municipal bonds, which increased banks' demand for munis. We examine if bonds issued by issuers with preexisting relationships have lower yields and if banks are more inclined to purchase municipal bonds from their connected issuers. To do so, we estimate the following specifications for the full sample:

$$\begin{aligned} Y_{b,i,j,t} = \beta_1 \cdot [Relationship_{b,i,j,t} \times Post\ HQLA_t] \\ + \beta_2 \cdot [Relationship_{b,i,j,t}] + \mathbf{X}_{b,i,j,t} + \lambda_{type,t} + \lambda_{rating,t} + \epsilon_{b,i,j,t}, \end{aligned} \tag{4}$$

where $Y_{b,i,j,t}$ represents outcome variable of bond b, from issuer i, with a bank relationship with a Y-14 bank j, in year-quarter t. In columns (1) and (2) the outcome variable is the issuance *Offer Yield*. In columns (3) and (4) the outcome variable is an indicator variable that takes the value of one if the bank acquires the bond after the shock (*Purchase*). *Relationship* is an indica-

tor variable that equals one if a bank has either an (*i*) underwriter relationship with a given issuer, (*ii*) outstanding credit relationship with a given issuer, or (*iii*) has bought and held bonds of a given issuer in the past. *Post HQLA* is an indicator variable that takes the value of one after 2015:Q4, i.e., when all investment-grade municipal bonds began to be considered HQLA. $\mathbf{X}_{b,i,j,t}$ is a set of controls that include bond maturity, bond term amount, and dummies for high credit rating, insured, HQLA, Bank-Qualified, and General Obligation Bonds. Finally, our models incorporate *Issuer-Type* $\times$ *Year-Quarter* fixed effects ($\lambda_{type,t}$), and *Credit Rating* $\times$ *Year-Quarter* fixed effects ($\lambda_{rating,t}$). Consequently, our estimates are designed to uncover outcome differences among issuers of the same type (e.g., State, City, School District) with identical ratings within the same year. These fixed effects help mitigate concerns that unobserved issuer characteristics drive our findings. In essence, to explain our results, any unobserved characteristics must be disregarded by rating agencies when assessing issuers.

[INSERT TABLE 8 ABOUT HERE]

Table 8 reports these results. Panel A focuses on underwriter relationships. The coefficient on the *Underwriter* $\times$ *Post HQLA* interaction indicates that having an underwriting relationship is associated with lower yields upon a positive demand shock for munis. We arrive at similar conclusions in Panel B using the credit relationship indicator. Importantly, we also see a higher probability of a relationship bank purchasing and holding a given issuer's municipal bond upon a positive shock. Finally, we find similar patterns in Panel C, which uses *Repeat-Holder* as the relationship measure. Our results imply that issuers significantly benefit from banking relationships in the municipal bond market.

6.2 The Effects of Banking Relationship During Negative Shocks

Studying the importance of banks to municipal bond issuers during the Global Financial Crisis is crucial for several reasons. The crisis caused economic uncertainty, which limited the federal government's ability to aid issuers and hampered access to financing from other investors. Even robust issuers were vulnerable. This situation provided a unique opportunity to evaluate the significance of banking relationships in times of distress.

[INSERT TABLE 9 ABOUT HERE]

Table 9 analyzes the impact of banking relationships on municipal bond issuers' cost of capital and banks' bond purchase decisions during the financial crisis. Columns (1) and (2) analyze the impact on offer yields of newly issued bonds. Our estimates in panel B indicate that municipal bond issuers with established banking credit relationships were able to issue bonds at yields approximately 3 basis points lower than their counterparts without such relationships during the crisis. Our analysis extends to Underwriting relationships (Panel A) and Repeat-Holder relationships (Panel C), yielding similar results. Our estimates reveal that issuers with such relationships experience yields between 12 and 20 basis points lower during financial crises than those without these relationships. As in Table 8, our models incorporate *Issuer-Type* $\times$ *Year* fixed effects and *Credit Rating* $\times$ *Year* fixed effects, enabling us to discern differences in outcomes among issuers of the same type and with identical ratings within the same year. This approach helps alleviate concerns that unobserved disparities between issuers with and without banking relationships influence our findings in issuer characteristics.

Interestingly, the baseline estimates (*Credit Rating*) reveal that, in non-crisis periods, issuers with a credit relationship tend to have yields around 2 basis points higher. This aligns with the findings in Bolton, Freixas, Gambacorta, and Mistrulli (2016) and suggests that municipal bond issuers and banks may be engaged in a trade-off—accepting a higher yield in favorable economic conditions in exchange for a lower cost of capital during economic downturns. In columns (3) and (4), we explore banks' bond-holding behaviors. These results indicate that banks are more likely to retain bonds issued by entities with which they have established relationships during regular times and maintain this practice during financial crises.

7 Concluding Remarks

We use a comprehensive regulatory dataset from the Federal Reserve's Y-14Q collection to study the municipal bond holdings of major banks. Our study reveals the substantial impact of banking relationships on banks' municipal bond-holding decisions and their considerable consequences for municipal bond issuers. Our investigation unravels the influence of relationships in both prosperous and challenging economic conditions. During favorable times, bonds associated with lending relationships experienced increased issuance and reduced yields, indicating a favorable

cost of capital. In times of crisis, these relationships acted as a stabilizer, with issuers enjoying lower bond yields, further emphasizing their importance.

Our findings, especially in the context of arm's length transactions, highlight the unexpected influence of banking relationships on the composition of a bank's bond portfolio and municipal bond issuance. Our findings broaden the scope of research on banking relationships by shifting focus from bank loans to bond issuance, where market dynamics typically hold more sway and where the advantages of banking relationships have been less explored.

Our results also inform the policy debate on the stability of large-scale asset markets. In response to the COVID–19 crisis, the Fed intervened for the first time in history in municipal bond markets by directly purchasing munis to support the flow of credit and liquidity to state and local governments through the Municipal Liquidity Facility. These actions highlight the importance of understanding the conditions that foster stability in this market during times of distress. Our paper shows the role of banks in sustaining issuers they are connected with through their bond-holding decisions. We add to a growing body of evidence indicating that the participation of banks in this market could increase its resilience.

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Figures

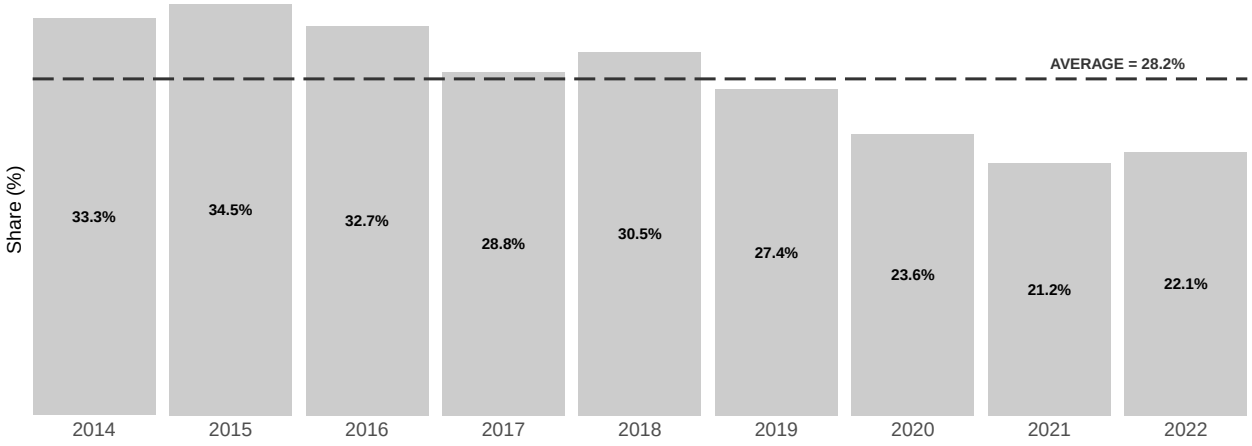

Figure 1. The Representativeness of Y-14 Banks in Municipal Bond Holdings, 2014–2022. This figure shows the annual share of municipal bond holdings by Y-14 banks relative to the total bank holdings reported in the Federal Reserve's Flow of Funds data. The bars represent the percentage for each year from 2014 to 2022.

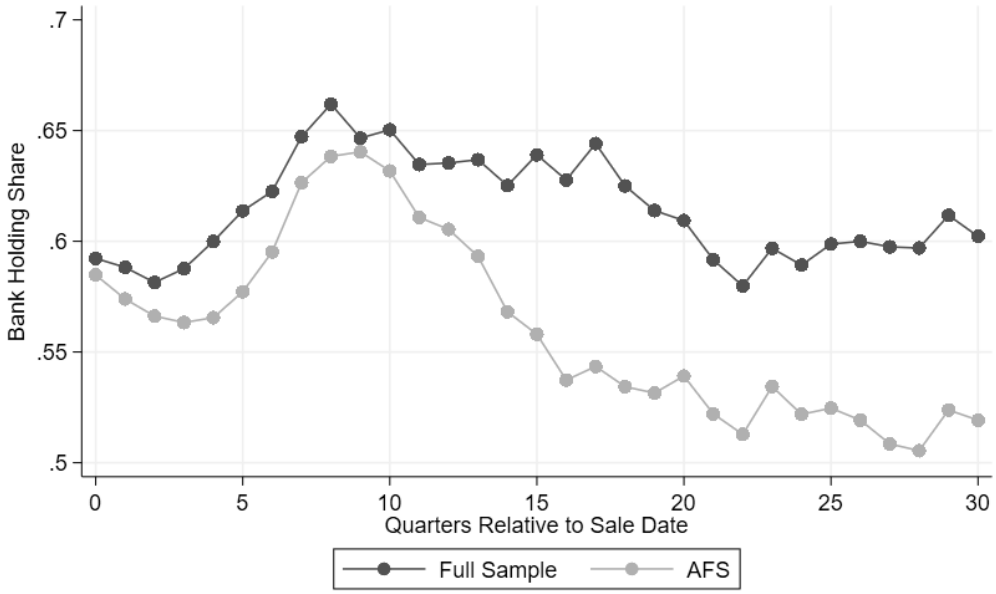

Figure 2. Bank Share over Time. This figure shows the median share of a municipal bond term amount held by Y-14 banks over time. *Bank Holding Share* is calculated as the ratio of the current amount held by banks to the total amount issued by the municipality under the respective CUSIP number. The x-axis denotes quarters relative to the sale-date quarter. The darker line captures the whole sample, while the lighter line depicts the bonds that banks mark as AFS.

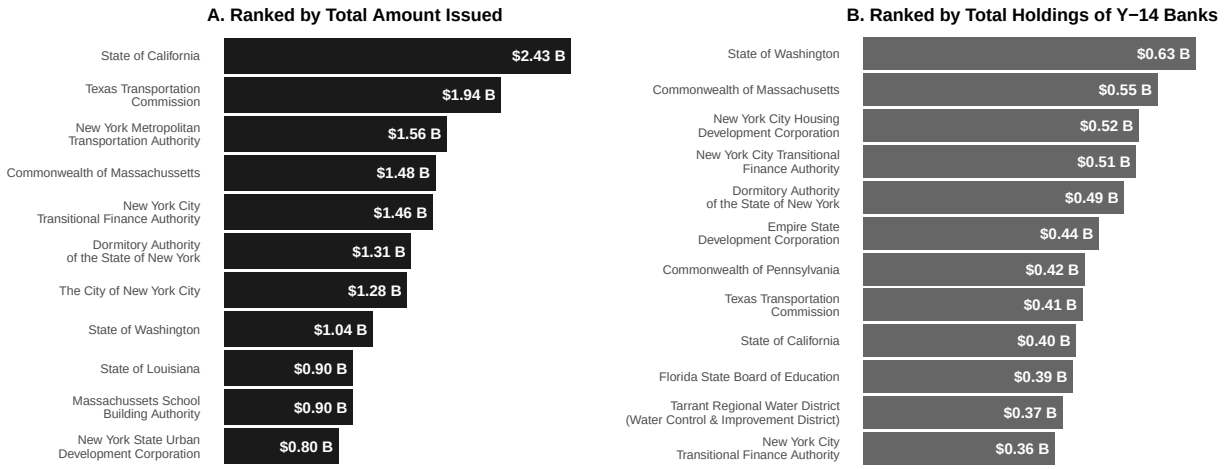

Figure 3. Top Issuers in the Matched Sample: 2014–2022. This figure shows the annual amount issued by the largest issuers in the Y-14 sample of municipal bond holdings and the largest amounts held by Y-14 banks. Panel A focuses on the largest issuers as measured by the total amount issued. Panel B ranks issuers by the total amount held by Y-14 banks.

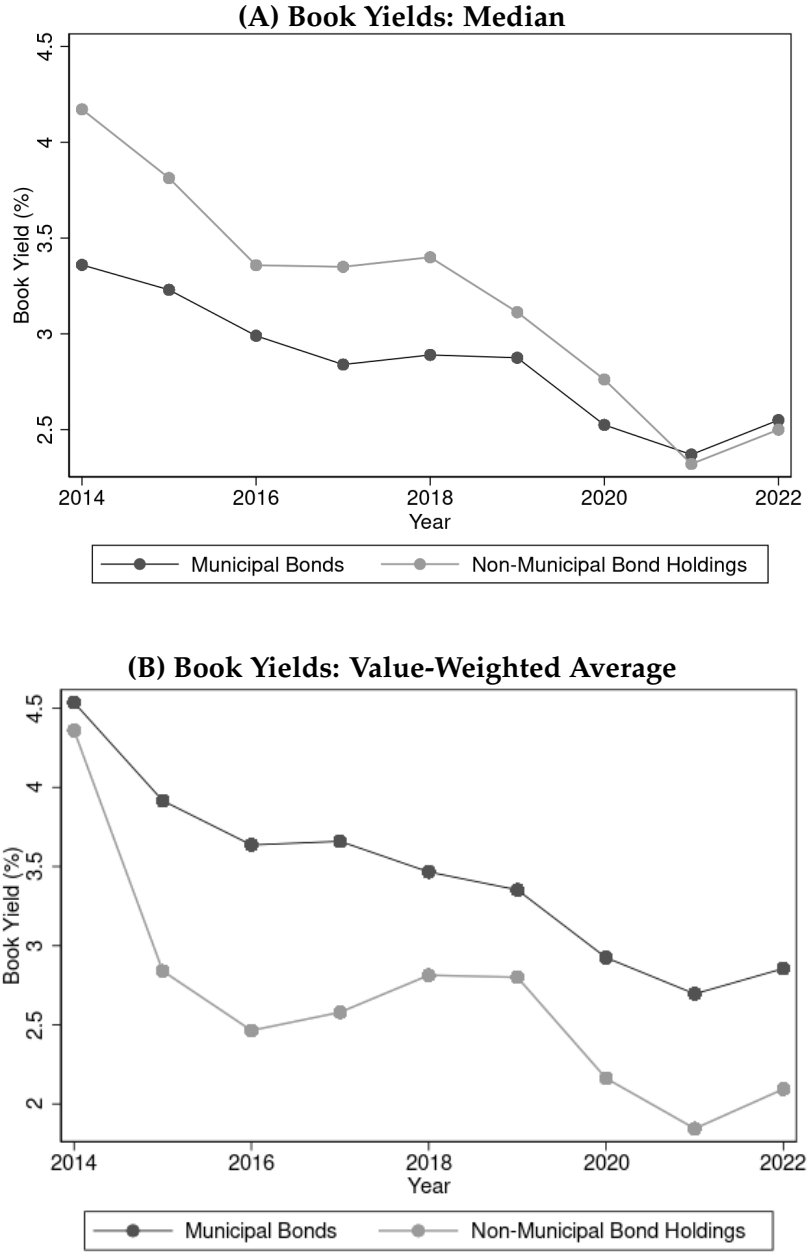

Figure 4. Trend in Book Yield: Muni vs. Non-Muni Holdings. This figure reports the book yields separately for banks' municipal bond holdings and non-municipal bond holdings over the reporting period. Panel A reports medians, and Panel B reports value-weighted means. Non-municipal bond holdings include Agency MBS, CDO, CLO, CMBS, Corporate Bonds, Sovereign Bonds, and US Treasuries. The total sample comprises approximately 1,000,000 security-year observations.

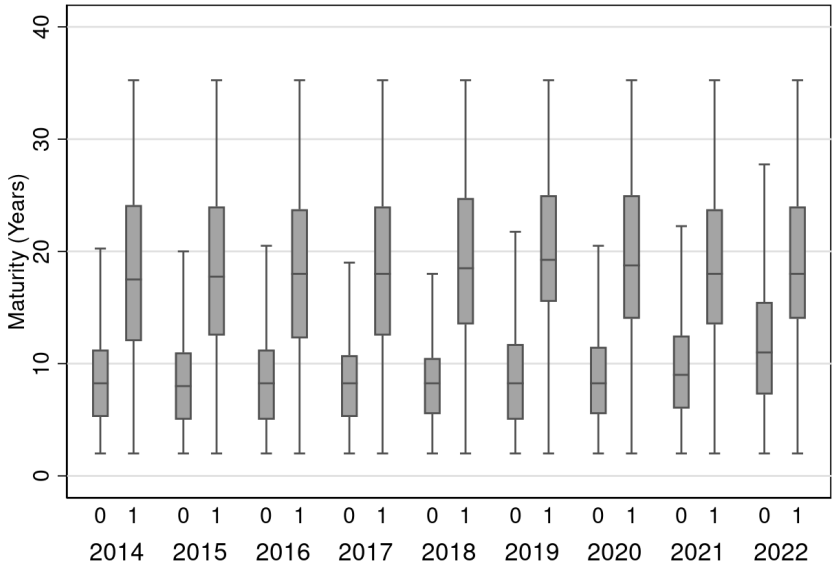

Figure 5. Large Bonds and Trend in Maturity. This figure reports box plots of maturities of banks' municipal bond holdings over the reporting period, separately for small (denoted "0" on the x-axis) and large bonds (denoted "1" on the x-axis). Large bonds are defined as an indicator taking value one if its market value exceeds the sample median. The solid area of each bar (box) represents the interquartile range (IQR) for each year. The solid line within the box is the sample median. The whiskers are the two lines outside the box that go from the minimum to the lower quartile (the start of the box) and then from the upper quartile (the end of the box) to the maximum. Outside values (outliers) are not plotted. The total sample comprises approximately 143,000 security-year observations.

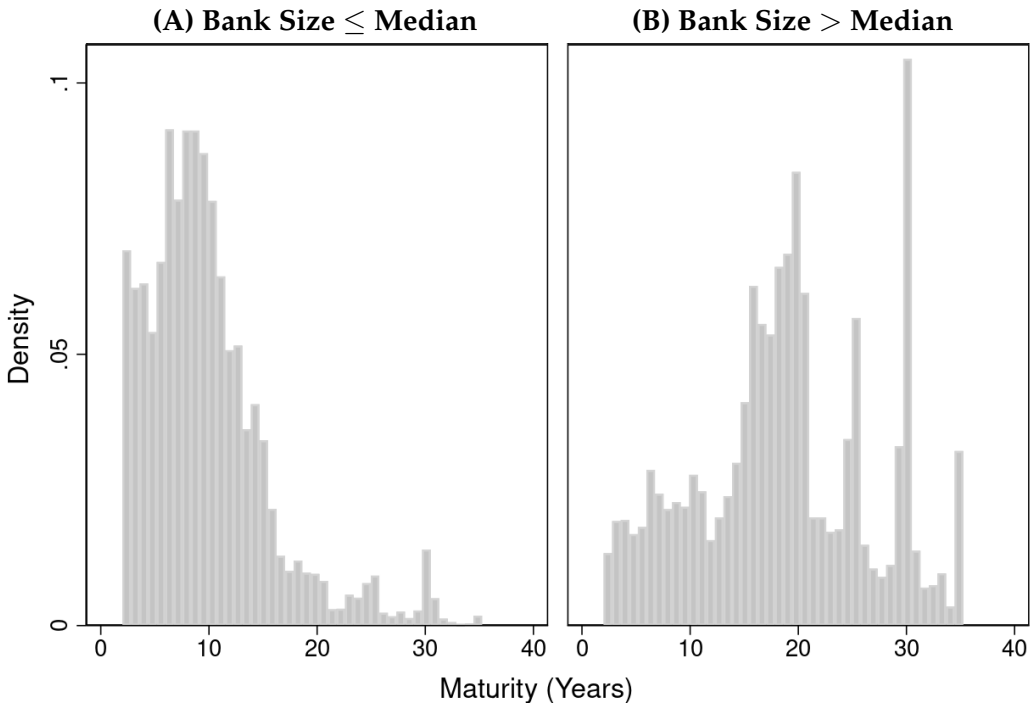

Figure 6. Maturity and Bank Size. This figure shows the distribution of maturity of municipal bonds held by Y-14 banks. The left-hand side figure presents the distributions of bonds held by small banks. The right-hand side figure presents the distribution of bonds held by large banks. Bank size is defined based on total assets: large banks have total assets above the sample median.

Tables

Table 1. Summary Statistics. This table presents summary statistics for key characteristics of banks' municipal bond holdings. Panel A presents summary statistics for the entire panel dataset, encompassing approximately 40,000 bonds across a ten-quarter time frame. Panel B highlights the characteristics of bonds at the moment of issuance within a single cross-sectional quarter of the panel. Panels C and D split the bond-bank-level data on accounting intent, i.e., whether banks intend to hold it to maturity (HTM) or make the bond available for sale (AFS). Panel E shows statistics for bonds not held by Y-14 banks. Variables definitions are in Appendix A.

A. Matched Sample at the Bank-Bond-Quarter Level	N	Mean	Median	SD	P25	P75
Current Market Value ($M)	496,280	6.8	2.4	10.1	0.5	8.7
Original Face Value ($M)	496,280	6.3	2.2	9.8	0.5	8
Book Yield: All Bonds (%)	496,280	3.2	3	1.6	2.0	4.1
Term Amount (%)	496,280	29.9	6.4	108	0.7	24
Offer Yield (%)	491,584	3	3.1	1.2	2.1	3.8
Coupon (%)	490,993	3.8	4	1.2	3.0	5
Credit Rating	470,697	19.7	20	1.6	19	21
Maturity (Years)	490,993	15.3	14.2	8.5	8.5	20.2
B. Matched Sample at the Bond-Bank Level	N	Mean	Median	SD	P25	P75
Term Amount ($M)	40,063	15.3	2.1	3.9	0.5	12.9
Offer Yield (%)	40,063	2.6	2.6	1.2	1.7	3.6
Coupon (%)	40,063	3.6	4	1.2	2.8	5
Maturity (Years)	40,063	12.6	11	7.7	6.5	17.3
Credit Rating	27,853	19.6	20	1.7	19	21
Current Market Value ($M)	40,063	4.5	1	8.5	0.4	4.8
Number of Submitted Bids	31,568	2.7	1	2.9	1	4
C. Bond-Bank Level: Hold-to-Maturity (HTM) Bonds	N	Mean	Median	SD	P25	P75
Term Amount ($M)	9,609	13.6	4.0	31.8	1.1	12.5
Offer Yield (%)	9,609	2.9	3.5	1.7	2.2	0.9
Coupon (%)	9,609	3.4	3.5	1.1	2.5	4.0
Maturity (Years)	9,609	16.7	16.3	5.7	13.2	19.2
Credit Rating	9,144	20.4	21	1.4	20	21
Current Market Value ($M)	9,609	5.6	2.1	8.9	0.8	6.4
Number of Submitted Bids	7,498	3.7	1	3.6	1	7
D. Bond-Bank Level: Available-for-Sale (AFS) Bonds	N	Mean	Median	SD	P25	P75
Term Amount ($M)	30,377	15.9	1.4	40.3	0.4	13
Offer Yield (%)	30,377	2.6	2.4	1.3	1.5	3.7
Coupon (%)	30,377	3.7	4	1.2	3	5
Maturity (Years)	30,377	11.3	9	7.8	5.5	14.8
Credit Rating	27,709	19.4	20	1.8	18	21
Current Market Value ($M)	30,392	4.1	0.7	8.3	0.3	3.9
Number of Submitted Bids	24,070	2.3	1	2.61	1	2
E. Bond-Bank Level: Bonds Not Held By Y-14 Banks	N (Million)	Mean	Median	SD	P25	P75
Term Amount ($M)	1.428	2.4	0.6	5.6	0.5	1.8
Offer Yield (%)	1.4	2.1	2.1	1.1	1.4	2.9
Coupon (%)	1.4	3.3	3	1.3	1.9	4
Maturity (Years)	1.4	9.4	8.3	6.4	5.5	12.3
Credit Rating	1.2	18.9	19	2	18	20
Number of Submitted Bids	1.3	2.7	1	2.7	1	4

Table 2. Issuer Types Characteristics of BHC Muni Holdings. This table presents bond characteristics categorized by issuer type. The sample comprises 40,063 distinct CUSIP-9 identifiers. Share is the percentage of a bank's total municipal holdings allocated to a particular issuer type. Market Value is reported by banks in the Schedule B.

Issuer Type	Share (% of Term Amount)	Market Value ($M)	Offer Yield (%)	Maturity (Years)	Credit Rating
State	0.46	9.22	3.02	16.44	20.3
City	0.17	2.53	2.45	10.81	19.7
Other	0.13	5.26	2.86	13.04	19.3
School District	0.10	2.77	2.52	11.28	19.1
County	0.07	4.43	2.54	12.85	20.1
Colleges/Universities	0.04	9.02	2.95	17.00	20.2
City and County	0.03	10.24	2.92	16.07	19.6
Special Districts	0.00	0.99	2.69	9.50	18.1

Table 3. Linear Probability Models of Municipal Bond Purchase. This table reports OLS estimates of a linear probability model where the dependent variable is an indicator variable, which takes value one if a given municipal bond is acquired and held in the securities portfolio of a Y-14 Bank. Standard errors clustered at the state and (sale date) year-quarter level are reported in parentheses. Statistical significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

	Dependent Variable: $\mathbb{1}\{Purchase\}$				
	(1)	(2)	(3)	(4)	(5)
Bank Relationships					
Underwriter	0.385***	0.394***	0.385***	0.386***	0.380***
	(0.033)	(0.032)	(0.033)	(0.033)	(0.032)
Credit Relationship	-0.001*	-0.002***	-0.001**	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Repeat-Holder	0.934***	0.927***	0.932***	0.931***	0.931***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Bond Characteristics					
Term Amount	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Maturity	0.003***	0.003***	0.003***	0.003***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Yield	-0.001	0.000	0.001	0.000	0.000
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Insured	0.002**	0.005***	0.003***	0.002***	0.002***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
High Credit Rating	0.008***	0.011***	0.007***	0.006**	
	(0.001)	(0.003)	(0.003)	(0.003)	
Regulation					
HQLA	0.005***	0.007***	0.005***	0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Bank-Qualified	0.016***	0.017***	0.016***	0.016***	0.016***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Year-Quarter FE	Y	N	N	N	N
Issuer Type FE	Y	N	Y	Y	N
State FE	N	N	N	Y	N
Rating × Year-Quarter FE	N	Y	Y	Y	Y
State × Year-Quarter × Issuer Type FE	N	N	N	N	Y
R^2	0.408	0.403	0.410	0.411	0.440
N	1,086,608	1,185,852	1,086,593	1,086,593	1,086,391

Table 4. Banking Relationships and the Decision to Purchase. This table reports OLS estimates of a linear probability model where the dependent variable is an indicator variable, which takes value one if a given municipal bond is acquired and held in the securities portfolio of a Y-14 Bank. All estimates in Table 3 are included in the regressions. In columns (1) to (3), *Relationship* is an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. In columns (4) to (6), *Relationship* is an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. In columns (7) to (9), *Relationship* is an indicator variable that takes the value of one if the bank previously held bonds of the issuer. Standard errors clustered at the state and (sale date) year-quarter level are reported in parentheses. Statistical significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Relationship Type:	Dependent Variable: $\mathbb{1}\{Purchase\}$								
	Underwriter			*Credit Relationship*			*Repeat Holder*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relationship	0.998***	0.987***	0.994***	-0.007***	-0.009***	-0.005***	0.996***	0.988***	0.983***
	(0.003)	(0.004)	(0.020)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.004)
Bond Characteristics									
Large Bond	0.008***	0.005***	0.005***	0.004***	0.001	0.001	0.004***	0.001	0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Relationship × *Large Bond*	-0.026***	-0.024***	-0.037*	0.016***	0.015***	0.016***	-0.013***	-0.007***	-0.002
	(0.003)	(0.004)	(0.020)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.004)
High Credit Rating	0.007***	0.007***		0.005***	0.004***		0.003***	0.004***	
	(0.001)	(0.001)		(0.001)	(0.001)		(0.001)	(0.001)	
Relationship × *High Credit Rating*	-0.015***	-0.014***	-0.017**	0.007***	0.009***	0.006***	-0.007***	-0.007***	-0.009***
	(0.002)	(0.003)	(0.008)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Regulation									
HQLA	-0.001	-0.003	-0.004	-0.001	-0.004	-0.002	0.001	-0.001	-0.002
	(0.003)	(0.003)	(0.009)	(0.003)	(0.004)	(0.009)	(0.002)	(0.002)	(0.007)
Relationship × *HQLA*	-0.001	-0.003	-0.017*	0.001	0.002	-0.001	-0.003***	-0.002*	-0.004*
	(0.003)	(0.003)	(0.010)	(0.002)	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)
Bank-Qualified	0.012***	0.012***	0.012***	0.013***	0.011***	0.012***	0.010***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Relationship × *Bank-Qualified*	-0.013***	-0.016***	-0.005	-0.004	-0.002	-0.002	-0.009***	-0.010***	-0.015***
	(0.003)	(0.005)	(0.016)	(0.003)	(0.003)	(0.002)	(0.001)	(0.002)	(0.006)
Year-Quarter FE	Y	N	N	Y	N	N	Y	N	N
Issuer Type FE	Y	Y	N	Y	Y	N	Y	Y	N
State FE	N	Y	N	N	Y	N	N	Y	N
State × Year-Quarter × Issuer Type FE	N	N	Y	N	N	Y	N	N	Y
Rating x Year-Quarter FE	N	Y	Y	N	Y	Y	N	Y	Y
R^2	0.072	0.077	0.128	0.018	0.026	0.081	0.018	0.026	0.430
N	1,185,863	1,086,608	1,086,391	1,185,863	1,086,608	1,086,391	1,086,606	1,086,603	1,086,391

Table 5. Relationship Lending and the Effects of HQLA Eligibility. This table reports difference-in-difference regressions of bank municipal bond purchase decisions in the style of Khwaja and Mian (2008). The dependent variable is the logarithm of a bank's total holdings of bonds issued by a given issuer. The sample is aggregated to the bank-issuer level. In columns (1) to (3), *Relationship* is an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. In columns (4) to (6), *Relationship* is an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. In columns (7) to (9), *Relationship* is an indicator variable that takes the value of one if the bank previously held bonds of the issuer. *HQLA* is an indicator that takes one starting in 2015:Q2 when HQLA eligibility was announced. *Maturity* and *Yield* are size-weighted. The sample period is restricted to pre-COVID to remove confounding effects from the pandemic. Standard errors clustered at the state and (sale date) year-quarter level are reported in parentheses. Statistical significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Relationship Type:	Dependent Variable: log(*Bank Holdings*)								
	Underwriter			*Credit Relationship*			*Repeat Holder*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relationship × *HQLA*	0.406**	0.411**	0.410**	0.711**	0.696**	0.613*	-0.331	-0.337	-0.335
	(0.202)	(0.203)	(0.196)	(0.295)	(0.295)	(0.336)	-0.22	(0.222)	(0.223)
Relationship	0.105	0.0933	0.0668	0.0281	0.0264	0.0632	0.519***	0.527***	0.501***
	(0.148)	(0.150)	(0.143)	(0.185)	(0.184)	(0.190)	-0.131	(0.129)	(0.128)
Maturity	0.080***	0.090***	0.090***	0.073***	0.087***	0.086***	0.076***	0.086***	0.087***
	(0.007)	(0.010)	(0.010)	(0.010)	(0.011)	(0.008)	-0.008	(0.010)	(0.010)
Yield		-0.109*	-0.143**		-0.148**	-0.160***		-0.114*	-0.147**
		(0.065)	(0.062)		(0.069)	(0.060)		(0.064)	(0.061)
log(*Amount*)			0.345***			0.311***			0.342***
			(0.051)			(0.060)			(0.050)
Issuer-Year-Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.767	0.766	0.774	0.802	0.803	0.810	0.768	0.767	0.776
N	2,698	2,686	2,686	2,110	2,101	2,101	2,698	2,686	2,686

Table 6. Relationship Lending and the Effects of HQLA Eligibility on the Decision to Mark a Bond HTM. This table reports difference-in-difference regressions of bank municipal bond HTM decisions in the style of Khwaja and Mian (2008). The dependent variable is the logarithm of a bank's total holdings of bonds issued by a given issuer market as HTM. The sample is aggregated to the bank-issuer level. In columns (1) to (3), *Relationship* is an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. In columns (4) to (6), *Relationship* is an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. In columns (7) to (9), *Relationship* is an indicator variable that takes the value of one if the bank previously held bonds of the issuer. *HQLA* is an indicator that takes the value of one starting 2015:Q2 when HQLA eligibility was announced. Maturity and Yield are size-weighted. The sample period is restricted to pre-Covid to remove confounding effects from the pandemic. Standard errors clustered at the state and (sale date) year-quarter level are reported in parentheses. Statistical significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

	Dependent Variable: log(*HTM Bank Holdings*)								
Relationship Type:	*Underwriter*			*Credit Relationship*			*Repeat Holder*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relationship × *HQLA*	-0.101	-0.107	-0.177	1.622***	1.621***	1.669***	-0.793	-0.789	-0.802
	(0.281)	(0.277)	(0.291)	(0.193)	(0.196)	(0.247)	(0.655)	(0.650)	(0.615)
Relationship	0.0242	0.0291	0.086	-0.118	-0.120	-0.112	0.222	0.221	0.150
	(0.214)	(0.217)	(0.218)	(0.200)	(0.206)	(0.168)	(0.225)	(0.224)	(0.226)
Maturity	0.066***	0.065***	0.072***	0.078***	0.079***	0.079***	0.065***	0.065***	0.072***
	(0.019)	(0.019)	(0.019)	(0.021)	(0.023)	(0.023)	(0.019)	(0.019)	(0.018)
Yield		0.023	-0.074		-0.028	-0.028		0.005	-0.092
		(0.091)	(0.135)		(0.158)	(0.152)		(0.089)	(0.140)
log(*Amount*)			0.314*			-0.035			0.302
			(0.183)			(0.127)			(0.181)
Issuer-Year-Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.952	0.952	0.954	0.961	0.961	0.961	0.953	0.953	0.955
N	276	274	274	224	222	222	276	274	274

Table 7. The Information Channel of Bank Relationships: Bond Returns. This table reports OLS estimates with annual bond returns as the dependent variable. Bond price return is computed using the bank-reported market value of a given holding at year t, i.e., $\textit{Bond Return}_{b,t} = \left(\textit{Market Value}_{b,t}/\textit{Market Value}_{b,t-1}\right) - 1$. The data are aggregated to the bond-year level. In columns (1) to (3), *Relationship* is an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. In columns (4) to (6), *Relationship* is an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. In columns (7) to (9), *Relationship* is an indicator variable that takes the value of one if the bank previously held bonds of the issuer. Bond controls include bond maturity, yield, term amount, and dummies for HQLA, Bank-Qualified, Insured, and General Obligation. Statistical significance levels: *** p < 0.01, ** p < 0.05, * p < 0.10.

Relationship Type:	Dependent Variable: *Bond Return*$_{b,t}$								
	Underwriter			*Credit Relationship*			*Repeat Holder*		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Relationship	-0.110	-0.121	-0.282	0.421***	0.327**	0.281*	0.337**	0.420**	0.268
	(0.502)	(0.593)	(0.585)	(0.144)	(0.166)	(0.166)	(0.142)	(0.178)	(0.178)
Bond Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Issuer Type × Year-Quarter FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE	Y	N	N	Y	N	N	Y	N	N
Rating FE	N	Y	N	N	Y	N	N	Y	N
Rating × Year-Quarter FE	N	N	Y	N	N	Y	N	N	Y
R^2	0.025	0.026	0.048	0.025	0.026	0.049	0.025	0.027	0.049
N	115,537	79,494	79,488	115,537	79,494	79,488	115,537	79,494	79,488

Table 8. The Value of Relationships in Positive Shocks. This table reports difference-in-difference estimates of the effect of existing relationships between a given municipality and a Y-14 bank around the HQLA eligibility change in 2015:Q2. The regressions are at the bond level. In columns (1) and (2), the dependent variable is the offer yield of the bond. In Columns (3) and (4), the dependent variable is a dummy taking value of 1 if the bond is purchased by a Y-14 Bank. All regressions control for bond maturity, bond term amount, and dummies for high credit rating, insured, HQLA, Bank-Qualified, and General Obligation Bonds. *Post HQLA* is an indicator variable that equals one from 2015:Q2 onwards, and 0 otherwise. In Panel A, *Underwriter* is an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. In Panel B, *Credit Relationship* is an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. In Panel C, *Repeat-Holder* is an indicator variable that takes the value of one if the bank previously held bonds of the issuer. Standard errors clustered at the state and (sale date) year-quarter level are reported in parentheses. Statistical significance levels: * p < 0.01, ** p < 0.05, * p < 0.10.

	Offer Yield		*Purchase*	
	(1)	(2)	(3)	(4)
A. Underwriting Relationship				
Underwriter	0.110**	0.130***	0.857***	0.855***
	(0.044)	(0.042)	(0.026)	(0.026)
Underwriter × *Post HQLA*	-0.236***	-0.251***	0.339***	0.339***
	(0.056)	(0.055)	(0.055)	(0.056)
R^2	0.758	0.763	0.088	0.090
N	1,086,606	1,086,603	1,100,406	1,100,403
B. Credit Relationship				
Credit Relationship	0.025***	0.030***	0.003**	0.003**
	(0.007)	(0.007)	(0.001)	(0.001)
Credit Relationship × *Post HQLA*	-0.031***	-0.037***	0.002	0.002
	(0.011)	(0.011)	(0.002)	(0.002)
R^2	0.758	0.763	0.036	0.039
N	1,086,606	1,086,603	1,100,406	1,100,403
C. Repeat-Holder Relationship				
Repeat-Holder	-0.032	-0.050*	0.966***	0.965***
	(0.024)	(0.025)	(0.001)	(0.001)
Repeat-Holder × *Post HQLA*	-0.127***	-0.146***	0.003**	0.003*
	(0.035)	(0.037)	(0.002)	(0.002)
R^2	0.752	0.763	0.398	0.399
N	1,086,606	1,086,603	1,100,406	1,100,403
Bond Controls	Y	Y	Y	Y
Issuer Type × Year FE	Y	Y	Y	Y
Rating × Year FE	N	Y	N	Y

Table 9. The Value of Relationships in Negative Shocks. This table reports difference-in-difference estimates of the effect of existing relationships between a given municipality and a Y-14 bank on offer yield and purchase probability during the global financial crisis. The sample includes all bonds issued in the period considered. The regressions are at the bond level. All regressions control for bond maturity, bond term amount, and dummies for high credit rating, insured, HQLA, Bank-Qualified, and General Obligation Bonds. In Panel A, *Underwriter* is an indicator variable that takes the value of one if the bank is part of the underwriting syndicate in the bond's primary market issuance. In Panel B, *Credit Relationship* is an indicator variable that takes the value of one if the bank has an outstanding loan balance with the issuer and zero otherwise. In Panel C, *Repeat-Holder* is an indicator variable that takes the value of one if the bank previously held bonds of the issuer. *Crisis* is a dummy that takes value one during the GFC (2007:Q4-2009:Q2), 0 otherwise. Standard errors are clustered at the state and (sale date) year-quarter level. * p < 0.01, ** p < 0.05, * p < 0.10.

	Offer Yield		*Purchase*	
	(1)	(2)	(3)	(4)
A. Underwriting Relationship				
Underwriter	0.074*	0.092**	0.938***	0.936***
	(0.044)	(0.042)	(0.003)	(0.003)
Underwriter × *Crisis*	-0.191**	-0.204**	0.003	0.005
	(0.083)	(0.083)	(0.004)	(0.004)
R^2	0.758	0.763	0.086	0.088
N	1,086,606	1,086,603	1,100,406	1,100,403
B. Credit Relationship				
Credit Relationship	0.023***	0.027***	0.003***	0.003***
	(0.007)	(0.006)	(0.001)	(0.001)
Credit Relationship × *Crisis*	-0.037***	-0.039***	-0.001	-0.001
	(0.012)	(0.012)	(0.002)	(0.002)
R^2	0.758	0.763	0.036	0.039
N	1,086,606	1,086,603	1,100,406	1,100,403
C. Repeat-Holder Relationship				
Repeat-Holder	0.054	0.071	0.939***	0.937***
	(0.043)	(0.045)	(0.003)	(0.003)
Repeat-Holder × *Crisis*	-0.122*	-0.136**	0.012***	0.013***
	(0.065)	(0.067)	(0.004)	(0.004)
R^2	0.758	0.763	0.142	0.144
N	1,086,606	1,086,603	1,100,406	1,100,403
Bond Controls	Y	Y	Y	Y
Issuer Type × Year FE	Y	Y	Y	Y
Rating × Year FE	N	Y	N	Y

Internet Appendix to "From Arm's Length to Arm in Arm: Banks and Municipal Bond Financing"

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Appendix

A Variable Definitions

- *Unique Identifier ID*: CUSIP, ISIN, or SEDOL identifier, if it exists.
- *Security Description*: reported asset class of the security.
- *Accounting Intent*: reported by the bank as Available-for-Sale (AFS) or Held-to-Maturity (HTM).
- *Credit Relationship*: indicator variable taking value one if a given bank has an outstanding loan with a given issuer i at or before period t when it acquires and holds a municipal bond of issuer i.
- *Underwriting Relationship*: indicator variable taking value one if a given bank has underwritten any bond for a given issuer i at time t or $t - n$ for $n > 0$, where t is the date of purchasing a new municipal bond of issuer i.
- *Repeat-Holder Relationship*: indicator variable taking value one if a given bank has held any municipal bond for a given issuer in the past.
- *Purchase*: indicator variable taking value one if a given bank buys and holds a given municipal bond, zero otherwise.
- *Capital Adequacy Ratio*: defined as total tier 1 and tier 2 capital over Risk-Weighted Assets constructed at the level of the Bank Holding Company.
- *Book Yield*: effective interest rate used to determine credit losses on debt instruments for other-than-temporary impairment (OTTI) purposes following ASC Topic 320. This value is typically the original unamortized yield without subsequent adjustments for paydowns or accretion.
- *Credit Rating*: As in Adelino, Cunha, and Ferreira (2017), the numeric ratings scale correspond to letter-based credit ratings. The highest-quality rating is assigned a rating of 22.
- *Market Value*: fair value of the security reported in USD.
- *Bond Size*: the natural log of the total bond amount issued in a series by a municipality.
- *Term Amount*: amount of debt that is part of an issuance with a specific maturity. Corresponds to a unique bond within an issuance.