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Abstract

Using confidential loan-level data, we investigate the importance of bank loans in the debt structure of U.S. state and local governments. We show that most bank debt is closely substitutable with municipal bonds and that smaller, lower-income and less credit-worthy borrowers are more reliant on bank borrowing. Moreover, we document a sizable difference in the maturity structure of bonds and loans that allows municipalities to save on interest costs but that could also lead to diluting bondholders' claims. Such dilution concerns are amplified by governments substantially increasing bank borrowing in response to credit quality deterioration. This suggests the upward trend in bank borrowing will likely persist if fiscal positions continue to decline.

Keywords: state and local governments' debt, debt heterogeneity, fiscal shocks

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1 Introduction

Although state and local governments in the U.S. have historically been regarded as some of the most financially sound entities, the aftermath of the Great Recession as well as the recent Covid crisis have cast doubt on this notion. For example, since the Great Recession substantial losses in state pension funds, rising healthcare obligations, as well as aging populations have all put strain on the budgets of state and local governments at the same time as unmet needs for infrastructure investments have been growing and estimated to amount to approximately $2 trillion in 2017 (see Novy-Marx and Rauh (2012); Novy-Marx and Rauh (2011); Lutz and Sheiner (2014); Butler and Yi (2019)).[1] These economic forces are likely to be exacerbated by the fiscal pressures caused by the Covid-19 pandemic that have led state and local governments to reduce employment in light of revenue declines (see Green and Loualiche (2021)). In the presence of these funding shortfalls, municipal entities have rapidly increased their reliance on private bank loans. Specifically, public Call Reports data indicate that state and local governments have increased their bank loan obligations from about $30 billion before the financial crisis to approximately $200 billion in the third quarter of 2020 (see Panel (a) of Figure 1).

Despite bank lending becoming a more important source of funding for municipal entities, the conditions under which such lending takes place are largely unknown due to the lack of detailed data on municipal bank loans. There were no disclosure requirements for municipal bank loans prior to 2019, and very few municipal entities chose to disclose voluntarily.[2] Following the adoption of regulation mandating bank loan disclosure since late February of 2019, such disclosures have only covered a small minority of the municipal debt market.[3]

Using confidential supervisory loan-level data on bank lending to state and local governments in the United States from the Federal Reserve's Y-14Q collection, we provide the first comprehensive empirical investigation of municipal bank loan contracts and shed light on the potential economic forces behind the rapid expansion in municipal bank lending. We first establish that the vast

[1] See http://www.msrb.org/media/Files/Resources/MSRB-Infrastructure-Primer.ashx.

[2] For example, only less than 100 issuances of bank loans have been reported as compared to the 44,000 state and local issuers (see https://www.sec.gov/rules/proposed/2017/34-80130.pdf) during the time period of voluntary disclosures. In addition, a substantial fraction of those documents are so heavily redacted that no information on bank loan interest rates, commitment amounts, maturities, or fees could be obtained.

[3] The SEC adopted amendments to Rule 15c2-12 that requires disclosure of "material" private obligations, taking effect on February 27^{th}, 2019. Since the rule became effective only 3,200 out of the nearly 24,000 municipal issuers that have issued municipal bonds in the past five years have made private debt disclosures.

majority of bank lending to state and local governments is done by the largest banks in the United States, those exceeding $50 billion in total assets. Using public information from banks' financial filings as in Bergstresser and Orr (2014), we find that large banks currently account for about 75% of all outstanding municipal loans with smaller banks accounting for the rest. Consequently, the aggregate trends of municipal lending by large banks and not those of smaller banks mirror closely the dynamics of total municipal lending in our loan-level data.

Our granular loan-level data show that the vast majority of outstanding bank loans to state and local governments is in the form of term loans and credit lines. Most bank debt appears highly substitutable with the primary source of external funding for government borrowers – the municipal bond market. We show that similar to municipal revenue bonds, most municipal term loans are fixed-rate, tax-exempt, secured by revenues of municipalities, and carry intermediate to long maturities. In contrast, credit lines potentially provide municipal borrowers with the option to increase borrowing in the future and appear less substitutable with municipal bonds as they are unlikely to be tax-exempt, less likely to be fixed-rate or secured, and have short maturities. The average municipal borrower with access to a bank credit line utilizes only a third to a half of their credit line, suggesting that municipalities have substantial space to expand future borrowing.

The substitutability of bank loans with municipal bonds appears to be an important factor for the reliance of governments on bank loans. Specifically, term loans represent a significant majority of bank debt of county, city, and special district governments with credit lines accounting for only about a fifth of bank financing for these governments, while state governments are more reliant on credit lines than on term loans. These patterns of financing of state and local governments mirror closely the evidence on credit line reliance for corporate borrowers in Sufi (2009). In other words, it is the largest and potentially unconstrained governments that are most reliant on bank credit lines. In contrast, smaller and potentially more constrained governments have less access to credit lines and therefore lower ability to raise financing in a short time frame. These findings have important implications for the potential policy responses of state and local governments to the large revenue shortfalls caused by the Covid crisis. Although, on average, state governments appear to have liquidity buffers that are sufficiently large to insulate against credit market disruptions and funding shortfalls, lower-level governments may be unable to meet such large liquidity shocks in the short term.

While the richness of debt heterogeneity presented so far provides initial insights into governments' choice to borrow from the bank debt market, we also examine the contractual and effective seniority of municipal bank debt contracts. These additional analyses allow us to draw implications about the impact of bank financing on municipal bondholders and the conditions that make bank loans attractive for borrowers. We show that bank borrowing of state and local governments is heavily collateralized and thus has high contractual priority. For example, the vast majority of banks loans are secured, with banks almost always having first-lien priority on the the cash flows that secure the loans. Whenever bank loans are unsecured, banks are almost always senior in terms of priority. Moreover, remaining bank loan maturities are short — only 2 to 3 years for lines of credit and 7 to 8 years for term loans.

We document that the short maturities of municipal bank loans may give banks additional seniority, or 'priority in time', relative to bondholders as newly-issued loans tend to be shorter-term than a significant fraction of outstanding bonds (see a thorough exposition of 'priority in time' in Ho and Singer (1982)). Importantly, such maturity difference may allow municipalities to save on interest costs by diluting bondholders' claims. To understand the extent to which bondholders' claims are diluted by bank loans, we compare the newly-issued loans of a given borrower to the pre-existing municipal bonds of the same borrower. We show that even though loans and bonds are both highly collateralized, for approximately 75% of borrower-quarters newly-issued bank loans typically have 6-9 years shorter remaining maturities than outstanding municipal bond series on the long end of the maturity spectrum of the given borrower.[4]

We estimate that raising financing via term loans with shorter maturity than outstanding bonds can save local governments an average of 11 basis points on interest costs per year. Controlling for a comprehensive set of factors that could be driving loan interest rates, we find that the greater the maturity gap (the difference between median remaining maturities of newly-issued loans and median remaining maturities of outstanding bonds), the lower bank loan interest rates are. For example, a positive maturity gap is associated with approximately 11 basis points reduction in loan interest rate per year, while a maturity gap of 5 and 10 years is associated with about 19 and 35 basis points loan interest cost savings, respectively. To put that estimate in perspective, note that Garrett et al. (2020) estimate that a 1 percentage point increase in the personal income tax subsidy

[4]In those instances, on average slightly less than a fifth of all outstanding bonds by amount are diluted.

for municipal bonds reduces municipal governments' borrowing costs by 6.5-7 basis points.

We next focus on the sample of county governments to examine the cross-sectional variation in municipal debt structure and gain insight into the major factors driving the reliance on bank loans. We document that smaller, lower per-capita-income, and less credit-worthy municipal borrowers are more reliant on bank borrowing. This is driven by reliance on term loans that are substitutable with municipal bonds, suggesting that bank debt is a particularly relevant portion of total debt financing exactly in the municipalities characterized by high informational asymmetry, where pledgeable income is low and uncertainty about debt repayment is high.

We expand on these findings by studying the response of county governments' debt structure to deterioration in credit quality. This analysis is particularly relevant for understanding the impact of the Covid crisis as credit quality deterioration in the context of state and local governments is likely to be closely tied to adverse fiscal shocks. We construct a measure of deterioration in credit quality using banks' internal risk ratings of each municipality. Our results indicate that deterioration in credit quality translates to an increase in a government's bank loan share of approximately 40-50 basis points and that this increase occurs primarily in the quarter of credit quality deterioration. These effects are significantly larger whenever county governments are faced with large deteriorations in credit quality, while we fail to find a debt structure response among the largest and the smallest county governments. Consistent with theories of information asymmetry and access to arm's length debt in the spirit of Diamond (1991), the smallest and most opaque borrowers appear to lose access to external finance following credit quality deterioration, while the largest entities are unlikely to lose access to municipal bond markets even after adverse shocks.

Moreover, governments' debt structure response to credit quality deterioration resembles the "maturity rat race" in the theory of Brunnermeier and Oehmke (2013). Their study shows that the high reliance on short-term may be the outcome of a "maturity rat race" – a dynamic in which borrowers have incentives to further shorten debt maturity in order to obtain additional debt capacity. Our findings on the dilution of long-term bonds by short-term bank loans provides direct empirical evidence of such a "maturity rat race" in the case of state and local governments. One implication of this theory in the current context is that governments that had previously borrowed heavily from banks may have limited ability to take on additional debt in the future.

We also complement a growing literature that explores the heterogeneity in revenue composition

of state and local governments (see, for example, Surez Serrato and Zidar (2018), Shoag et al. (2020), Fajgelbaum et al. (2018), Slattery and Zidar (2020)). Our results suggest that the debt structure of state and local governments may change significantly around revenue declines in a manner that affects governments' ability to secure future financing. This is especially relevant in light of the large recent revenue declines of governments caused by the Covid crisis (Gordon et al. (2020), Whitaker (2020), Clemens and Veuger (2020)). Overall, our findings imply that the trend toward "privatization" of municipal debt is likely to persist if state and local government continue to face deteriorating fiscal positions.

While prior literature has empirically studied debt heterogeneity and debt composition for corporate borrowers (see, for example, Barclay and Smith (1995b), Barclay and Smith (1995a), Sufi (2009), Rauh and Sufi (2010), Colla et al. (2013)), to our knowledge no such findings have been documented for state and local governments. Our newly constructed database sheds light on various characteristics of municipal bank borrowing and its interaction with municipal bond financing, illustrating the value of disclosure of private debt claims. Relatedly, our study contributes to the literature investigating the opaque nature of municipal lending markets and the impact of additional disclosures and third-party certification of issuers (e.g. Gore (2004), Baber and Gore (2008), Butler et al. (2009), Baber et al. (2013), Bergstresser and Orr (2014), Cuny (2016), Cornaggia et al. (2017), Cornaggia et al. (2019), Adelino et al. (2017)).

2 Bank Lending to Municipalities

2.1 Data Sources

We obtain granular information on bank loans to municipalities from the Federal Reserve's Y-14Q data, collected on a quarterly basis to support the Dodd-Frank Act Stress Tests and the Comprehensive Capital Assessment and Review. The reporting panel starts in Q3 of 2012 and includes bank holding companies with at least US $50 billion in total assets.[5] These data contain detailed loan contract-level information on all outstanding commercial and industrial bank loans with commitment amounts exceeding $1 million. In addition, banks provide their internal risk

[5]There were 37 institutions until 2018Q1. Regulatory changes increased the reporting threshold to $100 billion as of 2018Q2, thereby leading to the exclusion of four institutions with total assets below $100 billion.

ratings for each loan contract on their books as well as the equivalent risk rating in a ten-grade S&P scale. The data allow us to study individual borrowers and loans, and as a consequence the contract structure, riskiness and cost of private financing to state and local governments.

We identify observations corresponding to municipal borrowers in the Y-14Q data by using string search techniques identified in Appendix A and supplement this algorithm with a complete list of municipalities from the Census website. Specifically, we identify four types of municipal entities: 1) "cities", 2) "counties", 3) "states", and 4) "special districts". Additionally, we exclude municipal bank loans related to public-private partnerships as this subset of loans is likely to be significantly different in terms of collateral and repayment source than direct loans to state and local governments.

We complement the data with data on municipal bond issuance from the Mergent Municipal Securities Database. We track the identity of the issuer and separate issuance of general obligation (GO) bonds that are backed by the full faith of the municipal government and revenue bonds that are backed by project-specific revenues (such as the revenues from toll roads). We arrive at the quarterly outstanding amount of bond financing for each municipality by using comprehensive information on new bond issuance, repayment, refinancing, and bond calls. Specifically, for each municipality-quarter we add the dollar amount of new issues and refinancings to the existing balance as of the end of the previous quarter and subtract the amount of repayments as well as amounts associated with bond calls.

In addition, we use data on county population and county personal income per capita from the Bureau of Economic Analysis.

2.2 Characterizing Municipal Loan Contracts

While the Y-14 Collection uniquely details granular information on municipal bank loans made by large banks in the US, public data from the Consolidated Reports of Condition and Income (the Call Reports) provides aggregated bank-level information on outstanding loans to states and local governments by all banks operating in the US (also see Bergstresser and Orr (2014)). Panel (b) of Figure 1 uses Call Reports and FR Y-9C data to show that large banks (with total assets exceeding $50 billion) currently account for about 75% of all outstanding municipal loans with mid-sized and small banks accounting for the rest. Importantly, Panels (a) and (b) of Figure 1 taken together

show that the aggregate trends of municipal lending by large banks (and not those of mid-sized and small banks) mirror closely the dynamics of total municipal bank lending.

Panel (a) of Figure 2 relies on Y-14 data to compare utilized (outstanding) municipal debt with total bank loan commitments, which also include unused credit lines. Total commitments have grown from approximately $110 billion in Q3 of 2012 to about $175 billion in Q3 of 2020. Total outstanding municipal bank debt exhibits a similar trend, increasing from just over $50 billion in 2012Q3 to nearly $90 billion in 2020Q3.[6] Comparing total outstanding municipal bank loans by large banks in the Call Reports (panel (a) of Figure 1) to the outstanding debt in panel (a) of Figure 2 indicates that in recent years the Y-14 data captures roughly 60-70% of municipal bank lending of large banks in the United States.[7] Finally, Figure 2 also illustrates that the dollar amount of unused lines of credit over the sample period is almost as large as outstanding municipal debt, suggesting that state and local governments may have the ability to significantly increase borrowing in a short time frame.

Panel (b) of Figure 2 provides details on the distribution of municipal loan commitments captured by the Y-14 data across different types of public entities. This figure indicates that the exposures of cities represents the largest fraction of municipal debt of state and local governments, representing about $75 billion in commitments in recent quarters. The exposures of special district governments exceed $40 billion, while counties and states each account for slightly more than $20 billion in recent quarters. While the loan commitments of states, counties, and districts have leveled off in 2016/2017 before increasing again in 2020, the commitments of cities have continued the upward trajectory observed in previous years.

The vast majority of bank lending to states and local governments is done via credit lines, terms loans, and to a lesser extent leases. Table 1 breaks down loan characteristics and contractual provisions of term loans and credit lines by borrower type, significantly expanding the granularity of our analysis.[8] Panel A shows that states exhibit greater reliance on credit lines than other local

[6]This trend in our sample does not appear to be driven by the addition of new institutions to the Y-14Q collection over time since the initial collection already included the largest banks in the United States. Plotting the same figure after restricting the sample to the institutions that were in the 2012Q3 collection results in a very similar trend of commitment and utilized exposure.

[7]The primary reason why we do not capture all loans is that the Y-14 data set excludes borrowers with loan commitments below $1 million, precluding us from observing the smallest municipal issuers. Consequently, our results are more likely to generalize to municipalities that have at least $1 million in bank loan commitments.

[8]We present summary statistics for leases in Appendix Table A1. Other types of municipal bank lending that are infrequently observed include bond purchase agreements, demand loans, and commercial cards.

governments – credit lines account for 41% of all loan-quarter observations for states versus 22%, 23%, and 22% for counties, cities, and districts. Average credit line sizes varies between $15 million for districts and $36 million for states. It is important to note that only a fraction of all credit line commitments are drawn. Only between 52% (for states) and and 66% (for counties) of lines of credit have been at least partially drawn with average utilization ratio of drawn revolvers ranging between 29% and 46%. Once again this result points to the ability of state and local governments to increase debt in a short time frame.

We also describe both the remaining maturity and the original contract maturity of banks loans. We define the remaining maturity as the difference between the maturity quarter of the contract and the data observation quarter. We find that the average remaining maturity of credit lines is between 8 and 13 quarters, similar to the average maturity of bank loans to corporate borrowers (see Roberts and Sufi (2009)). In contrast, the original contract maturity of credit lines, computed as the difference between the loan maturity quarter and the origination quarter, is substantially longer – between 20 and 26 quarters. Remaining maturities are likely to be more informative about contract maturity structure than the original contract maturities to the extent that municipal loans are renegotiated frequently. Similar to evidence in the corporate loan market where the frequent renegotiation of commercial loans makes it infeasible to distinguish between renegotiations of existing and new commercial loan contracts (see Roberts (2015)), more than half of the municipal bank loan-quarters in our sample correspond to renegotiations or new originations. In this setting the contract maturity has a significant probability of extension every time a loan contract is renegotiated.[9]

The majority of municipal bank borrowing in terms of total funded (outstanding) amount is done via term loans. Term loans are also the most prevalent means of financing for counties, cities, and districts with approximately 59% of all respective loan-quarter observations. The average term loan amounts vary between $7 million (for districts) and $19 million (for states). Term loans are longer-term than credit lines with average remaining maturities ranging between 27 and 31 quarters (and original contract maturities ranging between 41 and 47 quarters). We empirically explore the difference in remaining maturities between bonds and loans in further detail in Section 3 to

[9] Additionally, conversations with bank examiners at the Federal Reserve reveal that the contract origination date in the Y-14 collection may often denote the start of the borrower-bank relationship.

understand whether there is potential for claim dilution of municipal bonds.

Panel B of Table 1 shows that bank lending to state and local governments is heavily collateralized. For example, between 44% and 61% of credit lines are secured, while between 79% and 84% of terms loans are secured. In addition, whenever a loan is secured, banks almost always have first-lien priority on the assets or cash flows that secure the loan (the fraction of loans that are senior secured is almost identical to the fraction of secured loans across all loan types). The remaining loans, which are not secured, are almost always senior in terms of contractual priority.

We also show that bank loans may employ additional contractual guarantees by entities different from the borrower – such guarantees are substantially more common in credit lines than in term loans (especially those of cities and districts). For example, up to 10% of credit lines and up to 3% of term loans are backed by additional guarantees. This suggests additional seniority of bank loans over other types of debt beyond potential seniority arising from collateralization and short maturities.

Notably, Panel B of 1 shows that between 60% and 66% of credit lines and the vast majority of term loans are fixed-rate. This is in contrast to the corporate loan market where the vast majority of loans are floating-rate and are based on benchmarks such as LIBOR or prime rates. The prevalence of fixed-rate provisions in municipal term loans may make them more substitutable with municipal bonds and potentially more attractive to municipal borrowers.

Turning to further contractual provisions, a non-trivial fraction of loans contains prepayment penalties. This is especially relevant for term loans where the share of contracts with prepayment penalties ranges from 35% to 44%. A substantial fraction of loans have associated state and/or federal tax exemptions for interest income from banks' perspective, further increasing their similarity with municipal bonds. For example, between 22% and 37% of credit lines and between 57% and 69% of term loans are tax exempt. Finally, very few of the loans are syndicated despite the sizable commitment amounts.

3 Bond-Loan Maturity Gap and Loan Pricing

Our results so far show that municipal term loans look a lot like municipal bonds in terms of contract characteristics, and that the municipal bank loan market might therefore be considered a close

substitute of the municipal bond market. Consequently, municipal term loans may have a pricing advantage for issuers for two reasons. Term loans are likely to have lower associated regulatory compliance costs from the perspective of lenders, which can lead to lower borrowing costs (see Bergstresser and Orr (2014)). Additionally, term loans may dilute bondholders by providing bank lenders with debt seniority.

We examine the potential dilution of pre-existing bonds and the extent to which this allows municipal borrowers to save on interest costs. Dilution may occur if, for example, the newly-issued bank loans have shorter maturities or higher collateralization than pre-existing bonds. We abstract from differences in collateralization between the bonds and the loans because the vast majority of both bonds and loans are secured. For example, for 75.15% of borrower-quarters both bonds and loans are secured by assets or cash flows, in 7.12% of instances loans are secured but bonds are unsecured, and in 17.73% of cases the bonds are secured but the loans are not.[10] Overall, we examine the instances in which newly-issued bank loans have shorter maturities relative to outstanding bonds of a given issuer. This would lead to higher effective priority of bank claims outside of bankruptcy, or 'priority in time' (see, Ho and Singer (1982); Barclay and Smith (1995a)).

Empirically, we focus on the difference in remaining maturities between bonds and loans of the same borrower. Remaining maturities are more empirically relevant than original maturities because we study whether new bank lending changes the effective priority of future bond cash flows. For the purposes of our analysis, we match all bank loans of a given borrower to the municipal bonds of the exact same borrower using the bank-provided 6-digit CUSIP of the borrower. This way we can compare newly-issued bank loans of a given borrower to the pre-existing municipal bonds of the same borrower.[11] Finally, we restrict the sample to bank loans that are likely to be closely substitutable with municipal bonds, namely, term loans that are tax-exempt, fixed-rate, and not syndicated (bilateral).[12]

We first investigate the potential dilutive effects to bondholders descriptively by comparing the maturity of the long-term outstanding bonds[13] of a given issuer with the typical (average)

[10] Given that virtually all secured loans have first-lien priority on municipal revenues/collateral, new loans are also likely to dilute pre-existing bonds in terms of collateral seniority. However, we are unable to compare collateralization of bonds and loans because of lack of sufficiently detailed data on the collateral of bonds and loans.

[11] We provide more detail on constructing the bond-loan comparison sample for our pricing analysis in Appendix C.

[12] In Appendix D, we examine the robustness of our results to relaxing such sample restrictions and show that they do not have a material impact on our results.

[13] Those with the maximum remaining maturity among all outstanding bonds of a given issuer.

maturity of newly-issued bank loans of the same issuer. Our goal is to understand whether the average bank loan to municipal borrowers dilutes at least some bondholders, with bondholders on the long-end of the maturity spectrum being most vulnerable to dilution. We find that in roughly three quarters of borrower-quarters bank loans have shorter remaining maturities than municipal bond series on the long end of the maturity spectrum (see Appendix Figure A1). In these instances, on average 17% of the dollar value of all outstanding bonds of a given issuer is diluted (with 75th and 90th percentiles of approximately 21% and 42%). Such bond-loan maturity difference is also economically large with a median value of 6 years and a 75^{th} percentile of 12.5 years. This pattern is even more pronounced for state governments with slightly less than 90% of borrower-quarters having newly-issued loans with shorter remaining maturities than long-term bonds. In contrast, such maturity difference appears slightly less pronounced for special district governments. Overall, this evidence indicates that bank loans are dilutive and have higher 'priority in time' than a substantial fraction of municipal bonds.

Given the higher 'priority in time' of bank lenders, bank financing may allow state and local governments to save on borrowing costs. To this end we relate loan interest rates to the difference in maturities between bonds and loans:

$$\text{Interest Rate}_{it} = \alpha_0 + \alpha_1 \text{Maturity Gap}_{it} + X'_{it}\boldsymbol{\delta} + Y'_{it}\boldsymbol{\gamma} + \epsilon_{it} \tag{1}$$

In equation (1), Interest Rate_{it} denotes the weighted-average interest rate of newly originated loans (weighted by loan commitment amount) to borrower i in quarter t and X_{it} and Y_{it} are matrices of weighted-average time-varying loan or bond characteristics of borrower i. The main variable in our analysis, the bond-loan maturity gap, is defined as the difference between the median remaining maturity of outstanding bonds and the median loan maturity of newly-issued bank loans of a given borrower i in quarter t, Maturity Gap_{it}. We use median remaining maturities for both bonds and loans as we are interested in comparing typical remaining maturities of bonds and loans. Using a maturity gap definition as in Figure A1 produces results that are even larger in magnitude and highly statistically significant.

We include county fixed effects to control for county economic conditions as well as loan remaining maturity fixed effects (in years) interacted with observation quarter indicators. The latter

is equivalent to controlling for the bank loan yield curves in any quarter during the sample period. We also control for borrower risk by including borrower internal ratings fixed effects and account for major non-price loan terms given a large literature in corporate finance has shown that non-price terms of bank loans are related to loan interest rates (see, Ivashina (2009)). Finally, we control for potential interest rates heterogeneity across different government types by including government type fixed effects.

Our base specification in column (1) of Table 2 shows that shortening loan maturity by one additional year relative to the outstanding bonds of a given borrower allows the borrower approximately 1.7 basis points savings on bank loan interest rates. In column (2) we control for the non-price terms of bank borrowing and bond characteristics, which has little effect on our estimates. Column (3) also includes bond characteristics such as average yields, total amount of bonds outstanding, and the dollar value of GO bonds as a fraction of the dollar value of all outstanding bonds. Finally, we also control for the fraction of bank financing relative to total financing (bonds and loans). Our estimates again change little relative to the previous specification. The last three columns present the average effect of positive maturity gap, maturity gap of at least 5 years, and a maturity gap of at least 10 years on loan interest rates. These results indicate that a positive maturity gap translates to loan interest rate savings of about 11 basis points, while maturity gap of more than five and ten years is associated with savings of 19 and 35 basis points, respectively.

4 Municipal Debt Structure

4.1 Descriptive Evidence

To better understand the heterogeneity in debt structure along borrower characteristics, we restrict our sample to county governments and match it to outstanding bond data and to county-level demographics. This yields a total of 2,724 counties, 1,365 of which have bank loans outstanding and 2,539 of which have bonds outstanding between 2012 and 2020 and that have available information on key economic variables. A total of 1,026 of these counties have both bank loans and bonds outstanding.

Panels (a) and (b) of Figure 3 depict scatter plots of the association between bank loans as a share of total debt (sum of loans and bonds) and county characteristics such as population and

personal income per capita. Specifically, panel (a) shows that governments in less populated counties are more reliant on bank financing than those in larger counties. This is likely because the fixed costs of bond issuance are a larger fraction of total issue proceeds for smaller issuers due to economies of scale in bonds issuance (see, e.g., Smith (1986)). In contrast, bank lending is likely to be associated with significant fixed costs when the lending relationship is first established but less so for additional interactions between the bank and the borrower. On average, bank debt accounts for between 10% and 20% of total debt of less populous municipalities and only between 5% and 10% of larger governments.

We find a strong negative association between the share of bank loans and county personal income per capita (Panel (b) of Figure 3). This association is consistent with governments with higher pledgeable income and credit quality raising a greater fraction of financing through public bonds. These patterns are also consistent with the previously observed association between bank loan share and county size as smaller counties are more likely to have lower per-capita income. The observed empirical association, however, appears substantially stronger than in Panel (a) of this Figure as local governments in lower-income counties tend to have on average up to 25% bank debt in their capital structure. These associations bear resemblance to theories of corporate borrowing (Diamond (1991)) in which the highest quality borrowers rely primarily on public debt markets and lower quality borrowers obtain bank loans.

We rely on information on the banks' internal risk ratings of each municipality to construct our measure of credit risk. Banks' internal risk ratings are also available to us in a common, 10-grade S&P scale that enables us to compare credit quality of different county governments working with different lenders. Whenever the borrower works with multiple lenders, we use the borrower's most conservative bank internal risk rating among all banks the borrower works with. Figure A3 in Appendix E presents the distribution of credit ratings for the sample of county government-quarters in our data. While the vast majority of observations appear to be high credit quality, nearly 40 percent of the sample is rated in the lowest investment-grade category ('BBB') and about a fifth of observations are rated below investment-grade. This evidence paints a somewhat different picture of municipal credit quality than agency ratings and indicates that a significant fraction of borrowers are either of low credit quality or are at risk of falling into low credit quality categories if faced with fiscal shocks.

Panel (c) of Figure 3 presents the association between credit risk and bank loan share. We find that the reliance on bank loans almost monotonically increases with risk. For example, banks loans account only for about 10-20 percent of the debt structure of 'AAA'- and 'AA'-rated governments that borrow from both banks and the bond market. In contrast, borrowers rated 'A' and lower have approximately 30 percent of their debt structure in the form of bank loans. This reliance steepens to more than 40 percent for governments rated below 'B'. This evidence corroborates our suggestive evidence from the previous panels of Figure 3 — higher-rated governments borrowing primarily from the bond market, while lower-rated borrowers exhibiting increasing reliance on bank loans as their credit quality deteriorates. As in the case of the corporate borrowing market this is likely to be the case because governments gradually lose access to the bond market as their credit quality worsens (Rauh and Sufi (2010), Diamond (1991)).

In panels (d), (e), and (f) of Figure 3, we investigate the relation between county characteristics/credit quality and the share of term loans relative to total bank borrowing, which is defined for the subsample of borrowers with bank loans. Among bank loan contracts, term loans are more likely to be substitutable with public bonds than lines of credit (see, e.g., Gustafson (2018)). To the extent that term loans drive the total bank debt trends we observe in panels (a) and (b) of Figure 3, we expect to find similar associations between the share of term loans and county characteristics. Panels (d) and (e) of Figure 3 show that governments in smaller counties and those in counties with lower personal income per-capita have a larger share of term loans. For example, term loans comprise on average between 60% and 80% of the bank debt of low per-capital personal income and less populous local governments. These patterns are consistent with smaller issuers or those with lower pledgeable income being more reliant on bank debt because of high degree of substitutability of term loans with municipal bonds. In other words, these issuers may be saving on bond issuance costs by substituting bonds with term loans.

The association between term loan share and credit risk bears resemblance to an inverted U-shape – term loan share is the highest for county governments in the middle of the credit spectrum and is lower for borrowers of high or low risk. Consistent with the evidence above and with theories of information asymmetry and access to arm's length debt (Diamond (1991)), this is likely a byproduct of high-credit quality borrowers relying on bond markets and bank credit lines and banks restricting access to permanent financing of low credit quality borrowers.

4.2 Debt Structure and Credit Rating Downgrades

We next investigate the response of county governments' debt structure to deterioration in credit quality. This analysis will help us understand the extent to which governments' reliance on bank debt is likely to increase in light of deteriorating fiscal positions, thus shedding light on whether the "privatization" of municipal debt may persist. We limit our sample to the subset of county governments that have at least some borrowing from the bank loan market. The latter requirement assures the availability of our comprehensive credit quality metrics that are based on banks internal risk ratings.

Table 3 presents the relation between changes in county governments' bank loan share and bank internal risk rating downgrades. Our estimates have the interpretation of quarterly changes in bank loan share as we include county government fixed effects throughout our specifications. We consider all quarterly credit rating downgrades (columns 1 and 2) as well as larger quarterly downgrades in which the borrower rating transitions from 'AAA', 'AA', or 'A' to 'BBB' or lower (columns 3 and 4). Our results indicate that downgrades are associated with approximately 40-50 basis points increase in bank loan share and that this increase manifests itself in the quarter of credit quality deterioration. This effect may last for an additional quarter as the estimates on the first lag of the event time coefficients indicate an additional 30 basis points increase in bank loan share which is not statistically significant. All remaining event time coefficients are close to zero indicating that the change in debt structure occurs quickly upon credit quality deterioration.

Columns 3 and 4 of Table 3 show the increase in bank loan share in municipalities' debt structure is significantly larger following large changes in credit quality with an average effect of approximately 1.3 percentage points. Similar to columns 1 and 2 debt structure continues to favor bank debt within about one quarter of the credit rating downgrade as the first lag of the event coefficients indicates an additional increase in bank loan share of 80-90 basis points that is statistically noisy. Overall, these results point to a significant increase in bank borrowing following adverse shocks to municipalities' credit quality. This suggests the trend toward "privatization" of municipal debt is likely to persist if governments continue to face deteriorating fiscal positions.

Tables A4 and A5 in Appendix E provide further detail on these results. In particular, we find that increases in bank loan share in response to downgrades are largely concentrated in the middle

half of the county size distribution. The results in the bottom quartile of the size distribution are consistent with banks rationing the smallest municipal borrowers following adverse credit quality shocks. While the largest borrowers exhibit a small increase in bank loan share following credit quality deterioration, these borrowers may still have ample access to the municipal bond market and may thus be unlikely to significantly increase their reliance on bank loans. Partitioning the sample into quartiles of county per-capita income (Table A5) supports these findings, albeit significantly more noisily statistically. Once again it is the governments in the middle of the per-capita income distribution that tap bank financing following rating downgrades, while the bank loan share of the smallest and the largest borrowers are largely unresponsive to credit rating downgrades. Collectively, this evidence corroborates our earlier results on access to bank loans across the credit quality spectrum.

5 Conclusion

State and local governments have substantially increased their reliance on private bank loans in recent years. Using confidential supervisory loan-level data on bank lending to municipal governments in the United States, we document the key characteristics of these loans. We show that bank loans to municipal entities are highly collateralized, have relatively short maturities, and frequently provide tax exemptions to lenders. Newly-originated bank loans tend to be dilutive to a significant fraction of pre-existing bondholders by giving bank lenders higher effective priority. Thus, another benefit of bank financing to municipal governments is the significant interest cost savings whenever bank loans are shorter in maturity than at least some outstanding bonds.

Zooming in on municipal debt structure, we find that governments that are most reliant on bank financing tend to have lower credit quality, lower per-capita income, and lower population. Moreover, we document that governments significantly increase their bank borrowing in response to credit quality deterioration, adding to the 'privatization' of municipal debt. Overall, while bank debt may allow municipalities to currently save on interest costs, high reliance on bank borrowing may limit the ability of a municipality to take on additional debt in the future (see, e.g., Brunnermeier and Oehmke (2013)).

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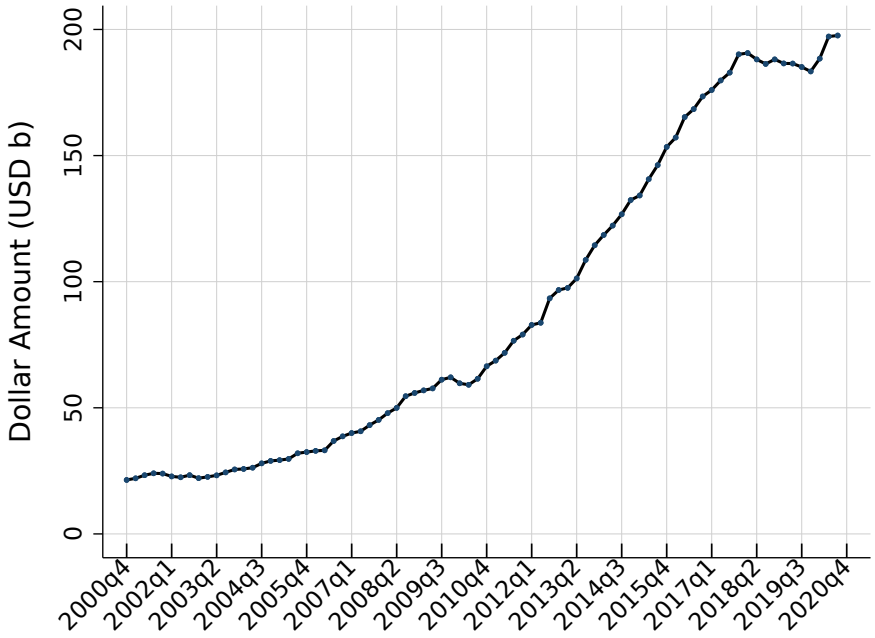
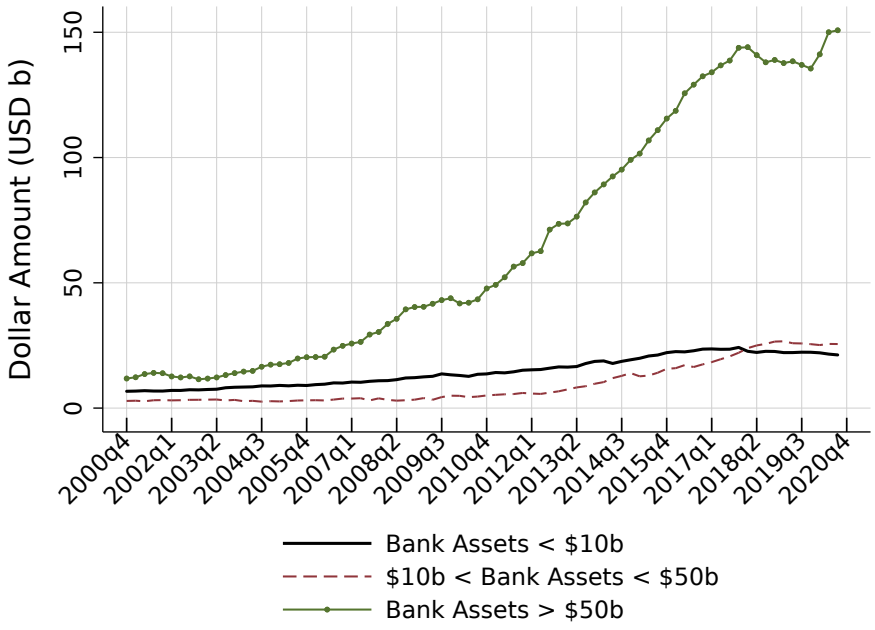
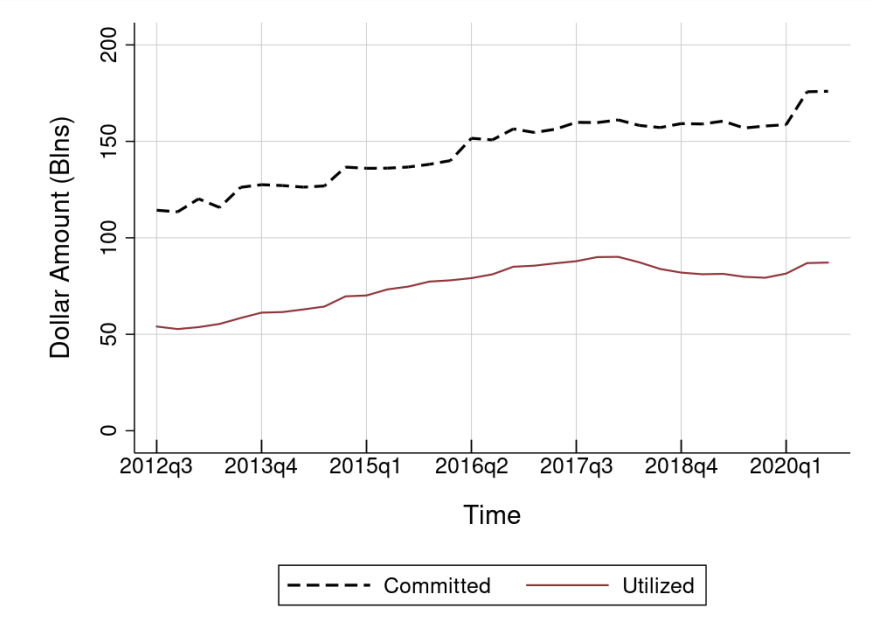


(a) Total Municipal Bank Loans

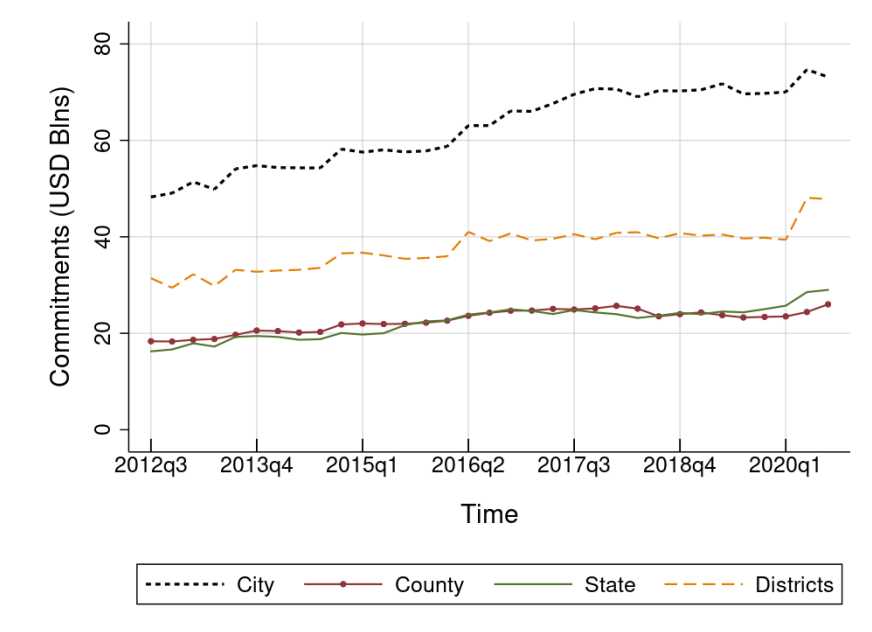


(b) Municipal Loan Exposure by Bank Size

Figure 1: Municipal Bank Loan Exposure. Panel A of this figure presents the total dollar amount of municipal bank loans outstanding over time, while panel B decomposes the total municipal into exposure held by banks with less than $10 billion, between $10 and $50 billion, and more than $50 billion in total assets. Source: Call Reports and FR-Y9C.

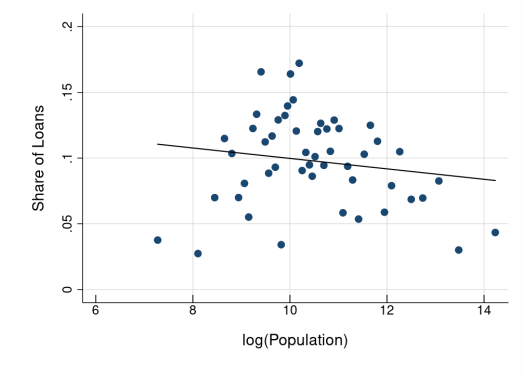


(a) Total Municipal Loans

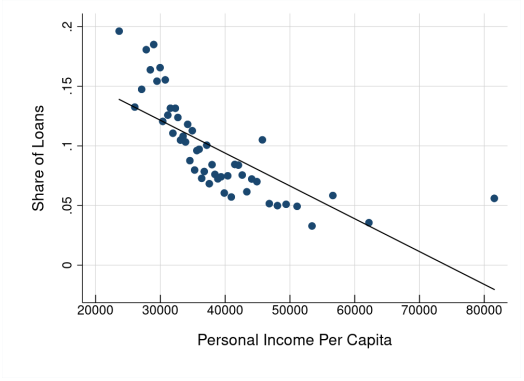


(b) Municipal Loans by Subdivision

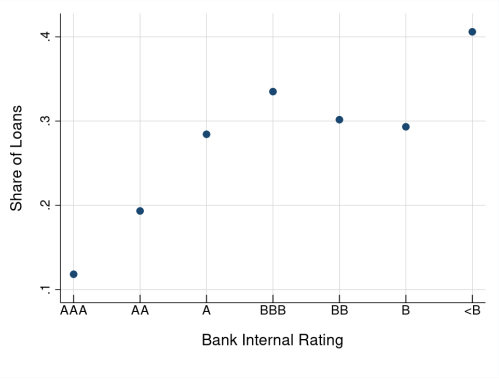
Figure 2: Municipal Bank Debt. Panel A of this figure presents the total dollar amount of utilized and committed loan exposure of Y-14 banks to municipalities during our sample period. Panel B presents the total dollar amount of commitments to different groups of municipal issuers over the sample period (states, counties, cities, and special districts).



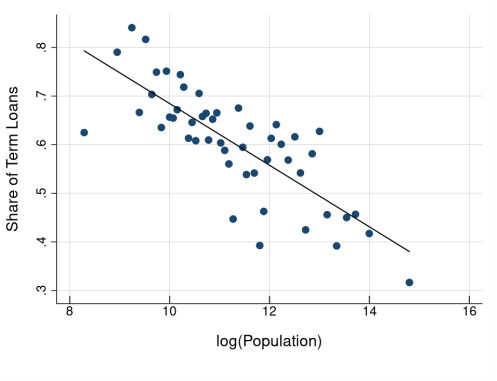
(a) Population



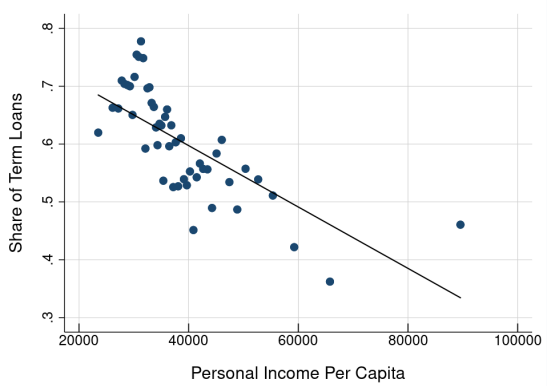
(b) Personal Income Per Capita



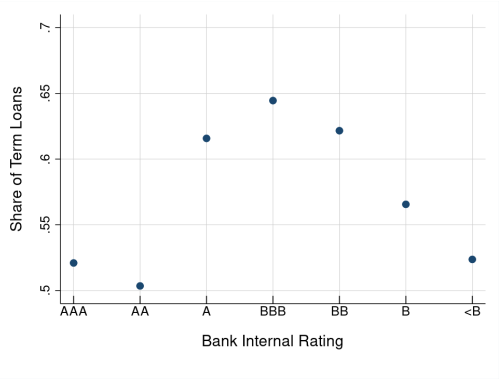
(c) Credit Rating



(d) Population



(e) Personal Income Per Capita



(f) Credit Rating

Figure 3: Municipal debt structure and county characteristics: This figure presents scatter plots of the relation between the share of bank loans (panels a, b, and c) or term loan share of local governments (panels d, e, and f) and key county characteristics and credit ratings. Bank debt share is defined as the the total dollar amount of bank loans (bank loan commitments) divided by the dollar value of total debt (bank loan commitments and municipal bonds). Term loan share is defined as the the total dollar amount of term loans divided by the dollar value of bank debt (bank loan commitments). The credit rating is the most conservative internal bank loan rating of the borrower in a 10-grade S&P scale. For the sake of presentation the scatter plot points are aggregated into 50 bins or less.

Table 1: Loan Characteristics. This table presents summary statistics (means) for key characteristics of bank loans to state, county, city, and special district governments. Committed and drawn amounts are expressed in million of US dollars, while remaining and original contract maturities are expressed in quarters. All other variables in this table are defined as in Appendix B.

	States	**Counties**	**Cities**	**Districts**
	Panel A: Major Loan Terms			
Credit Lines				
Fraction of all loans	0.414	0.220	0.230	0.221
Committed Amount	36.265	18.900	25.178	15.283
Drawn Amount	5.247	5.249	4.540	3.761
Utilization	0.293	0.420	0.425	0.460
Fraction Drawn	0.521	0.661	0.620	0.613
Interest Rate	0.029	0.032	0.030	0.029
Remaining Maturity	7.872	10.800	12.270	12.639
Original Maturity	20.140	22.313	24.804	26.451
N	22,921	16,706	47,890	21,730
Term Loans				
Fraction of all loans	0.338	0.587	0.591	0.586
Committed Amount	19.454	9.445	6.982	6.674
Interest Rate	0.029	0.029	0.029	0.029
Remaining Maturity	27.048	29.732	31.215	30.639
Original Maturity	41.271	45.839	46.736	47.063
N	18,608	43,375	117,736	55,266
	Panel B: Collateral and Contractual Provisions			
Credit Lines				
Secured	0.435	0.512	0.576	0.609
Senior Secured	0.386	0.471	0.513	0.553
Guaranteed	0.028	0.028	0.040	0.102
Fixed Rate	0.601	0.603	0.621	0.655
Prepayment Penalty	0.130	0.185	0.213	0.226
Tax Exempt	0.221	0.320	0.348	0.367
Syndicated	0.059	0.031	0.026	0.030
N	22,921	16,706	47,890	21,730
Term Loans				
Secured	0.787	0.835	0.793	0.819
Senior Secured	0.768	0.817	0.769	0.781
Guaranteed	0.030	0.021	0.016	0.032
Fixed Rate	0.753	0.897	0.914	0.907
Prepayment Penalty	0.352	0.440	0.420	0.409
Tax Exempt	0.566	0.606	0.685	0.584
Syndicated	0.046	0.019	0.016	0.010
N	18,608	43,375	117,736	55,266

Table 2: Bond-Loan Maturity Gap and the Cost of Bank Credit. This table presents the relation between bank loan interest rates at origination/renegotiation and the bond-loan maturity gap of municipal issuers. Loan interest rate is defined as the weighted average interest rate (in basis points) across all "new" loans of the same issuer at a given quarter weighted by loan amount; loan amount is defined as the sum of all "new" term loans commitments across different loans of the same issuer at a given quarter. The sample is restricted to term loans that are fixed-rate, tax-exempt, and bilateral (not syndicated). The bond-loan maturity gap is defined as the difference in the median remaining maturity of outstanding bonds and the median remaining maturity of bank loans. See Appendix B for additional variable definitions. The standard errors are clustered at the state level.

Dependent variable:	Loan Interest Rate					
	(1)	(2)	(3)	(4)	(5)	(6)
Maturity Gap	-1.713**	-1.449**	-1.299**			
	(0.705)	(0.609)	(0.588)			
Positive Gap				-11.228*		
				(6.379)		
Gap >5 Yrs					-18.815***	
					(6.535)	
Gap >10 Yrs						-34.812***
						(10.893)
Log(Loan Amount)		-10.428***	-6.885	-6.921	-6.387	-7.241
		(2.936)	(6.159)	(6.273)	(6.241)	(6.091)
Guaranteed		17.220	17.414	16.643	16.457	18.121
		(26.708)	(26.570)	(26.531)	(27.391)	(27.640)
Prepayment Penalty		-11.830**	-11.870**	-11.866**	-11.842**	-11.226**
		(5.459)	(5.532)	(5.587)	(5.477)	(5.433)
Secured		-52.798***	-52.717***	-52.875***	-52.774***	-52.886***
		(11.548)	(11.507)	(11.508)	(11.487)	(11.640)
Bond Yield			0.280	0.236	0.310	0.380
			(0.999)	(0.981)	(1.009)	(1.027)
Bonds Outstanding			-4.630	-5.278	-5.357	-5.576
			(6.986)	(7.023)	(7.020)	(7.095)
GO Bonds			13.645	14.872	15.018	14.956
			(20.969)	(20.406)	(20.703)	(21.106)
Fr. Bank Financing			-23.550	-24.733	-25.837	-19.852
			(42.384)	(42.854)	(42.255)	(42.901)
R^2	.637	.663	.664	.663	.664	.664
N	6711	6711	6711	6711	6711	6711
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Government Type FE	Yes	Yes	Yes	Yes	Yes	Yes
Internal Rating FE	Yes	Yes	Yes	Yes	Yes	Yes
Loan Rem Maturity X Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: Loan Share and Credit Rating Downgrades. This table presents the relation between county governments' bank loan share and credit quality deteriorations as measured by changes in bank internal risk ratings. Bank loan share is defined as the the total dollar amount of bank loans (bank loan commitments) divided by the dollar value of total debt (bank loan commitments and municipal bonds). We measure credit risk using the borrower's most conservative bank internal risk rating among all banks the borrower works with in a 10-grade S&P scale. This measure is only defined for county governments that have bank loans in their debt structure. Our regressions study the relation between loan share and downgrades at up to four lags. Columns (1) and (2) present results for all downgrade events and columns (3) and (4) present results whenever the borrower rating transitions from 'AAA', 'AA', or 'A' to 'BBB' or lower. See Appendix B for additional variable definitions. The standard errors are clustered at the borrower level.

Dependent variable:	Loan Share			
	All Downgrades		Large Downgrades	
	(1)	(2)	(3)	(4)
Downgrade_t	0.004**	0.005**	0.013**	0.013**
	(0.002)	(0.002)	(0.005)	(0.007)
Downgrade_{t-1}	0.003	0.003	0.008	0.009
	(0.002)	(0.003)	(0.006)	(0.007)
Downgrade_{t-2}	0.001	0.001	0.003	0.005
	(0.002)	(0.002)	(0.006)	(0.006)
Downgrade_{t-3}	0.000	0.000	0.002	0.003
	(0.002)	(0.002)	(0.005)	(0.005)
Downgrade_{t-4}	0.000	0.000	0.001	0.002
	(0.002)	(0.002)	(0.005)	(0.005)
$\text{Log(Population}_t\text{)}$		-0.014		-0.014
		(0.102)		(0.102)
$\text{Per-capita Income}_t$		-0.001		-0.001
		(0.001)		(0.001)
R^2	.937	.938	.937	.938
N	22143	21666	22143	21666
County FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	No	Yes	No
Internal Rating X Quarter FE	No	Yes	No	Yes

Appendix A

We identify municipal entities in the Y14 data set by using string search techniques. We first identify the following six groups of entities:

a) Cities/towns/townships/minor civil divisions: "CITY','TOWNSHIP", "TOWN OF", "VILLAGE OF", "BOROUGH";

b) Counties: "COUNTY", "PARISH";

c) States: "STATE", "COMMONWEALTH", "DISTRICT OF COLUMBIA";

d) Higher education institutions by filtering all entities with three-digit 2007 NAICS codes of "611";

e) Hospitals by filtering all entities with three-digit 2007 NAICS codes of "622";

f) Other entities that may be government entities within the following 2007 NAICS codes: "92", "48811", "4911", "519120" or 2007 NAICS code "22", "61", "712" whenever Y-14 field #26 takes the value of '8' (all other loans, excluding consumer loans).

We first keep all observations that meet any of the conditions from a) through f) and remove borrowers that are individuals or private households (three-digit NAICS code of "814"), foreign entities, religious non-profits and other types of outreach non-profits (2007 three-digit NAICS code of "813"). We then classify a borrower to be a "city" if the borrower name countains any of the keywords in a) above. We next classify a borrower to be a "county" if there are no keywords from a) in the borrower name but we identify at least one keyword from b). We then define a borrower to belong to the "state" category if the borrower name contains any of the words in c) but does not contain any words from a) and b). Last, we classify a borrower to be a "special district" if the borrower name field contains any of the following keywords: "DIST" together with the following phrases: "FIRE", "WATER", "UTILITY", "SCHOOL", "IRRI", "COLLEGE", "HEALTH", "LIBRARY", "PARK", "FOREST", "SEWER", "SANIT", "RESCUE", "TRANSIT", "COUNTY", "HOSPITAL", "CITY"; or it has the following phrases: "MUNICIPAL", "AUTHORITY", "METROPOLITAN", "BRIGADE"; "SCHOOL", "USD #", "CUSD", "HSD", "CSD".

One disadvantage with the classification algorithm so far is that we are likely to omit municipalities in the Y-14 data that do no contain any of the keywords above. Given that, we supplement the identification procedure using the complete list of municipality names from the Census website.

Specifically, we match all government and not-for-profit borrowers in the Y-14 data to the list of municipalities in the Census using the zipcode of each borrower. We then apply the following sequence of steps:

1) If the Census City field is contained within the borrower name field, we define to entity to belong to a city government.

2) We next classify entities to belong to the county level if the the borrower name does not contain the Census City field but it contains the Census County name field.

3) If the borrower name contains neither the Census City nor the Census County fields but it contains the Census State filed, we classify the entity into the "state" category.

4) We update the previous classification based solely on the borrower name with the current classification based on the Census match.

We drop all colleges and hospitals if we are unable to match these to a "special district" entity. We then drop all observations that we are unable to classify using either the borrower name classification or the Census match. Finally, we manually inspect the borrower name field and drop any observations where we have misclassified private non-profits, private companies and corporations, and tribal governments as state and local governments.

Appendix B - Variable Definitions

Below we present variable definitions for the municipal loan data coming from the FR-Y-14Q Collection. The item numbers of data fields refer to Schedule H1 of the Y-14Q data on the Federal Reserve's website:

$https://www.federalreserve.gov/reportforms/forms/FR\_Y-14Q20201231\_i.pdf$

Committed Amount – The commitment amount of a given municipal bank loan in millions of U.S. dollars (field #24 in Schedule H1).

Drawn Amount – The drawn amount under a given municipal bank credit line in millions of U.S. dollars (field #25 in Schedule H1).

Utilization – The drawn amount under a given municipal bank credit line as a fraction the commitment amount of the same loan.

Fraction Drawn – The fraction of credit lines that have been drawn in our loan-quarter panel.

Interest Rate – The interest rate of a given municipal bank loan (field #38 in Schedule H1).

Remaining Maturity – The difference between the maturity date of a given municipal bank loan (based on the maturity date field #19 in Schedule H1) and the current observation date expressed in quarters.

Original Maturity – The difference between the maturity date of a given municipal bank loan (field #19 in Schedule H1) and the origination date of the same loan (field #18 in Schedule H1) expressed in quarters.

Secured – We define a municipal bank loan to be secured if either the bank has first-lien or second-lien security on the borrower's assets or cash flows (based on fields #35 and #36 in Schedule H1).

Senior Secured – We define a municipal bank loan to be senior secured if the bank has first-lien security on the borrower's assets or cash flows (field #35 in Schedule H1 takes the value of 1).

Guaranteed – We define a municipal bank loan to be guaranteed if the loan is guaranteed by a third-party (field #44 in Schedule H1 takes the value of 1, 2, or 3).

Fixed Rate – We define a municipal bank loan to be fixed rate if the loan interest rate does not vary with base rate indexes such as the LIBOR or prime rates (field #37 in Schedule H1 takes the value of 1).

Prepayment Penalty – We define a municipal bank loan to have a prepayment penalty if the loan currently has a prepayment penalty or it had a prepayment penalty in the past that has expired (field #94 in Schedule H1 takes the value of 1 or 2).

Tax-Exempt – A municipal bank loan is identified in the Y-14 data as tax-exempt if the interest income the bank receives from the loan is tax-exempt (field #43 in Schedule H1 takes the value of 2).

Syndicated – We define a municipal bank loan to be syndicated if is identified in Y-14 to be syndicated (field #34 in Schedule H1 takes the value of 2, 3, 4, or 5 or field #100 takes the value of 1, 2, 3, or 4).

Maturity Gap – Defined as the difference between the median remaining maturity of the borrower's outstanding bonds and the median maturity of newly-originated/renegotiated loans of a given borrower i in quarter t.

Positive Gap – Takes the value of 1 whenever *Maturity Gap* of a given borrower i in quarter t is positive and zero otherwise.

$Gap > 5\ Yrs$ – Takes the value of 1 whenever *Maturity Gap* of a given borrower i in quarter t is greater than 5 years and zero otherwise.

$Gap > 10\ Yrs$ – Takes the value of 1 whenever *Maturity Gap* of a given borrower i in quarter t is greater than 10 years and zero otherwise.

Bond Yield – The weighted average bond yield across all outstanding bonds of a given borrower i in quarter t.

Bonds Outstanding – The natural log of the total dollar amount of bonds outstanding of a given borrower i in quarter t.

GO Bonds – The dollar value of general obligation bonds as a fraction of total dollar value of outstanding bonds of a given borrower i in quarter t.

Fr. Bank Financing – The dollar value of bank financing as a fraction of the dollar value of total financing (bank financing plus bond financing) of a given borrower i in quarter t.

Loans Share – defined as the sum of bank loan commitments (field #24) of a given county government i divided by the sum of bank loan commitments and all outstanding municipal bonds for the same county government in quarter t.

Term Loan Share – defined as the committed amounts under the term loans of a given county

i (based on fields #20 and #24) divided by the total committed amounts under all banks loans (field #24) for the same county in quarter t.

Internal Rating – This variable is only defined for the counties with bank debt in Schedule H1 of the Y-14Q data. This is the municipal borrower internal credit rating assigned by the bank (field #10 in Schedule H1 of the Y-14Q data) converted to a 10-grade S&P ratings scale, with 1 denoting AAA and 10 denoting D.

Below we present variable definitions for the county economic data coming from the Bureau of Economic Analysis:

$https://www.bea.gov/data/income-saving$

$Log(Population)$ – The log of the population count in a given county-year.

$Personal\ per-capita-income$ – The personal income per-capita in a given county-year.

Appendix C - Comparison Sample Construction

We compare newly-issued bank loans of a given borrower to the pre-existing municipal bonds of the same borrower in order to understand the extent to which claim dilution occurs in practice. To make such comparison feasible, we match the bank loans of a given borrower to the municipal bonds of the exact same borrower using the bank-provided 6-digit CUSIP of the borrower.

The Y-14 data set provides the 6-digit CUSIP for only a fraction of the original Y-14 sample we present in Table 1. Specifically, we have a total of 4,228 distinct municipal CUSIPs in the Y-14 data set for which we idenify issuers in the Mergent bond data; these CUSIPs correspond to 97,141 loan-quarter observations from 2012Q3 through 2020Q3. Table A2 shows that term loans and credit lines in the full sample from Table 1 are fairly similar to the observations with available CUSIPs with the exception of loan amounts (larger in the full sample) and the fraction of secured loans (larger in the CUSIPs sample). All other variables display economically small differences and appear comparable between the two samples.

Overall, relying on this subset of our initial data set is unlikely to affect the generalizability of our results as our analysis focuses on remaining maturities, a dimension of the data that appears similar in both samples. We acknowledge that higher loan collateralization in the CUSIPs subsample may also lead to greater potential dilution of bonds than in the full sample. To alleviate such concerns, our empirical tests on the bond-loan maturity gap account for collateralization of bank loans.

In each quarter we then sum all newly-issued loans of a given municipality and create amount-weighted averages of the interest rate, remaining maturity, as well as fixed-rate, guarantee, prepayment, and security provisions across these loans. Last, for each borrower-quarter we calculate the most conservative borrower internal rating across all lenders on a uniform ten-grade S&P scale.[14]

For every quarter and municipal borrower in the Mergent database, we compute the total dollar value of outstanding bonds as well as the amount-weighted averages of bond yields, original maturities, remaining maturities, and the fraction of general obligation bonds. We also obtain the maximum remaining maturities of each issuer-quarter. We match the borrower-quarters from the Y-14 data to the borrower-quarters in the bonds data. In any quarter, we merge in the total

[14]The heterogeneous designs of banks' internal ratings systems makes direct cross-sectional comparisons difficult. In order to generate a consistent credit rating that allows cross-bank comparisons, the Y-14 lenders provide concordance maps to a uniform S&P ten-grade scale.

outstanding amount of bonds, average bond yields and original maturities, the fraction of bonds that are general obligation, as well as the maximum and median maturities of outstanding bonds.

We exclude credit lines from the analysis for several reasons that make comparisons with bonds difficult. Even though the short maturities typical of credit lines (see Table 1) may mean they are dilutive to pre-existing bond holders, the average utilization ratio of drawn credit lines-quarters is only between 29% and 46% and a substantial fraction of lines have zero outstanding drawn amount. In other words, credit lines may have the potential to dilute bond holders in the future but seem unlikely to do so currently. Another reason for excluding credit lines from the comparison analyses is that they may not be substitutable with municipal bonds and may be used for different purposes from term loans (such as short-term working capital financing).

We also exclude lease agreements. Even though these obligations may be more comparable with municipal bonds, leases are secured by specific assets rather than governments' revenue streams or the governments' full faith promise to repay debt which makes them dissimilar to GO and revenue municipal bonds. To further assure the comparability between loans and bonds we exclude term loans that are not fixed rate, tax-exempt, and bilateral. Collectively, imposing this restriction reduces our sample to 26,093 loan-quarter observations. As a robustness test, in Appendix D we relax these restrictions and include leases as well as term loans that are floating rate, taxable, or syndicated. Our results in Table A3 are very similar to the ones presented in Table 2.

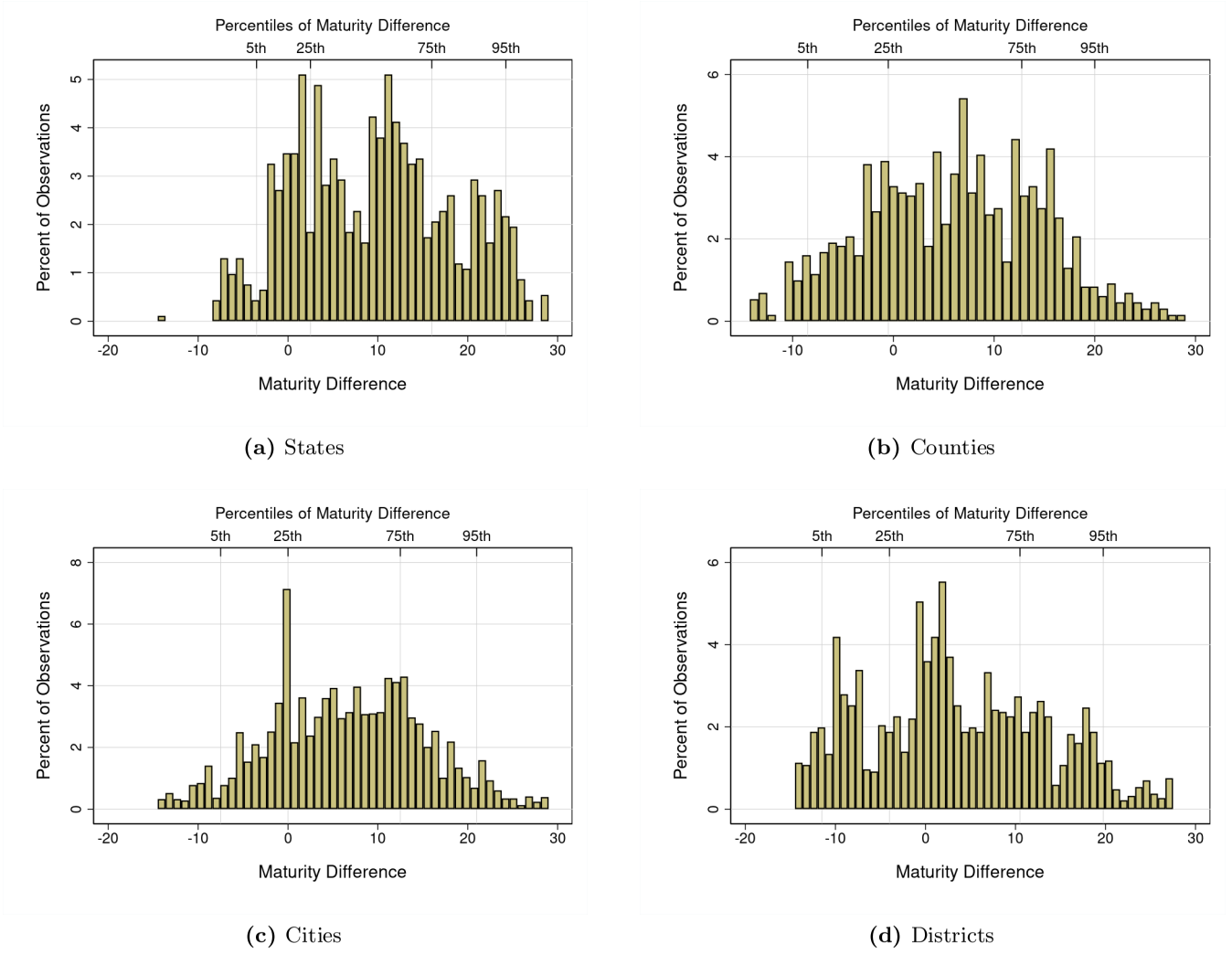
Finally, we define the set of newly-issued loans to include both loan renegotiations and originations given loan renegotiation is frequent (see a more detailed discussion in Section 2). From the perspective of bond holders, renegotiation of existing bank loans and new bank loans are economically equivalent as both involve the addition of new loan terms that may impact the effective priority of bonds. Following Roberts and Sufi (2009), we define renegotiations as any change to the amount, interest rate, and the maturity of the loan. We define originations as any observation that corresponds to a new loan ID as defined by the lender. Renegotiations comprise approximately 51.8% of all loan-quarter observations while originations account for about 8.2% of loan-quarters of the 26,293 loan-quarter observations above. Focusing on the subsample of renegoations and originations leaves us with 15,529 loan-quarter observations.

Appendix D - Bond-Loan Maturity Difference using the Full Sample of Municipal Governments

In additional robustness analysis, we relax the restrictions imposed in Table 2 by including leases, as well as floating rate, syndicated, and taxable term loans. We do so to alleviate concerns that these restrictions lead to a selected sample of borrowers. We include leases in the sample as they are more similar to term loans than credit lines and may also be dilutive to bondholders. For similar reasons we also include floating rate, syndicated, and taxable term loans. We nevertheless control for loan heterogeneity in our regression specifications in Table A3 by including the fraction of financing for each borrower-quarter that is tax exempt, syndicated, fixed-rate, or in the form of lease agreements.

Figure A2 shows that similar to the findings in Figure A1, approximately 75% of newly-originated or renegotiated loans are dilutive to the bondholders at the long end of the maturity spectrum. In Table A3, we use a very similar set of fixed effects and controls as those in Table 2. We obtain very similar results to the ones presented in Table 2, showing that the restrictions we have imposed in Table 2 are not consequential.

Appendix E - Additional Figures and Tables



(a) States

(b) Counties

(c) Cities

(d) Districts

Figure A1: Maturity difference between municipal bonds and loans of the same municipal issuer. This figure presents the difference in maximum remaining maturity between municipal bonds and the weighted-average maturity of newly-originated or renegotiated bank loans of each municipal issuer. The sample of bank loans used to construct this figure is comprised of all fixed-rate, tax-exempt, bilateral term loans. Panels (a) through (d) present distributions for state, county, city, and special districts governments, respectively.

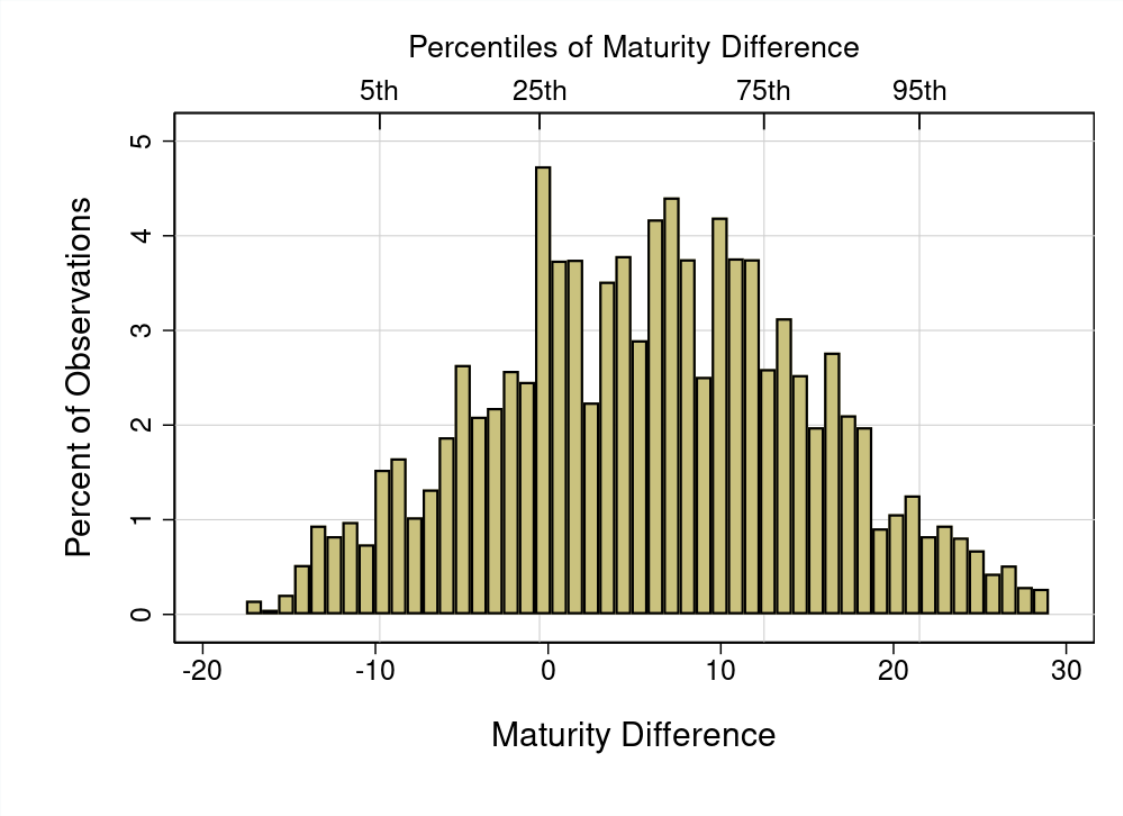


Figure A2: Maturity difference between municipal bonds and loans of the same municipal issuer. This figure presents the difference in maximum remaining maturity between municipal bonds and the weighted-average maturity of newly-originated or renegotiated bank loans of each municipal issuer. The sample of bank loans used to construct this figure is comprised of all term loans and leases.

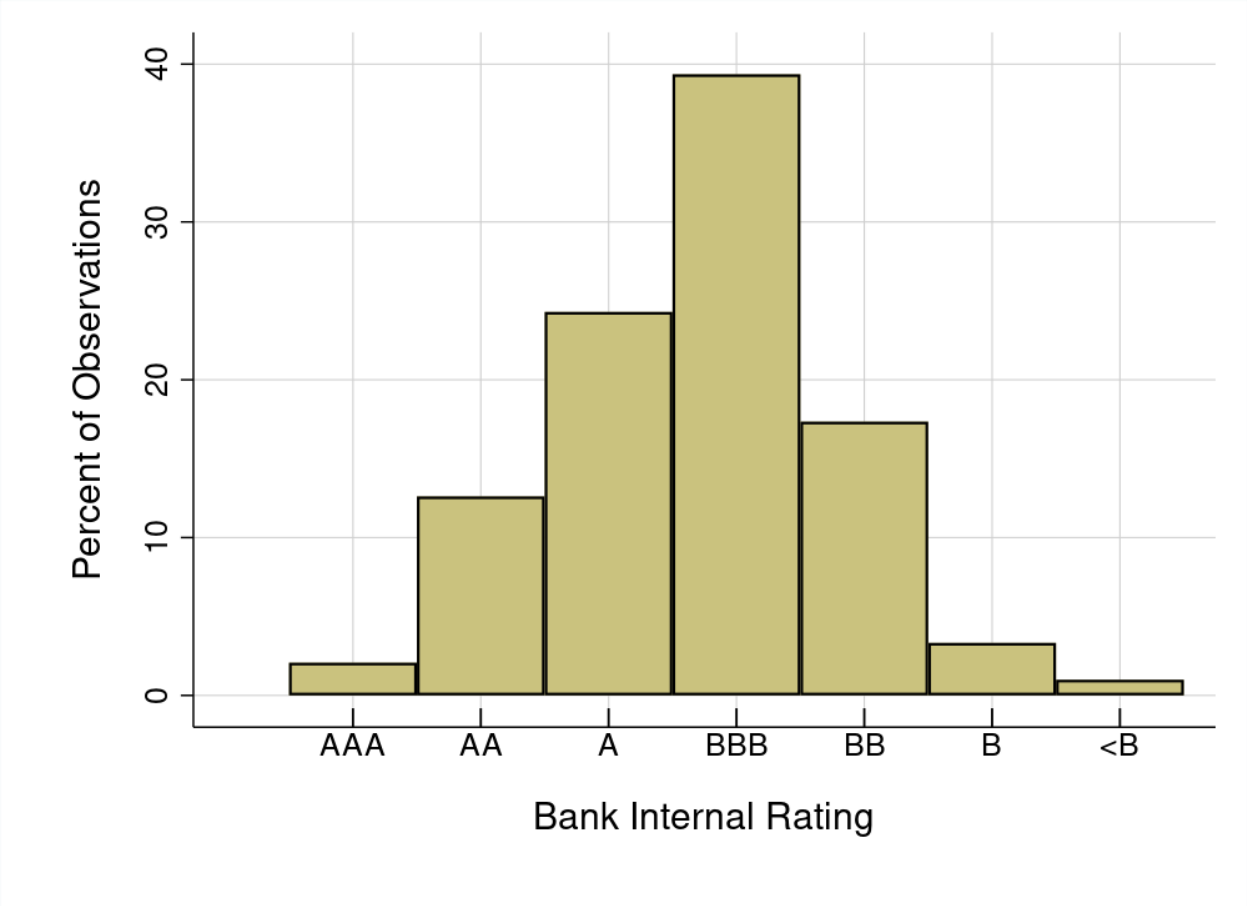


Figure A3: Credit Ratings of County Governments. This figure presents the credit ratings distribution of county government-quarters in our sample based on banks' internal risk ratings in a common 10-grade S&P scale. Whenever municipal borrowers have loan commitments with multiple banks in a given quarter, we take the most conservative rating across these banks. All ratings below 'B' are aggregated in one bucket in light of the few observations in these rating categories.

Table A1: Characteristics of Leases. This table presents summary statistics (means) for key characteristics of bank-originated leases to state, county, city, and special district governments. Committed and drawn amounts are expressed in millions of US dollars, while remaining and original contract maturities are expressed in quarters. All other variables in this table are defined as in Appendix B.

	States	**Counties**	**Cities**	**Districts**
Major Loan Terms				
Fraction of all loans	0.151	0.144	0.124	0.136
Committed Amount	5.749	4.835	4.748	4.002
Interest Rate	0.030	0.029	0.030	0.032
Remaining Maturity	24.022	26.661	29.494	31.114
Original Maturity	34.891	36.896	40.449	41.916
N	8,194	10,350	24,244	12,744
Collateral and Contractual Provisions				
Secured	0.987	0.995	0.989	0.988
Senior Secured	0.978	0.995	0.988	0.987
Senior Unsecured	0.013	0.004	0.007	0.005
Guaranteed	0.005	0.008	0.008	0.003
Fixed Rate	0.975	0.983	0.988	0.991
Prepayment Penalty	0.342	0.328	0.382	0.412
Tax Exempt	0.660	0.679	0.692	0.645
Syndicated	0.007	0.001	0.006	0.003
N	8,194	10,350	24,244	12,744

Table A2: Sample Differences. This table presents sample difference between the full sample we work with in Table 1 and the sample of loans with available 6-digit CUSIPs. We present means, medians, and differences in means, together with the statistical significance of the difference in means tests. All variables in this table are defined as in Appendix B.

	Full Sample		CUSIPs Sample		
	Mean	**Median**	**Mean**	**Median**	**Difference**
Term Loans					
Loan Amount	11.555	4.305	8.270	3.405	3.285
Interest Rate	0.028	0.025	0.029	0.027	-0.001
Remaining Maturity	27.452	25.000	30.108	29.000	-2.656
Secured	0.660	1.000	0.802	1.000	-0.142
Fixed Rate	0.902	1.000	0.891	1.000	0.010
Prepayment Penalty	0.456	0.000	0.415	0.000	0.040
Tax Exempt	0.621	1.000	0.619	1.000	0.002
Syndicated	0.022	0.000	0.017	0.000	0.005
Credit Lines					
Committed Amount	41.714	10.356	24.028	4.777	17.687
Drawn Amount	4.764	0.012	4.418	0.231	0.346
Interest Rate	0.037	0.028	0.034	0.027	0.004
Remaining Maturity	8.406	5.000	10.974	5.000	-2.568
Secured	0.470	0.00	0.544	1.000	-0.074
Fixed Rate	0.549	1.000	0.586	1.000	-0.037
Prepayment Penalty	0.137	0.000	0.193	0.000	-0.056
Tax Exempt	0.270	0.000	0.308	0.000	-0.039
Syndicated	0.030	0.000	0.034	0.000	-0.004
Leases					
Loan Amount	5.591	2.729	4.805	2.391	0.786
Interest Rate	0.029	0.027	0.031	0.028	-0.001
Remaining Maturity	27.256	21.000	28.710	25.000	-1.454
Secured	0.990	1.000	0.990	1.000	-0.000
Fixed Rate	0.995	1.000	0.986	1.000	0.010
Prepayment Penalty	0.437	0.000	0.374	0.000	0.064
Tax Exempt	0.682	1.000	0.656	1.000	0.026
Syndicated	0.009	0.000	0.004	0.000	0.005

Table A3: Bond-Loan Maturity Gap and Loan Pricing: Robustness. This table presents the relation between bank loan interest rates at origination/renegotiation and the bond-loan maturity gap of municipal issuers. Loan interest rate is defined as the weighted average interest rate (in basis points) across all "new" loans of an issuer in a given quarter weighted by loan commitment amount; the loan amount is defined as the sum of all "new" term loans and lease commitments across different loans of the same issuer in a given quarter. The bond-loan maturity gap is defined as the difference in the median remaining maturity of outstanding bonds and the median remaining maturity of bank loans. See Appendix B for additional variable definitions. The standard errors are clustered at the state level.

Dependent variable:	Loan Interest Rate			
	(1)	(2)	(3)	(4)
Maturity Gap	-1.571**	-1.374**	-1.425***	
	(0.608)	(0.539)	(0.537)	
Positive Gap				-13.851**
				(5.650)
Log(Loan Amount)		-12.539***	-6.770	-6.822
		(2.398)	(4.742)	(4.730)
Tax Exempt		-68.064***	-68.294***	-68.777***
		(9.605)	(9.596)	(9.548)
Guaranteed		33.409	32.777	32.264
		(20.762)	(21.075)	(20.982)
Fixed Rate		13.419	13.105	13.878
		(16.451)	(16.143)	(15.991)
Prepayment Penalty		8.743	8.693	8.665
		(5.462)	(5.481)	(5.520)
Syndicated		-17.291	-17.762	-17.012
		(14.019)	(14.024)	(13.917)
Secured		-54.253***	-54.872***	-55.133***
		(8.903)	(8.605)	(8.653)
Lease		23.664***	23.782***	23.796***
		(7.617)	(7.657)	(7.583)
Bond Yield			3.182*	3.107*
			(1.779)	(1.769)
Bonds Outstanding			-5.202	-5.432
			(5.208)	(5.249)
GO Bonds			-0.142	0.134
			(11.502)	(11.334)
Fr. Bank Financing			-42.889	-42.669
			(29.490)	(29.343)
R^2	.524	.577	.579	.579
N	15435	15435	15435	15435
County FE	Yes	Yes	Yes	Yes
Government Type FE	Yes	Yes	Yes	Yes
Internal Rating FE	Yes	Yes	Yes	Yes
Loan Rem Maturity X Quarter FE	Yes	Yes	Yes	Yes

Table A4: Loan Share and Credit Rating Downgrades: County Size Quartiles. This table presents the relation between county governments' bank loan share and credit quality deteriorations as measured by changes in bank internal risk ratings. The bank loan share is defined as the the total dollar value of bank loans (bank loan commitments) divided by the dollar value of total debt (bank loan commitments plus municipal bonds). We measure credit risk using the borrower's most conservative bank internal risk rating among all banks the borrower works with in a 10-grade S&P scale. This measure is only defined for county governments that have bank loans in their debt structure. Our regressions study the relation between loan share and downgrades at up to four lags. Columns (1) through (4) present results for all downgrade events and columns (5) through (8) present results for 'large downgrades' – whenever the borrower rating transitions from 'AAA', 'AA', or 'A' to 'BBB' or lower. The county size quartiles are defined in terms of county population – Q1 corresponds to the least populous quartile and Q4 to the most populous. See Appendix B for additional variable definitions. The standard errors are clustered at the borrower level.

Dependent variable:	Loan Share							
	All Downgrades				Large Downgrades			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size Quartiles	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Downgrade_t	-0.007	0.017**	0.011*	0.003**	-0.014	0.029**	0.035**	0.001
	(0.006)	(0.007)	(0.006)	(0.001)	(0.014)	(0.014)	(0.016)	(0.005)
Downgrade_{t-1}	0.003	0.020**	-0.006	-0.002	0.004	0.019	0.007	-0.004
	(0.008)	(0.008)	(0.007)	(0.002)	(0.018)	(0.014)	(0.017)	(0.005)
Downgrade_{t-2}	0.003	0.008	-0.004	-0.000	0.010	0.008	0.000	-0.002
	(0.007)	(0.008)	(0.005)	(0.001)	(0.018)	(0.012)	(0.012)	(0.004)
Downgrade_{t-3}	0.001	0.005	-0.005	-0.000	0.005	0.004	-0.002	-0.002
	(0.006)	(0.007)	(0.005)	(0.001)	(0.017)	(0.010)	(0.011)	(0.003)
Downgrade_{t-4}	0.003	0.004	-0.004	-0.000	0.012	0.001	-0.000	-0.003
	(0.006)	(0.006)	(0.004)	(0.002)	(0.017)	(0.009)	(0.010)	(0.003)
$\text{Log(Population}_t)$	0.197	-0.338	-0.192	0.247**	0.196	-0.330	-0.191	0.247**
	(0.246)	(0.314)	(0.163)	(0.119)	(0.245)	(0.314)	(0.163)	(0.119)
$\text{Per-capita Income}_t$	0.003	-0.001	-0.001	-0.000	0.003	-0.001	-0.001	-0.000
	(0.002)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)	(0.001)	(0.001)
R^2	.914	.917	.913	.968	.914	.917	.913	.968
N	5395	5387	5396	5404	5395	5387	5396	5404
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal Rating X Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A5: Loan Share and Credit Rating Downgrades: Income Quartiles. This table presents the relation between county governments' bank loan share and credit quality deteriorations as measured by changes in bank internal risk ratings. The bank loan share is defined as the the total dollar value of bank loans (bank loan commitments) divided by the dollar value of total debt (bank loan commitments plus municipal bonds). We measure credit risk using the borrower's most conservative bank internal risk rating among all banks the borrower works with in a 10-grade S&P scale. This measure is only defined for county governments that have bank loans in their debt structure. Our regressions study the relation between loan share and downgrades at up to four lags. Columns (1) through (4) present results for all downgrade events and columns (5) through (8) present results for 'large downgrades' – whenever the borrower rating transitions from 'AAA', 'AA', or 'A' to 'BBB' or lower. The county per-capital income quartiles are defined in terms of county per-capita income – Q1 corresponds to the quartile with the lowest per-capita income and Q4 to the one with the largest. See Appendix B for additional variable definitions. The standard errors are clustered at the borrower level.

Dependent variable:	Loan Share							
	All Downgrades				Large Downgrades			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income Quartiles	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Downgrade_t	0.004	0.001	0.010*	0.001	0.002	0.006	0.031**	-0.001
	(0.006)	(0.005)	(0.006)	(0.002)	(0.012)	(0.011)	(0.015)	(0.008)
Downgrade_{t-1}	0.010	0.009	0.006	-0.002	0.016	0.020	0.011	-0.000
	(0.008)	(0.006)	(0.007)	(0.002)	(0.016)	(0.013)	(0.014)	(0.009)
Downgrade_{t-2}	0.007	0.003	0.005	-0.001	0.012	0.012	0.007	-0.002
	(0.007)	(0.004)	(0.005)	(0.002)	(0.014)	(0.012)	(0.011)	(0.006)
Downgrade_{t-3}	0.006	0.001	0.003	-0.001	0.011	0.003	0.000	-0.000
	(0.007)	(0.003)	(0.005)	(0.002)	(0.014)	(0.008)	(0.011)	(0.004)
Downgrade_{t-4}	0.007	0.002	-0.001	-0.001	0.009	-0.001	-0.000	-0.001
	(0.006)	(0.003)	(0.003)	(0.002)	(0.013)	(0.007)	(0.007)	(0.003)
$\text{Log(Population}_t\text{)}$	0.183	-0.278	0.040	-0.105	0.183	-0.281	0.038	-0.104
	(0.295)	(0.241)	(0.227)	(0.115)	(0.291)	(0.242)	(0.229)	(0.114)
$\text{Per-capita Income}_t$	0.012*	0.011**	0.003	-0.000	0.012*	0.011**	0.003	-0.000
	(0.007)	(0.004)	(0.003)	(0.001)	(0.007)	(0.004)	(0.003)	(0.001)
R^2	.926	.961	.962	.969	.926	.961	.962	.969
N	5383	5372	5385	5393	5383	5372	5385	5393
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal Rating X Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes