The Price of Diversity: Evidence from Municipal Bonds

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Abstract: This paper studies how the racial and ethnic demographic composition of U.S. municipalities is priced in the municipal bonds market. It leverages high-frequency financial data on the universe of municipal bonds issued between 2004 and 2019. More diverse cities pay higher costs on their debt: up to +10 basis points of yield-spread (+6%) per standard deviation increase of Black and Latino population shares, equivalent to +3.8% in total interest costs for the average bond. This holds controlling for maturity structure and credit ratings. Causal estimates of this *diversity premium* are based on a novel implementation of shift-share instruments for Black and Latino population shares. The effect is not driven by income, population trends, municipal revenues, amount of outstanding debt, or tax capacity of the issuers. The results are consistent with the discrimination of racial and ethnic minorities in the primary market for municipal bonds. Discrimination is not present in credit ratings and does not occur because of the underwriters involved in the issuance process. This evidence carries important implications for our understanding of public investments and the provision of public goods in local governments.

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1 Introduction

Local governments in the U.S. are key providers of public goods (Trounstine, 2020). These include essential infrastructure like roads, sewage, and waste treatment facilities, local and regional transit, housing, fire and police protection. These goods and services are paid for with a combination of taxes and debt. Municipal bonds are the primary source of capital, a $4 trillion market (MSRB, 2023). Understanding how municipal bonds are priced and what drives the borrowing costs of local government is therefore critical to understand their investment decisions and the resulting provision of public goods.

A lot of attention has been given to how local expenditures are affected by preferences and composition of the electorate. Dating back at least to the seminal work of Alesina et al. (1999), a vast literature in political economy has studied how the ethnic diversity of local communities influences public spending. Much less attention has been paid to how local governments finance their expenditures, and to what explains the cost of providing public goods. This paper studies the effect of the racial and ethnic demographic composition of U.S. municipalities on the borrowing costs they face in the municipal bonds market.

Most of the literature suggests that diversity in some form – ethnic fractionalization, racial segregation, political representation of minorities, or simply the share of non-White population – is associated with the underprovision of public goods (Alesina et al., 1999; Hopkins, 2009; Trounstine, 2016; Beach and Jones, 2017).[1] The intuition behind this result is that different racial and ethnic groups have heterogeneous preferences for public goods, in terms of quantity and type, creating gridlock. Even under the assumption of homogeneous preferences, different groups might dislike paying for others having access to shared goods. This conflict of interests results in disagreement over spending, and ultimately in underprovision. The mechanisms identified are primarily focused on the demand for public goods by citizens (Habyarimana et al., 2007).

This paper takes a step back and estimate the effect of diversity - measured as non-White share of the population - on the borrowing costs paid by municipalities when issuing bonds. The presence of a diversity premium could explain, at least in part,

[1] Gisselquist (2014) warns that the negative correlations reported by Alesina et al. (1999) are quite sensitive to the specification used, and depend on the specific categories of spending considered. In this respect, my paper is relevant specifically for capital spending categories.

the underprovision of public goods as a result of higher costs for raising capital to invest. To do so, I collect data on the universe of municipal bonds issued between 2004 and 2019 by cities and towns in the U.S. (SDC, 2021). I measure borrowing costs as yield-spreads, the difference between the tax-adjusted yield-to-maturity of a bond and a risk-free benchmark (Schwert, 2017; Babina et al., 2021; Garrett et al., 2023). The spread accounts for the varying tax advantages of bonds across states, and for differences in the risk structure of the bonds issued.

I find that municipalities with higher non-White shares of population pay significantly higher costs on their debt. The effect is economically meaningful: one standard deviation increase in the population share of Blacks increases the yield-spread by 10 basis points on average (+6%), or the total interest costs on the average bond by 3.8%; a one standard deviation increase in Latinos increases the yield-spread by 4.6 basis points and the total interest costs by 1.8% on average. The effect for Latinos is much stronger in the U.S. South, where one standard deviation increase can lead to +31 basis points in yield-spread and a 11.8% increase in total interest costs on average.

My empirical strategy controls for a number of economic fundamental drivers of risk - sociodemographic characteristics of the issuers, their revenues, expenditures, and outstanding debt - as well as prevailing market conditions, the maturity structure, and credit ratings of the bonds.

There may be concerns about endogeneity due to unobserved fundamentals correlated with the Minority share or with the selection of municipalities into the sample of issuers. To account for these potential sources of endogeneity, I employ a novel implementation of shift-share instruments for the share of minorities in the population. I rely on the Great Migration flows of 1940-1970 for the share of Blacks (Boustan, 2010; Derenoncourt, 2022; Calderon et al., 2023), and international migration flows for the shares of Blacks and Latinos (Mayda et al., 2022, 2023).[2] The instruments capture an arguably exogenous component of shares of minorities predicted by migration flows. I adapt the instruments to the most recent advances in the shift-shares literature based on Borusyak et al. (2022) and Borusyak and Hull (2023). By recentering the instruments controlling for the sum-of-shares used to construct them, my IV analysis relies only on the plausible exogeneity of the flows for identification, while allowing

[2] A shift-share IV similar to Mayda et al. (2022) and Mayda et al. (2023) has been recently applied to municipal bonds by Gordon and Guerron-Quintana (2024). They show that municipalities more exposed to migration issue more debt, suggesting this is because population growth makes future repayments easier.

the pre-determined shares to be endogenous. This is possibly one of the first papers implementing these new robustness strategies in the context of shift-share instruments for population composition.

The controls included in the main specification rule out a number of mechanisms. The diversity premium is not driven by income effects or population trends – more diverse municipalities being poorer or undergoing periods of population decline, affecting their riskiness as borrowers – nor by municipal revenues, outstanding debt, or tax capacity of the issuers – more diverse municipalities relying more heavily on debt overall, or having a smaller tax base to service debt. Additional robustness checks show that the effect of diversity is not confounded by crime, other liabilities like public pension obligations, state-level market conditions at the time of issuance, nor political representation of minorities in city councils. Instead, the results are consistent with the discrimination of racial and ethnic minorities in the primary market for municipal bonds.

An important limitation is that I cannot disentangle whether discrimination is statistical or taste-based. In contrast to existing papers on discrimination, municipal bonds do not offer an objective benchmark of whether they are priced fairly. For example, in the case of motor vehicle searches (Knowles et al., 2001), we can observe whether the stop found a violation. For mortgages (Berkovec et al., 1998), we can measure loan performance based on timely payments. In the case of municipal bonds, however, defaults are extremely rare (Moody's, 2022), and I do not have information on smaller failures like delayed payments. It is worth pointing out that these events are recorded by the rating agencies and would presumably enter the credit rating assigned to bonds, which I control for. As a result, more diverse municipalities could be statistically riskier borrowers on average and differences in expected risk could explain the occurrence of statistical discrimination. On the contrary, if the premium in yields is the result of a dislike of investors for diverse communities, with no justification in terms of risk, the discrimination would be taste-based. Market yields are an endogenous equilibrium outcome, and the absence of an objective measure of risk for municipal bonds makes it impossible to disentangle the two types of discrimination. Moreover, if either form of discrimination happens at the market level, looking at secondary market trading would present the same limitations.[3]

[3] On the topic of discrimination, Jenkins (2021) offers an insightful case study on debt and the making of San Francisco in the second half of the 20th century, and how debt has been used for the

While I cannot disentangle statistical and taste-based discrimination, I can test where this discrimination may be happening during the issuance process. The evidence suggests that there is no discrimination in credit ratings, and that it does not occur because of the underwriters – usually investment banks – involved in the issuance process. Municipalities with higher non-White shares of population are not more likely to receive worse credit ratings for otherwise equivalent municipal bonds. Including fixed effects for the underwriters of each bond does not cancel our the effect of diversity. Nor do underwriters make higher profits in dealing with issues from more diverse communities. The diversity premium originates in the primary market for bonds.

To the best of my knowledge, this paper is one of the most comprehensive studies on diversity and the municipal bonds market, with a focus on U.S. cities. Rugh and Trounstine (2011) show that more diverse communities see fewer bond elections. Conditional on being proposed, these bonds are larger presumably because of the need to satisfy more diverse preferences, and are more likely to be approved as a result. Bergstresser et al. (2013) county-level analysis shows a positive correlation between the religious and ethnic fractionalization of an issuer and the offering yield of bonds. Dougal et al. (2019) show that historically black colleges and universities pay higher underwriting fees on school bonds. Similarly, Eldemire-Poindexter et al. (2022) confirm the positive correlation between the share of Black population at the county level and yields on municipal bonds of Bergstresser et al. (2013). They show this correlation is stronger in states with higher racial resentment, arguing that this is the result of discrimination. Recently, Smull et al. (2023) report a similar positive correlation between the share of Black population and yield-spreads on a cross-section of municipal bonds in 2022.
I contribute to this emerging literature by focusing on U.S. cities, rather than pooling together different levels of local jurisdictions, and by showing a robust effect of diversity on a precise measure of borrowing costs. Relative to the existing research, my measure of borrowing costs takes into account the tax advantages and a credible risk-free benchmark of municipal bonds: the yield-spread allows for a clean comparison of bonds across a panel of issuers, without confounding the estimates with nominal differences in taxation or maturity structure. Importantly, diversity matters not only in terms of non-White population share, but also in terms of individual Black and

development of white neighborhoods to the detriment of minorities.

Latino shares considered separately. Finally, this is the first paper providing a credible causal estimate of the effects of diversity on yield-spreads by implementing validated shift-share instruments.

This paper relates to the broader literature on municipal bonds. A considerable amount of research looks at factors determining the supply of capital in this market (Bergstresser and Orr, 2014; Dagostino, 2022; Yi, 2021; Adelino et al., 2023). Several papers discuss risk factors of municipal bonds such as defaults and liquidity (Schwert, 2017; Gao et al., 2019*a*; Abott et al., 2021), politics (Gao et al., 2019*b*; Dagostino and Nakhmurina, 2023; Ren and Zhao, 2023), and climate change (Goldsmith-Pinkham et al., 2021). Babina et al. (2021) and Garrett et al. (2023) study how to accurately measure the tax advantages of municipal bonds and the implications for this market, including a high degree of segmentation by state. Giesecke et al. (2023) offer a comprehensive and detailed analysis of the financial position of U.S. municipalities, covering revenues, expenditures, holdings, and liabilities. Dippel (2022) focuses on the specific case of public pension liabilities, for which the data is unfortunately quite limited and makes calculation of forward looking obligations particularly challenging. Carlson et al. (2022) tackles the problem of municipal issuance from a game-theoretical perspective.[4] Demographic diversity is an understudied factor in the pricing of municipal bonds, and I contribute to fill this gap.

This paper also relates to the political economy literature on taxation, debt, and public goods provision(Alesina and Passalacqua, 2016). Most of this literature is primarily theoretical (Battaglini and Coate, 2007, 2008; Bouton et al., 2020) or calibrated to aggregate U.S. level data (Bassetto, 2006; Azzimonti et al., 2016). A notable recent exception is Janas (2023): U.S. cities greatly expanded their debt during the 1920s; those more financially exposed when the Great Depression hit were forced to cut expenditures, in particular capital investments. Political representation at the local level also can play an important role in shaping public investments (Trebbi et al., 2008; Ricca and Trebbi, 2022). I aim to further our understanding of public goods provision focusing on the cost of public investments through debt, and its underlying drivers.

The rest of the paper is organized as follows. Section 2 provides background information on municipal bonds: what they are, what they are used for, and how their market works. Section 3 explains how to measure borrowing costs precisely, taking into account

[4]For a more general review of the municipal bonds literature, see Cestau et al. (2019).

their tax advantages and comparing them to a meaningful risk-free benchmark. Section 4 describes the data used in the paper. Section 5 presents the empirical strategy of the paper, including the main specification and a discussion of the shift-share instruments. Section 6 reports the main results. Section 7 discusses the mechanisms. Section 8 concludes.

2 Municipal Bonds Background

U.S. municipalities play a crucial role in providing public goods such as roads and infrastructure, fire and police protection, sewage and waste management facilities. These services are funded through an operating budget, which includes tax revenues and current expenditures. Virtually all local governments in the U.S. must adhere to balanced budget rules, meaning total revenues and expenditures in the operating budget should match (NLC, 2023; Poterba, 1995).

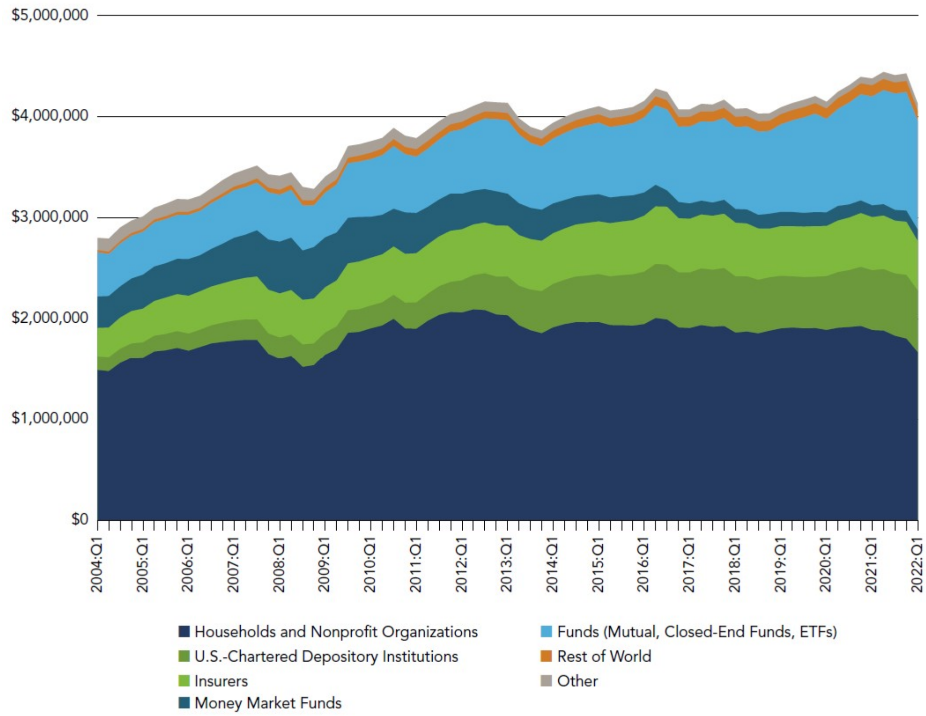
Many of the services provided necessitate substantial capital investments that exceed the scope of the operating budget. To fund these investments, municipalities issue debt in the form of municipal bonds. However, bonds can only be used to finance capital expenditures. The servicing and repayment of this debt are part of the operating budget and must be balanced with tax revenues. Therefore, municipal bonds cannot be used to cover operating deficits. The reliance of U.S. municipalities on debt for capital investment is substantial. According to my data, the average ratio of capital outlays in a year to the amount of outstanding debt is approximately 25%.

The market for municipal bonds in the U.S. is substantial. As of 2021, the total outstanding municipal debt amounted to over $4 trillion, with an average $435 billion in new debt issued every year since 2015.[5] To put things into perspective, this is equivalent to 14% of the U.S. federal debt. However, it is important to note that municipal debt is distinct from federal debt: the federal government bears no liability for municipal bonds, the responsibility rests solely with the issuing local government. The municipal bonds market is traditionally illiquid, with an average $9 billion traded daily. Individual investors, who typically adopt a buy-and-hold strategy until maturity, hold over 40% of bonds (Figure 1).[6] The remainder of the debt is primarily held by

[5] These statistics include bonds issued by states and all other local governments. Source: MSRB (2023).

[6] The tax-exemption of municipal bonds from federal and, in most cases, own-state income taxes is the reason why the municipal bonds market is segmented by state. Investors have a strong preference

Figure 1: Bonds Holders, 2004-2022 ($ Millions)



Share of holders of municipal bonds (from all local governments, States and below) by group. Source: MSRB (2023).

banks, insurance companies, and funds.

When a municipality decides to issue bonds, it follows an underwriting process. The municipality deals directly with an underwriter, usually an investment bank, which purchases the entire issuance. The underwriter then sells these bonds to investors, which could be individuals or other financial institutions. The municipality and the underwriter agree on the price and yield at which the underwriter pledges to sell the bonds on the primary market. They also agree on the gross underwriting spread, which is the difference between the price at which the underwriter buys from the municipality and sells to investors. This spread represents the underwriter's profit.

The municipality and underwriter can engage in a negotiated process, collaborating to design the bonds in terms of maturity structure and other financial features. Alternatively, the municipality can design the entire issuance and then submit it to potential underwriters. These underwriters then compete in an auction, bidding on the total

for holding bonds issued by jurisdictions in their own state, and enjoy the tax benefits. It is also the reason why individuals are the most common holders, rather than tax-exempt entities like pension funds.

interest cost. This cost reflects both the gross underwriting spread asked and the price and yield of the bonds.

The municipality is responsible for the timely payment of coupons on these bonds, usually every six months and almost always at a fixed rate predetermined at issuance. At maturity, the municipality repays the principal amount to the bondholders.
The funds used for these repayments can come from different sources. So-called *General Obligation* (GO) bonds are backed by the full faith and taxing capacity of a municipality to the repayment of a bond. Technically, the municipality is legally required to raise taxes if necessary to meet its obligations. Because of the important liabilities they generate, GO bonds often require voter approval to be issued. On the other hand, *Revenue* bonds are repaid from a specific, identified source of income, often related to the project the bonds are financing. This is the case, for example, of a parking garage whose parking fees cover the interests and principal repayment of the bonds issued to finance its construction.

Municipal bonds have low default rates. According to Moody's (2022) and MSRB (2023), default rates on investment-grade municipal bonds between 1970 and 2020 were 0.1%, compared to 2.24% for corporate obligations. Most bonds receive a credit rating by rating agencies, reflecting the ability of the issuer to make timely interests and principal payments.
Beyond default risk, investors consider other risk factors. Municipal bonds are exempt from federal income taxes and often state income taxes as well (see Section 3 for details). Changes in tax rates affect returns and market value of bonds. Bonds can be called by municipalities, usually in periods when they can refinance their debt at better conditions, adding to the uncertainty. Finally, municipal bonds are just one type of security available on the financial markets. Their value is a function of the prevailing interest rate, with U.S. Treasury bonds being regarded as an important risk-free benchmark. Interest rate fluctuations are particularly important for illiquid assets like municipal bonds.

3 Measuring Borrowing Costs

The goal of this paper is to study the effect of the racial and ethnic demographic composition of U.S. municipalities on the borrowing costs they face in the municipal bonds market. In order to do so, it is necessary to measure borrowing costs in a precise and consistent way.

The yield-to-maturity of a bond measures the overall returns to an investor holding it from issuance to maturity, taking into account both the recurring coupon payments as well as the possible initial pricing at a discount below or premium above the face value. The yield is also a good candidate measure of the borrowing cost for the issuing municipality. Formally, the yield-to-maturity of a bond of price p is y such that:

$$p = \sum_{t=1}^{T} \frac{coupon_t}{(1+y)^t} + \frac{face\ value}{(1+y)^T}, \tag{1}$$

that is, the rate that equates the present-discounted cash flow generate by the bond to its price at issuance.

To get to the best measure of borrowing costs, it is necessary to make two adjustments. First, all municipal bonds are exempt from the federal income tax. Bonds are also most often exempt from own-state income taxes: tax-residents of a state do not pay income tax on bonds issued in that state. Babina et al. (2021) show that, because of these tax advantages, the market for municipal bonds is segmented by state: investors have a preference to hold bonds from their own state and enjoy the corresponding tax benefits. The assumption to adjust bond yields for their tax advantage is therefore safe and intuitive. The tax advantages of bonds are priced into their yields, which means that the exact same bond (in terms of payment and maturity structures), issued by identical municipalities in different states, display different yields simply because of differences in tax rates and nothing else. To make bonds from all municipalities comparable, the first step is to adjust their yields for the different tax advantages.

I follow Schwert (2017) and Garrett et al. (2023) to compute state-specific and time-varying tax advantages and the corresponding tax-adjusted yields. State taxes are always deductible from federal taxes. Deductibility of federal taxes from state taxes varies by state. In states without deduction of federal taxes, the effective tax rate is:

$$\tau = \tau_f(1 - \tau_s) + \tau_s;$$

where τ_f and τ_s are the federal and state income tax rates respectively. In states that allow deduction of federal taxes, the effective tax rate is:

$$\tau = \frac{\tau_f(1 - \tau_s) + \tau_s(1 - \tau_f)}{1 - \tau_f \tau_s}.$$

Given the effective tax rate τ, the tax-adjusted yield is:

$$\tilde{y} = \frac{y}{1 - \tau}. \tag{2}$$

See Section B for derivation.

The second adjustment is to make all municipal bonds comparable in terms of risk structure and market conditions at the time of issuance. As seen in (1), the yield of a bond is a function of the coupon payments, the price at issuance (at premium or discount), and the maturity structure (when coupons and principal are paid). We do not want to compare the yield of a long term bond issued in a volatile year to that of a short term bond issued in a stable period, but rather take these mechanical drivers of risk explicitly into account. The natural comparison is then relative to a risk-free benchmark, rather than directly across different bonds: how much would it cost to generate the same cash flow of a given bonds using risk-free securities? U.S. Treasury bonds are often assumed risk-free by the finance literature (Longstaff et al., 2005). An investor can guarantee the same cash flow of a municipal bond by purchasing the right amount of treasury bonds of specific maturities. For instance, suppose a municipal bond pays a coupon of \$100 in six months and another \$100 coupon and principal of \$1,000 at maturity in one year. An investor can ensure the same payments by purchasing a six-months treasury bond that pays \$100 at maturity and a one-year treasury bond that pays \$1,100 at maturity. Each of these treasury bonds has their own price. The sum of these prices is the price of a risk-free synthetic security generating the exact same cash-flow of a risky municipal bond. Using this synthetic risk-free price in (1) gives a corresponding synthetic risk-free yield. The difference between the actual yield of a municipal bond and the corresponding risk-free yield is the yield-spread, which is the main outcome variable of interest about bonds used in the rest of the paper.

In practice, U.S. Treasury bonds have their own specific maturity and payment structures, the simple $100 payment security described above often does not exist. The Federal Reserve Board of Governors and the U.S. Treasury publish daily estimates of a zero-coupon equivalent yield curve for treasury bonds.[7] The curve is estimated monthly for maturities of less than a year, and yearly after that. I interpolate the curve to the monthly level to better match the timing of the coupon payments of municipal bonds. Let y_t^{rf} be the estimated zero-coupon equivalent risk-free yield of a treasury bond maturing at time t. We can use (1) to compute the price p^{rf} of a synthetic risk-free security generating the same cash flow of any municipal bond:

$$p^{rf} = \sum_{t=1}^{T} \frac{coupon_t}{(1 + y_t^{rf})^t} + \frac{face\ value}{(1 + y_t^{rf})^T}. \tag{3}$$

Using p^{rf} in (1) allows to recover a unique risk-free yield for the entire bond y^{rf}, and to calculate the tax-adjusted yield-spread as:

$$s = \tilde{y} - y^{rf}. \tag{4}$$

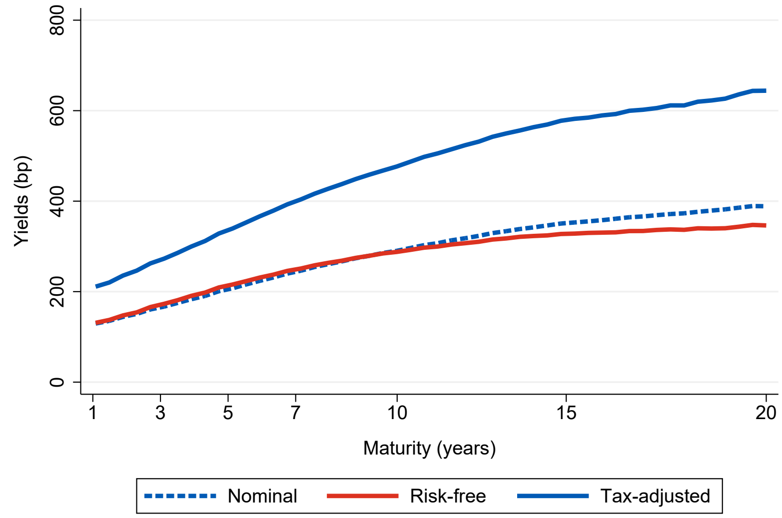
Note that the treasury curves are estimated daily, meaning that we know the risk-free equivalent yield for each bond at the precise time of issuance, which accounts for the prevailing market conditions at the time. Together with the tax-adjustment, this finally makes the yield-spread the most precise measure to compare municipal bonds. Figure 2 shows the three curves of the nominal, tax-adjusted, and risk-free yields estimated on the bonds used in the paper. Additional yield and spread curves by maturity and year are illustrated in Figure A1 and Figure A2.

4 Data

The paper combines three main sources of data on the universe of municipal bonds issued by municipalities, their sociodemographic composition, and their financial accounts. I rely on proprietary data on the universe of municipal bonds issued between 2004 and 2019 by municipalities in the U.S, based on the SDC Global Public Finance

[7]Federal Reserve Yield Curve data available here and U.S. Treasury Bill Rates data available here.

Figure 2: Yield Curves, 2004-2019



Yield-to-maturity (at issuance) curves estimated on the bond level data used in the paper, covering the universe of municipal bonds issued by cities between 2004 and 2019. Local means regression. The *nominal* curve is based on the nominal yield of bonds, observed raw in the SDC (2021) data. The *tax-adjusted* curve is estimated on the bond yields adjusted according to (2). The *risk-free* curve is based on the equivalent risk-free yield in (3) built on US treasury bills and matched to each municipal bond in the data.

module of Thomson Reuters. The data includes detailed information on bonds at the time of issuance.

Out of the 6,899 unique cities or towns with at least 2,500 inhabitants existing in the contiguous U.S. during the sample period, 3,514 issued at least one bond, at least once between 2004 and 2019.[8] Conditional on issuing at least once, the average municipality issued bonds 5.7 times. The median municipality issued bonds 3 times. Based on these numbers, a coverage of approximately 50% relative to the population of municipalities is reasonable. Issuing bonds is no small feat, especially for smaller municipalities. It is therefore plausible that a significant number of municipalities do not end up in the sample of issuers not because they do not rely on bonds, but simply because they did not do so during this period.

Table 1 reports summary statistics for 256,185 bonds issued by 3,514 unique municipalities. The average bond has a spread of approximately 173 basis points with respect to its risk-free benchmark discussed in Section 3. Bonds are worth on average just

[8]Having removed outliers, the universe of potential issuers is 6,032 municipalities. Almost 60% of those, or 3,514 are issuers in the data used throughout the paper. This is a result of an extensive data cleaning, including probabilistic name matching (95% match-rate) and trimming of outliers. This is therefore a lower-bound number of issuers, with some not being included most likely due to imperfections of the raw data.

Table 1: Bonds Summary Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Yield-spread (bp)	172.871	86.054	9.700	519.300	256,185
Par Amount ($1mm)	1.139	3.306	0.003	284.003	256,185
Maturity (years)	8.495	5.143	1.000	20.000	256,185
GO (indic.)	0.722	0.448	0.000	1.000	256,185
Competitive (indic.)	0.493	0.500	0.000	1.000	256,185
Rated (indic.)	0.856	0.351	0.000	1.000	256,185

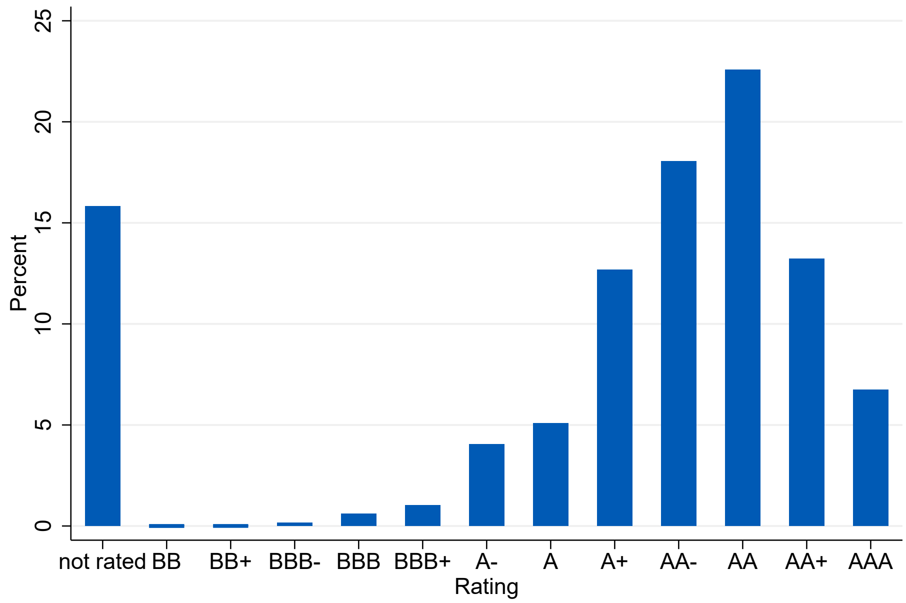
The *yield-spread* is measured in basis points (0.01%). The *par amount* is the face value or principal of the bond. Values deflated to 2010 dollars. *maturity* is the length of the bond, from date of issuance to the date the principal will be repaid and the bond extinguished. *GO* bonds commit the full faith and taxing capacity of the issuing municipality to the repayment of the bond, as opposed to *revenue* bonds with their own dedicated cash flow. Bonds can be issued through *competitive* auctions between underwriters or through a negotiated process with one specific underwriter. Bonds can be *rated* by the main rating agencies similar to any other security.

over $1 million and mature in 8.5 years. 72% of bonds are GO, that is backed by the full faith and taxing capacity of a municipality. The rest are Revenue bonds. New bonds are issued either competitively or through a negotiated process. Finally, over 85% of bonds receive the rating of a credit rating agency. Table A1 in Appendix A reports additional summary statistics at the bonds and issue levels.

As mentioned in Section 2, municipal bonds have extremely low default rates. This is reflected in their high-quality ratings, shown in Figure 3. Over 60% of bonds are rated double- or triple-A. The rest is either not rated (15%) or almost entirely rated at least A-. All bonds in the sample are considered investment-grade.

Information on the city finances is based on the U.S. Census of Governments, a quinquennial survey of all local governments in the country, conducted in years ending in 2 and 7. The surveys offer a detailed breakdown of municipal revenues and expenditures, as well as a snapshot of the stock of outstanding debt. To each new bond issuance, I attach the data of the previous, most recent Census. Table 2 offers a brief description of these accounts. On average, issuing municipalities raise and spend a little less than $2,000 per capita, per year. Following the discussion in Section 2, it is not surprising that they keep a balanced budget, on average. At the same time, these municipalities bear a considerable amount of long-term outstanding debt, at just over $2,000 per capita, or 112% of their annual revenues. I combine these with

Figure 3: Ratings



Share of bonds in the sample assigned to each rating category.

Table 2: Accounts Summary Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Total Revenues ($1mm)	154.208	1,977.600	0.234	100,306	7,865
Revenues per capita ($)	1,966.897	1,517.144	70.140	32,441	7,865
Total Expenditures ($1mm)	154.331	2,002.740	0.075	102,446	7,865
Expenditures per capita ($)	1,956.071	1,533.695	16.983	31,821	7,865
Outstanding Debt ($1mm)	201.635	2,561.266	0.000	125,092	7,865
Outstanding Debt per capita ($)	2,033.746	2,130.468	0.000	72,916	7,865
Deficit/Revenues	-0.001	0.184	-0.979	1.901	7,865
Debt/Revenues	1.119	0.805	0.000	5.009	7,865

Based on the quinquennial Census of Governments, run in years ending in 2 and 7, covering the universe of local governments in the U.S. Values deflated to 2010 dollars. Summary statistics for the 3,514 unique issuing municipalities in the sample, over the 2004-2019 sample period.

real estate data from Zillow (2023) to proxy for tax capacity: on average, over 55% of tax revenues for municipalities in the sample come from property taxes.[9]

Finally, information on the sociodemographic composition of the municipalities is based on U.S. decennial censuses from Manson et al. (2022), linearly interpolated to match the timing of the U.S. Census of Governments. These variables include the population size and its composition in terms of non-White minorities overall, Blacks (not of Hispanic origin), and Hispanic or Latinos. In addition, the controls of the main specification include measures of the median household income, the share of over 65 population, the unemployment rate, and two measures of education, the shares of population holding at least some degree or a graduate degree. Summary statistics for the Census information are reported in Table 3.

Table 3: Census Summary Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Population	52,041	237,339	2,501	8,615,473	7,865
Minority (frac.)	0.242	0.202	0.005	0.980	7,865
Black (frac.)	0.080	0.125	0.000	0.929	7,865
Latino (frac.)	0.107	0.142	0.002	0.978	7,865
Median household Income ($)	56,328	23,617	17,122	232,901	7,865
Over 65 (frac.)	0.140	0.050	0.011	0.670	7,865
Unemployment (rate)	0.070	0.031	0.007	0.381	7,865
Some Degree (frac.)	0.268	0.088	0.046	0.589	7,865
Graduate Degree (frac.)	0.108	0.078	0.006	0.571	7,865

Based on decennial U.S. Census. All municipality-level info based on Manson et al. (2022). Census observations are linearly interpolated to match the Census of Governments data in Table 2. Racial and enthnic composition shares computed relative to the voting-age population. Values of median household income deflated to 2010 dollars. Summary statistics for the 3,514 unique issuing municipalities in the sample, over the 2004-2019 sample period.

[9] Zillow Home Value Index (ZHVI) for All Homes Including Single-Family Residences, Condos, and CO-OPs. Measured as weighted average of the middle third (*mid-tier*) of homes in a given location. It should be interpreted as the typical, not median, home value.

5 Empirical Strategy

The goal is to estimate the effect of the racial and ethnic composition of a municipality on the borrowing condition it faces when issuing a bond. The dependent variable of interest is the yield-spread, the difference between the tax-adjusted yield of a bond and a risk-free benchmark, introduced in Section 3.

The main independent variable of interest is the share of Minority population, measured as non-White population. This can naturally be expanded into shares of single groups, such as Black and Latino shares. In practice, these shares are computed relative to the voting age population of a municipality, to better capture their political and economic relevance (Ricca and Trebbi, 2022). To account for potential endogeneity and omitted risk factors, I employ a novel implementation of shift-share instruments for the share of minorities in the population. This is discussed in detail below, following an explanation of my measurement choices and the basic empirical specification.

The tax adjusted yield measure offers two better qualities compared to a simple yield, that makes comparisons between bonds more precise and economically meaningful. First, the tax-adjustment allows to abstract from spurious differences in taxation over time and across locations. Second, the comparison with a risk-free benchmark accounts for the specific cash flow of each bond, while at the same time capturing the prevailing market conditions at the time of issuance.

The main OLS specification is the following:

$$spread_{bmt} = \beta minority_{mt} + \gamma_c' \mathbf{X^c}_{mt} + \gamma_a' \mathbf{X^a}_{mt} + \gamma_f' \mathbf{X^f}_{bt} + \delta_{s(m)} + \delta_{ty(b)} + \delta_{r(b)} + \varepsilon_{bmt}, \quad (5)$$

where b indicates attributes of a specific bond, issued by municipality m in year t. All specifications, unless otherwise noted, include three main fixed effects. The first is a fixed effect for the state of the issuer $s(m)$, to control for time-unvarying market characteristics for each state, and differences in budgetary rules by state. The sample period from 2004 to 2019 is arguably too short of a time frame to rely on municipality fixed effects. In addition, the demographic data available at the local level cannot match the high-frequency of new bonds issues, without relying on extreme interpolation. Nonetheless, robustness checks with municipality fixed effects are reported in the robustness checks. The second is a year-of-issue by maturity fixed effect, essentially to capture the time varying yield and spread curves for bonds of different durations, illustrated in Figure A1 and Figure A2. Finally, it includes a fixed effect for the rating group of the bond $r(b)$, to control for the assessed risk of the bonds (see Figure A3).

The specification can include three sets of controls. $\mathbf{X^c}_{mt}$ indicates a set of sociodemographic variables derived from the Census: the log of the population size, the log of the median household income, the share of population over 65, the unemployment rate, and the shares of population holding at least some degree or a graduate degree. It also includes the population growth rate in the previous 10 years. All of these measures are designed to account for the overall size and structure of the issuer, and its longer term trend.

Similarly, $\mathbf{X^a}_{mt}$ includes key economic indicators of the financial health of a municipality: the log of total revenues and expenditures, the log of the outstanding debt at the time of issuance, the log of mid-tier house values and its growth rate over the previous year. Both these sets of controls are designed to measure the overall taxing potential of issuers and their credit worthiness based on economic fundamentals. Essentially, information observable to investors that can explain the yield-spread on municipal bonds.

An additional set of controls $\mathbf{X^f}_{bt}$ includes several financial features of the bonds: the log of the face value, the log amount of the entire issue, indicators for whether the bond is callable, GO, issued competitively, used for new money or refinancing, credit enhanced, bank qualified, and whether a sink fund exists. While these are interesting features, and they are often included in the finance literature on municipal bonds, they are also inherently endogenous to the financial conditions faced by an issuer. For instance, how much a municipality decides to issue can be a function of what they expect to pay for it. In the same way, whether they decide to issue it competitively or through a negotiated process, or whether to purchase credit enhancements or not, can be a result of the conditions they expect on the market, which in turn are a function of economic fundamentals and their sociodemographic structure. These would be bad controls, which I occasionally add for robustness purposes.

The specification in (5) aims to control for the main observable drivers of spread, and to isolate the effect of the Minority share. However, while the set of fixed effects and controls included can arguably capture most economic fundamentals factors, they cannot rule out definitely the presence of omitted variables. In particular, we may worry about omitted risk variables that are positively correlated with both the

Minority share and the spread on bonds. This is the case, for instance, if minorities sort into high-spread municipalities. Or, vice versa, if White population sorts into low spread municipalities. This would bias the OLS estimates in (5) upwards.

To tackle this concern, I construct a shift-share instrument for the share of minorities in the population, similar to that used by Boustan (2010) and Mayda et al. (2022) (see also Derenoncourt (2022), Calderon et al. (2023), and Mayda et al. (2023)). I adapt this instrument following the most recent advances in the literature on shift-share instruments and their identifying assumptions, in particular based on Borusyak et al. (2022) and Borusyak and Hull (2023). This allows me to relax one of the key assumptions for validity, and rely exclusively on the exogeneity of the shifts used in constructing the instrument.

The fact that municipalities select into the sample of issuers, that is they decide whether to issue or not, raises another potential concern. We can only observe a spread for municipalities that decide and manage to issue a bond. If higher-Minority municipalities select into the sample of issuers based on lower omitted risk, then OLS estimates in (5) would be biased downwards. In other words, the concern is that most higher-Minority municipalities in the sample are those that can afford to issue bonds at lower spreads, for some unobservable or omitted reason. This would bias the OLS estimates downwards. The instrument might capture, at least in part, this selection.

The idea behind a shift-share instrument is to predict exogenous shares for any group of interest, by combining predetermined shares of that group with plausibly exogenous shifts in its population. By measuring only the exogenous component of the shares, the instrument would clean the minorities estimates from biases due to the possible positive or negative correlation of minorities shares with omitted risk variables. If the minorities shares are positively correlated with omitted risk, the IV strategy would correct the estimates downwards. If the minorities shares are negatively correlated with omitted risk, explaining the selection into the sample of issuers, the IV strategy would correct the estimates upwards.

The instrument is constructed as follows. For any location c in which we want to predict a valid exogenous population shares of a group, let B_{jc} be the number of people of that group born in state or country j and living in c (out-of-state or country) in a given pre-period. The total number of people born in j and living out of j is $\sum_k B_{jk}$, for all locations k not in j. Define $s_{jc} = B_{jc}/\sum_k B_{jk}$, the share of people in c out of the total born in and living out of j.This is the predetermined share of the group in

c used in the instrument. Let G_j be the total number of migrants in the group of interest out of j, during a given time period. This is the shift of the instrument. The predicted share of the group in c is then:

$$z_c = \frac{\sum_j s_{jc} G_j}{p_c}, \tag{6}$$

where p_c is the total population of c in the pre-period. I follow Boustan (2010) and others in relying on the Great Migration of Blacks out of the U.S. South between 1940 and 1970 as plausibly exogenous shift to instrument for Black shares out of South.[10] The migration data are based on Gardner and Cohen (1992) and Bowles et al. (2016). The 1940 shares are computed from the 1940 full count Census (Ruggles et al., 2023). Because of the origin of the shifts used, this instrument is only available for locations out-of-South.

I augment these instruments with insights from the international migration literature (Mayda et al. (2022)). To instrument for Black shares, I add migration flows to the U.S. between 1980 and 2000 from the Caribbean Islands and non-North Africa.[11] The pre-period shares for these flows are based on the 1980 Census.

To instrument for the share of Latinos, I use shifts between 1980 and 2000 from Mexico, Cuba, Dominican Republic, Central America, South America. These are the country of origin used by the U.S. Census for its Hispanic or Latino classification. The pre-period shares for these flows are also based on the 1980 Census. The instruments for Black and Latino shares are available at the county level. In addition, an instrument for the share of Asian is possible, using shifts from China, India, Japan, Korea, Philippines, and Vietnam between 1980 and 2000. However, this instrument performs particularly poorly in terms of first-stage, and is not used in the empirical analysis that follows. Finally, the instruments I am proposing address the potential concern of minorities endogenously sorting into higher-risk municipalities.

The identifying assumption behind a shift-share instrument is that, conditional on

[10]Southern states, following the Census definition, include: West Virginia, Virginia, North Carolina, South Carolina, Georgia, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, Texas. Maryland, Delaware, and Florida are net receivers of Black migrants between 1940 and 1970 and are therefore not included in the shifts.

[11]The Caribbean islands include Jamaica and other (non-Hispanic) West Indies. Migrants from these countries are predominantly classified as Black or African-American by the U.S. Census. The flow is calculated as the difference in foreign-born people from these countries between the 1980 and the 2000 Census.

controls, omitted variables affecting the yield-spread must not be simultaneously correlated with both the pre-period shares s_{jc} and shifts G_j. In the context of this paper, exogeneity of the shares may not be tenable assumption. Despite being set in a very early pre-period, either 1940 or 1980, they might still be correlated with the omitted risk variables that motivate the IV strategy in the first place. It turns out, thanks to the recent advancements of Borusyak et al. (2022) and Borusyak and Hull (2023), that shift-share IVs can be valid even with exogenous shifts only. They show that a shift-share design can be reshaped into an aggregate shift-level regression relying simply on shift-level instruments and their exogeneity and producing equivalent estimates. This equivalence can be achieved by controlling for the sum of shares used to build the shift-share instruments in the usual specification. The simple intuition is to control for the part of the instrument that is mechanically generated by the shares, not necessarily exogenous, and not by the shifts. Locations with high pre-determined shares show higher values of the instrument for any given amount of shift. In my case, this means controlling for:

$$\frac{\sum_j s_{jc}}{p_c}, \tag{7}$$

or the sum of shares rescaled by the pre-period population. This control is included in all 2SLS results that follow. The shift-level strategy developed by Borusyak et al. (2022) also allows to cluster the standard errors by shift, something that is not possible in the usual bond level setup. Shift-level equivalent estimates are also reported for all 2SLS results. The robust IV strategy developed by Borusyak et al. (2022) does not accommodate an over-identified setup with different shares. That is, a setup in which shift-share instruments for different groups are combined to predict an aggregate Minority share. This is why the IV result will focus on Black and Latino shares instrumented separately. To the best of my knowledge, this is a novel implementation of Borusyak et al. (2022); Borusyak and Hull (2023) robust IV strategies in the context of shift-share instruments for population shares.

6 Results

This section discusses the main results of the paper. First, it presents an overview of the correlation between Minority shares and yield-spread, ruling out a number of alternative mechanisms. I present next the results using the IVs just described in

Section 5, which provide more causally robust estimates of the effect of the ethnic and racial composition of municipalities on the borrowing costs. Finally, I try to quantify the economic significance of these results.

Table 4 reports the OLS results of the main specification in (5) for the Minority share coefficient. The Minority share is standardized, so the coefficient can be interpreted as the effect of one standard deviation increase in shares, and the units of measure are basis points. All columns include the full set of fixed effects described in (5): state, year of issuance by maturity, rating group. The columns progressively add the three set of controls. The preferred specification includes the census and accounts control, and it is reported in column (5). The coefficient of Minority share in column (5) of Table 4 is positive and significant: a one standard deviation increase in the Minority share is associated with a 2.5 basis points increase in the yield-spread. Municipalities with higher Minority share face higher borrowing costs. This is equivalent to a 1.4% increase relative to the average spread, or 3% of its standard deviation. For context,

Table 4: Minority and Yield-Spread

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)	(4) Spread (bp)	(5) Spread (bp)	(6) Spread (bp)
Minority (sd)	6.431***	1.888**	2.320***	3.518***	2.528***	2.138***
	(0.648)	(0.753)	(0.633)	(0.551)	(0.744)	(0.661)
Census Controls	-	X	-	-	X	X
Accounts Controls	-	-	X	-	X	X
Financial Controls	-	-	-	X	-	X
Mean Dep. Var.	172.871	172.871	172.871	172.871	172.871	172.871
SD Dep. Var.	86.054	86.054	86.054	86.054	86.054	86.054
Obs.	256,185	256,185	256,185	256,185	256,185	256,185
Municipalities	3,514	3,514	3,514	3,514	3,514	3,514

Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimates. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Minority fraction is the share of non-White voting age population, and it is standardized to mean 0 and standard deviation 1. All columns include state, year×maturity, and rating fixed effects. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The financial controls are bond level and include: (log) amount of the bond, (log) amount of the issue, and indicators for callable, GO, competitively issued, new money, credit enhanced, bank qualified, and sink fund bonds.

the standard deviation of the Minority share is 0.2. As an example, consider an average $1 million bond issued at face value, with an average maturity of 8 years and average yield to maturity and coupon rate of 2.62% ($210k of total interests). A one standard deviation increase in the Minority share is equivalent to a 0.95% increase in interests, or an extra $2,000.

Estimates of (5) unpacking the previously aggregate Minority share into shares of Black, Latino, and other minorities are reported in Table A6 in Appendix A. The results are consistent, with both the shares of Blacks and Latinos positively correlated with the yield-spread. Other minorities display a smaller correlation, and not significant.

The shift-share instruments designed and discussed in Section 5 can identify causal estimates, in particular by ruling out bias from omitted risk variables. Column (1) in Table 5 reports the baseline OLS estimates for reference, which include the full set of fixed effects and the census and accounts controls. Minorities are considered separately as Black, Latino, and other population shares. Both Black and Latino shares are positively and significantly correlated with spread, in line with the aggregate Minority results. Column (2) shows reduced-form estimates, using the shift-share IVs directly as regressors instead of the Black and Latino shares. Column (3) reports the 2SLS coefficients of interest. Looking at the first-stage, the instruments work well and have the expected sign. The first-stage F-statistics are well above the customary threshold of 10.[12] The larger 2SLS coefficients seem to suggest that the instruments can account at least in part for the selection into the sample of issuers. They also carry a more significant economic meaning. Going back to the million dollar bond example, a one standard deviation increase in the share of Blacks increases the total interest costs by 3.8%, or an extra $8,000. A one standard deviation increase in the share of Latinos increases the borrowing costs by 1.8%.

Column (4) estimates are based on the shift-level equivalence result in Borusyak et al. (2022). These are the result of a shift-level regression in which the original data is reshaped and weighted by the shares of the shift-share instrument, to obtain a sample with as many observations as shifts used to construct the instrument, in this case origin locations. The endogenous variable can then be instrumented directly with the

[12] Angrist and Kolesár (2024) suggest that in a just-identified setting like the one of this paper, the conventional threshold works well for inference.

Table 5: Shift-Share IV Results

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)	(4) Spread (bp)
Second Stage:				
Black (sd)	1.166**	3.059**	10.289**	10.289***
	(0.543)	(1.241)	(5.223)	(2.128)
Latino (sd)	2.190***	0.292	4.687*	4.687***
	(0.725)	(0.854)	(2.674)	(1.360)
First Stage:				
Black IV (sd)			0.272***	0.063**
			(0.066)	(0.027)
Latino IV (sd)			0.534***	0.414***
			(0.033)	(0.034)
Method	OLS	Reduced	2SLS	Shift lvl.
F-stat			19.775 / 42.878	5.383 / 147.691
Mean Dep. Var.	172.871	172.871	172.871	
SD Dep. Var.	86.054	86.054	86.054	
Obs.	256,185	256,185	256,185	21
Cluster Level	County	County	County	Shift
Clusters	1,324	1,324	1,324	21

Standard errors clustered at the county level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. Column (2) is a reduced form specification using the instruments as regressors. Column (3) is recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023). The *first stage* panel reports the first stage coefficients of each instrument on their corresponding endogenous variable. The reported F-stats are for the Black and Latino IVs first-stages respectively. Column (4) reports the shift-level equivalent estimates based on Borusyak et al. (2022). The effective sample sizes, computed as the inverse of the Herfindahl index of the squared shares, are 12.7 and 4.4 for the Black and Latino IVs respectively.

corresponding shift. If the original location-level specification in column (3) correctly controls for the rescaled sum of shares in (7), the estimates are equivalent to column (4), as in this case. All in all, this supports the fact that the results only rely on the exogeneity of the shifts as identifying assumption, without also requiring exogeneity of the shares. This is a considerably less demanding condition for validity.
Because of the way the shift-share instrument for the Black share is constructed, and how it builds on within-U.S. shifts from the Great Migration from the South, we might expect it to be more robust out-of-South. Table A7 and Table A8 restrict the attention to the effect of the Black share in out-of-South municipalities and Latino shares in Southern cities respectively. The estimates for the share of Blacks are comparable. For Latinos, the effect is particularly strong in the South. The 2SLS coefficient in column (3) suggest that one standard deviation increase in the share of Latinos increase the yield-spread by over 30 basis points. That is equivalent to an approximate 11.8% increase in total interest costs on the average bond.

Up to 10 basis points increase per standard deviation increase of Black and Latino population shares, or a 3.8% increase in total interests, may appear somewhat small. It is to benchmark these magnitudes against existing research on municipal bonds. Garrett et al. (2023) study the tax advantage of municipal bonds. They estimate that 1 percentage point more of tax subsidy – taxes from which munis are exempt – decreases borrowing costs by 6.5 to 7 basis points. Goldsmith-Pinkham et al. (2021) study the effects of climate change on the bonds market and riskiness of municipal borrowers. They estimate that a 10 percentage point increase in the share of properties exposed to a 6 ft sea level rise corresponds to a 5.3 basis points increase in spread on municipal bonds. These interesting comparisons show results entirely in the same order of magnitude as my estimates of the effect of diversity. Much of the variation in municipal bonds spreads is explained by market level conditions. What is left has necessarily smaller effects but is nonetheless economically meaningful.

7 Mechanisms

The controls already included in Table 4 and Table 5 are carefully designed to rule out several potential mechanisms. In particular, controlling for median household income and unemployment rate rules out the possibility that the diversity premium is simply due to more diverse municipalities being poorer and therefore perceived as riskier borrower. I test an additional specification that adds the shares of population in different income brackets, to account for income inequality. The results are consistent and the effect of diversity holds.

The population growth rate in the main controls excludes a population trend mechanism of more diverse municipalities undergoing periods of population decline. This could explain pessimistic forecasts of tax capacity in the long run and therefore higher spread. In fact, the opposite is true, with non-White minorities being by far the fastest growing groups in the population nation-wide.[13]

The effect of diversity on spread is also not explained by the total amount of revenues raised, nor by the amount of outstanding debt when issuing new bonds. The effect holds regardless of the overall reliance on debt to finance spending.

As mentioned in Section 4, on average over 55% of tax revenues for municipalities in the sample come from property taxes. The real estate values and trends (mid-tier house values from Zillow (2023)) included in the controls are the best proxy to measure the tax capacity of municipal issuers, ruling out risk driven by the potential tax base available to service debt.

I test for a number of additional mechanisms presented below. Most of these carry significant data limitations which I discuss case by case.

A recurring comment in the public discourse is that more diverse cities tend to display higher levels of crime.[14] To examine whether crime can explain, at least in part, the effect of diversity on spread, I collect and analyze crime reporting data from the FBI and the Department of Justice (NIBRS, 2024). I re-estimate the main specifications presented in Table 4 and Table 5 adding reported property crimes per 1,000 residents as controls. The results are shown in Table A9 in Appendix A. The effect of Minority shares on spread remains positive and significant, robust to the inclusion of crime controls. The reporting system operates on a voluntary basis, with a less-than-ideal coverage of about a third of my sample. The first-stages of the 2SLS specification are weaker, and the second-stage estimates insignificant, regardless of the inclusion of crime controls. The loss of precision is arguably due to the loss of observations rather

[13] www.census.gov/newsroom/press-releases/2024/population-estimates-characteristics.html

[14] https://www.brennancenter.org/our-work/research-reports/myths-and-realities-understanding-recent-trends-violent-crime

than the added controls. This check holds also including crimes against persons and society, on top of property.
In addition to outstanding bonds, public pension benefits are a significant source of liabilities for municipalities. Just like outstanding debt, unfunded pension liabilities could affect the perceived credit-worthiness of municipal issuers. I assess whether these additional liabilities confound the diversity premium evidence by collecting public pension data from the Annual Surveys of Public Pensions (ASPP, 2024). Ideally, we would want to measure future unfunded pensions. However, this information has only been collected starting with the 2017 wave. Instead, I use the ratio of total benefits paid to total contributions received and gains as proxy. Estimates with the additional pension controls are reported in Table A10 in Appendix A. The diversity premium effect holds. Similar to the crime data, the coverage of ASPP (2024) surveys is limited to a fourth of my sample, in line with existing research using the same source (Dippel, 2022). Once again, the instruments' first-stages are weak and the second-stage estimates imprecise, whether or not the pension controls are included, due to the reduced observations.

Robustness checks for additional specifications are presented in Table A11 and Table A12 of Appendix A. The diversity premium effect is robust to the inclusion of municipality fixed effects, which rule out time-unvarying municipality-specific factors. Because of the tax advantage of municipal bonds discussed in Section 2, the bonds market is highly segmented by state (Babina et al., 2021; Garrett et al., 2023). To better account for state-level market conditions at the time of issuance, I can modify the main specification to include a time-varying state-by-year fixed effect. This captures both demand-side dynamics such as the number of potential investors interested in bonds, as well as supply-side factors such as debt issues from other local governments in the state.
Finally, I test for the potential effect of city council composition and political representation of non-White minorities. Council composition data is based on ICMA (2020) surveys, covering approximately 40% of the sample. The political representation of minorities in city councils does not seem to have an effect on spread. On the other hand, the population diversity effect remains.

Having ruled out an extensive list of alternative mechanisms, the diversity premium result remains consistent with potential discrimination of diverse municipalities in the bond market, in terms of higher borrowing costs. As introduced in Section 1, an important limitation is that I cannot disentangle whether the larger yield-spreads are due to statistical or taste-based discrimination in the bonds market. This is because of a missing objective measure of performance of bonds in my data, contrary to existing literature on discrimination. For instance, in the case of discrimination in motor vehicle searches (Knowles et al., 2001), we can observe whether a stop found a violation. In the case of discrimination in loan approvals (Berkovec et al., 1998), we can measure loan performance based on timely payments. The intuition is that these features allow the authors to measure the expected utility of searches and loan approvals for decision makers, and disentangle statistical from pure taste-based discrimination that goes beyond a rational utility maximization behavior.

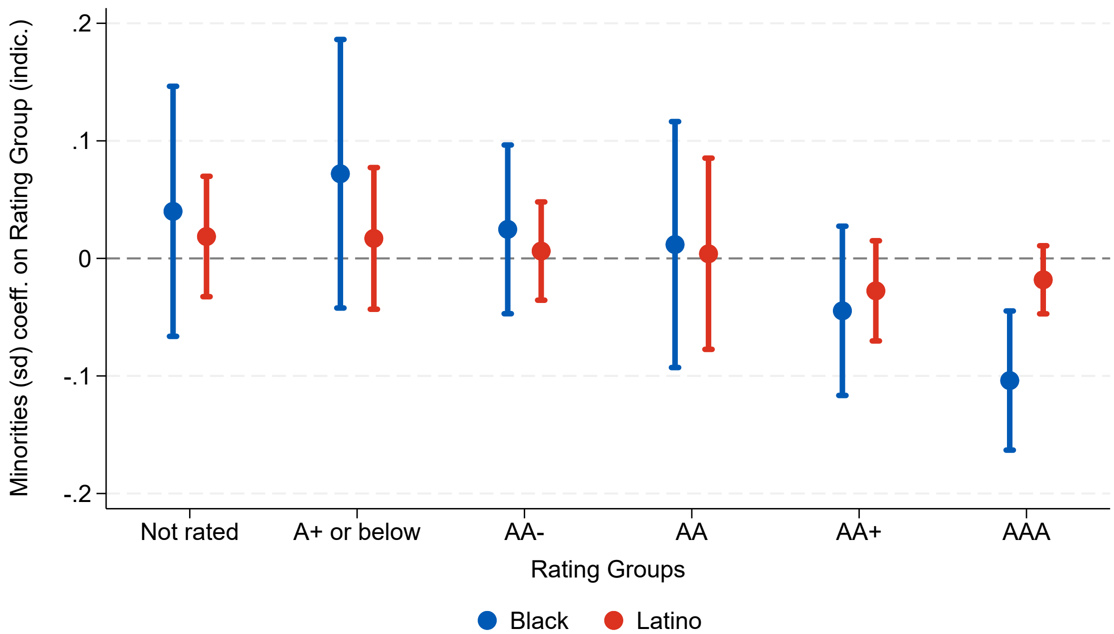
In contrast, yields and spreads are endogenous market outcomes and cannot be considered objective performance indicators. Other measures such as defaults are extremely rare in municipal bonds (Moody's, 2022), and I do not have information on smaller failures like delayed payments. It is worth pointing out, however, that these events are recorded by rating agencies and would credibly enter the credit rating assigned to bonds, which I control for. Finally, if either form of discrimination happens at the market level, looking at secondary market trading would present the same limitations.

While I cannot disentangle statistical and taste-based discrimination, I can test where this discrimination may be happening during the issuance process. The evidence suggests that there is no discrimination in credit ratings, and that it does not occur because of the underwriters – usually investment banks – involved in the issuance process.

I estimate the probability of each bond being assigned a specific rating using simple Linear Probability Models. The dependent variables are indicators for each rating group. The specification is otherwise identical to the main one in (5) in terms of controls, with state and year fixed effects. The main regressors of interest are the population shares of Blacks and Latinos, instrumented with the usual shift-shares. Their second-stage coefficients are plotted in Figure 4. There is no clear evidence that bonds issued by more diverse municipalities receive significantly worse ratings, once accounting for the economic fundamentals of the issuers.[15]

[15]This is true with the exception of cities with higher shares of Blacks being less likely to receive a

Figure 4: Rating Probabilities (LPM, 2SLS)



C.I. 95%, standard errors clustered at the county level. Linear Probability Model estimates, plotting the second-stage coefficients of Black and Latino population shares. The observations are at the bond level. The dependent variables are indicators for each bond being assigned a specific rating category. The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. Including state and year fixed effects. The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. The specification is recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023).

Discrimination also does not occur because of the underwriters involved in the issuance process. Usually, these are investment banks that help municipalities design the bonds, then buying the entire issuance from the city and selling the bonds to investors. Acting as intermediaries between the municipalities and investors, they could affect the premium paid by diverse municipalities. I test for this possibility in columns (1) to (3) of Table 6. Adding fixed effects for the specific underwriters of each bond does not affect the coefficients on shares of minorities compared to the main results. The diversity premium is not driven by underwriters.

Underwriters also make a profit on the transaction between issuers and primary market investors. This is measured in dollars per thousand of par value and it is called *gross-spread*. Columns (4) to (6) check whether underwriters make higher profits

triple AAA rating *ceteris paribus*. These bonds, however, make up only about 7% of the market.

Table 6: Underwriters and Potential Discrimination

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)	(4) Gross-Spread	(5) Gross-Spread	(6) Gross-Spread
Minority (sd)	2.527***			-0.025		
	(0.717)			(0.094)		
Black (sd)		1.149**	9.207*		-0.076	0.989
		(0.578)	(4.741)		(0.077)	(0.656)
Latino (sd)		2.104***	4.517*		-0.003	0.120
		(0.642)	(2.465)		(0.080)	(0.343)
Underwriter FE	X	X	X	-	-	-
Method	OLS	OLS	2SLS	OLS	OLS	2SLS
F-stat			22.373 / 42.549			15.948 / 34.859
Obs.	256,163	256,163	256,163	9,962	9,962	9,962
Cluster Level	Municipality	Municipality	County	Municipality	Municipality	County
Clusters	3,514	3,514	1,324	2,697	2,697	1,128

Clustered standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. Columns (1) to (3) are at the bond level. The dependent variable is *Spread* (yield-spread in (4)), measured in basis points (0.01%). Columns (4) to (6) are at the issuance level. The dependent variable is the gross-spread profit of the underwriter, measured in $ per thousand of par value. The Minority, Black, and Latino fractions are share of non-White voting age population, and it are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state and rating fixed effects. Columns (1) to (3) include year×maturity and underwriter fixed effects. Columns (4) to (6) include year-of-issuance fixed effects. The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. The 2SLS specifications are recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023).

on bonds issued by more diverse municipalities. The specification is at the issuance level, with *gross-spread* as dependent variable. Everything else is consistent with the main specifications seen so far. The estimates suggest that this is not the case, with insignificant coefficients very close to zero. As a note of caution, the *gross-spread* information is only available for about half of the issues in my sample. Reassuringly, repeating the estimates of columns (1) to (3) only on bonds and underwriters for which there is information on profits confirms the main results.

Although not able to distinguish statistical from taste-based discrimination, this is, to the best of my knowledge, a first step towards better understanding where discrimination may be happening in the municipal bonds market. The *diversity premium* shown in this paper originates in the primary market for bonds.

8 Conclusion

This paper studies the effect of the racial and ethnic demographic composition of U.S. municipalities on the borrowing costs they face in the municipal bonds market. Understanding how these demographics are priced in the market for municipal debt is crucial to understanding the investment decisions of diverse municipalities, and to better interpret the evidence of underprovision of public goods in diverse communities. Borrowing costs are measured as yield-spreads, the difference between the yield-to-maturity of a bond and a risk-free benchmark. The spread is adjusted for the varying tax advantages of bonds across states, and for differences in the risk structure of the bonds issued. The data on yields covers the universe of municipal bonds issued between 2004 and 2019 by cities and towns in the U.S.

The results show evidence of a diversity premium in bonds pricing. Municipalities with higher non-White shares of population pay substantially higher costs on their debt. The effect is economically significant: one standard deviation increase in the population share of Blacks increases the yield-spread by 10 basis points on average, or the total interest costs on the average bond by 3.8%; a one standard deviation increase in Latinos increases the yield-spread by 4.6 basis points and the total interest costs by 1.8% on average. The effect for Latinos is much stronger in the U.S. South, where one standard deviation increase can lead to up to +31 basis points in yield-spread and a 11.8% increase in total interest costs on average.

To rule out potential bias from omitted risk variables, I use shift-share instruments for the share of minorities in the population, which rely on plausibly exogenous domestic and international migration shocks. Higher shares of minorities causally increase the borrowing costs of cities.

The effect is not explained by economic fundamentals of cities, and holds controlling for maturity structure and credit rating of the bonds. The diversity premium is not driven by income, population trends, municipal revenues, amount of outstanding debt, or tax capacity of the issuers. The results are consistent with the discrimination of racial and ethnic minorities in the primary market for municipal bonds. And while I am not able to disentangle statistical from taste-based discrimination, I show that discrimination is not present in credit ratings and does not occur because of the underwriters involved in the issuance process.

Having proved the existence of this interest premium for municipalities with higher shares of minorities, the next step will be to assess whether the higher cost has implications for the capital investment decisions of these municipalities. Capital investments are in turn crucial drivers for the amount and quality of public goods and services provided, arguably one of the most important outcomes of interest for the literature on debt and public spending. The results in this paper can help us better understand the supply of public goods in local governments, and add an important piece to the puzzle of the underprovision of public goods in diverse communities.

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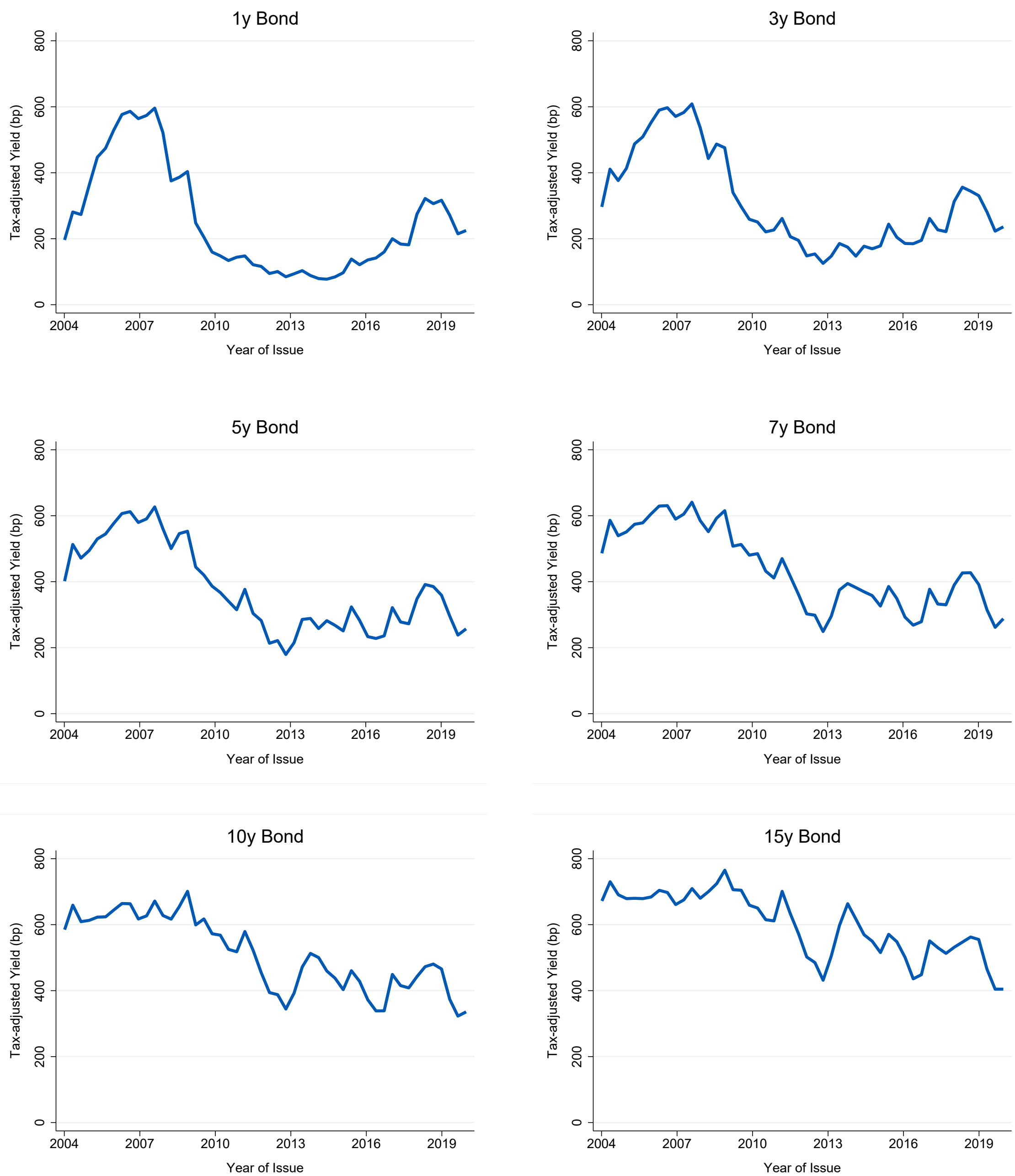
Appendix

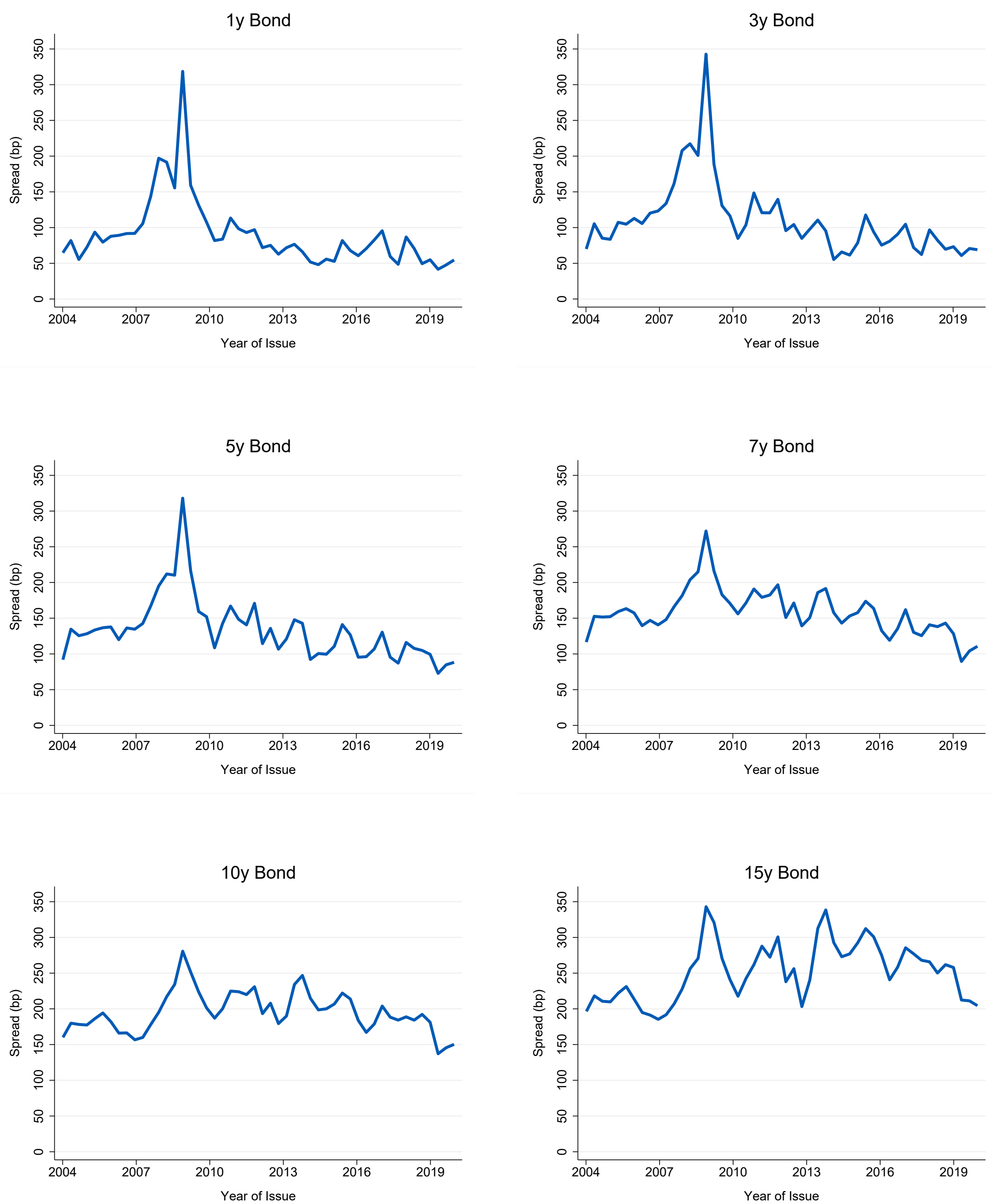
A Tables and Figures

Figure A1: Yield Curves by Maturity



Yield-to-maturity (at issuance) curves estimated on the bond level data used in the paper, covering the universe of municipal bonds issued by cities between 2004 and 2019. Local means regressions by maturity of the bonds.

Figure A2: Spread by Maturity



Spread (yield-spread in (4), measured in basis points (0.01%)) curves estimated on the bond level data used in the paper, covering the universe of municipal bonds issued by cities between 2004 and 2019. Local means regressions by maturity of the bonds.

Table A1: Bonds Summary Statistics

	Mean	Std. Dev.	Min.	Max.	Obs.
Yields and Spread					
Yield to Maturity (bp)	261.747	109.452	15.000	613.000	256,185
Price at Issue ($ per $100 of face value)	104.935	6.729	95.427	141.763	256,185
Tax-adjusted Yield (bp)	429.526	175.594	26.000	978.700	256,185
Yield-spread (bp)	172.871	86.054	9.700	519.300	256,185
Bond Amounts					
Par Amount ($1mm)	1.139	3.306	0.003	284.003	256,185
Per capita Par Amount ($ per capita)	24.392	46.018	0.003	4,494.763	256,185
Maturity (years)	8.495	5.143	1.000	20.000	256,185
Issue Amounts					
Issue Amount ($1mm)	17.178	52.989	0.047	1,325.495	19,932
Per capita Issue Amount ($ per capita)	351.987	447.237	0.438	9,406.164	19,932
Outstanding Debt at Issue ($1mm)	754.803	6,322.408	0.005	127,659.766	19,932
Features					
Callable (indic.)	0.428	0.495	0.000	1.000	256,185
GO (indic.)	0.722	0.448	0.000	1.000	256,185
Competitive (indic.)	0.493	0.500	0.000	1.000	256,185
Rated (indic.)	0.856	0.351	0.000	1.000	256,185
Credit Enhanced (indic.)	0.291	0.454	0.000	1.000	256,185
New Money (indic.)	0.585	0.493	0.000	1.000	256,185
Bank Qualified (indic.)	0.466	0.499	0.000	1.000	256,185
Sinking Fund (indic.)	0.355	0.479	0.000	1.000	256,185

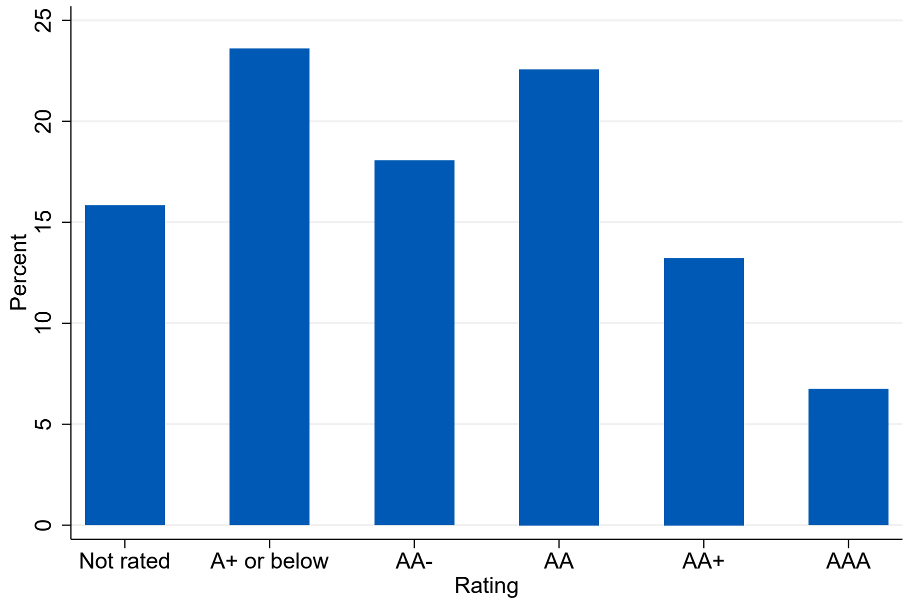
Values deflated to 2010 dollars. The construction of yields and spreads is discussed in Section 3. *Callable* bonds can be repaid by the issuer before maturity, usually after a minimum period. *GO* bonds are discussed in Section 2, as well as the *competitive* or *negotiated* issuance processes. *Credit enhanced* bonds contain additional insurance clauses for the timely payments of interests and principal. *New Money* bonds are used to raise new capital, as opposed to refinance existing debt at better conditions. When bonds are *Bank Qualified*, banks may deduct 80% of the cost of purchasing and holding a bond, under the condition that the issuer intends to sell no more than $10 million in bonds annually. Issuers can create *Sinking Funds* into which they make periodic deposits to ensure their ability to service the debt.

Table A2: Means Balance

	(1) Non-Issuers	(2) Issuers	(3) Diff.
Demographic Composition			
Minority (frac.)	0.258	0.242	-0.017***
			(0.004)
Black (frac.)	0.102	0.080	-0.022***
			(0.003)
Latino (frac.)	0.105	0.107	0.002
			(0.003)
Sociodemographics			
Population	15672.248	52041.447	36369.200***
			(5216.402)
Median Household Income	50451.160	56328.447	5877.287***
			(476.997)
Over 65 (frac.)	0.156	0.140	-0.016***
			(0.001)
Unemployment (rate)	0.077	0.070	-0.007***
			(0.001)
College Educ. (frac.)	0.232	0.268	0.036***
			(0.002)
Graduate Educ. (frac.)	0.091	0.108	0.017***
			(0.002)
Pop. Growth (10y)	0.131	0.186	0.054***
			(0.009)
Accounts			
Revenues (per capita)	1569.188	1966.897	397.708***
			(27.727)
Expenditures (per capita)	1531.692	1956.071	424.378***
			(28.021)
Outstanding Debt (per capita)	1137.312	2033.746	896.434***
			(34.726)
Obs.	21,929	21,929	21,929
Municipalities	6,032	6,032	6,032
Cluster level	Municipality	Municipality	Municipality

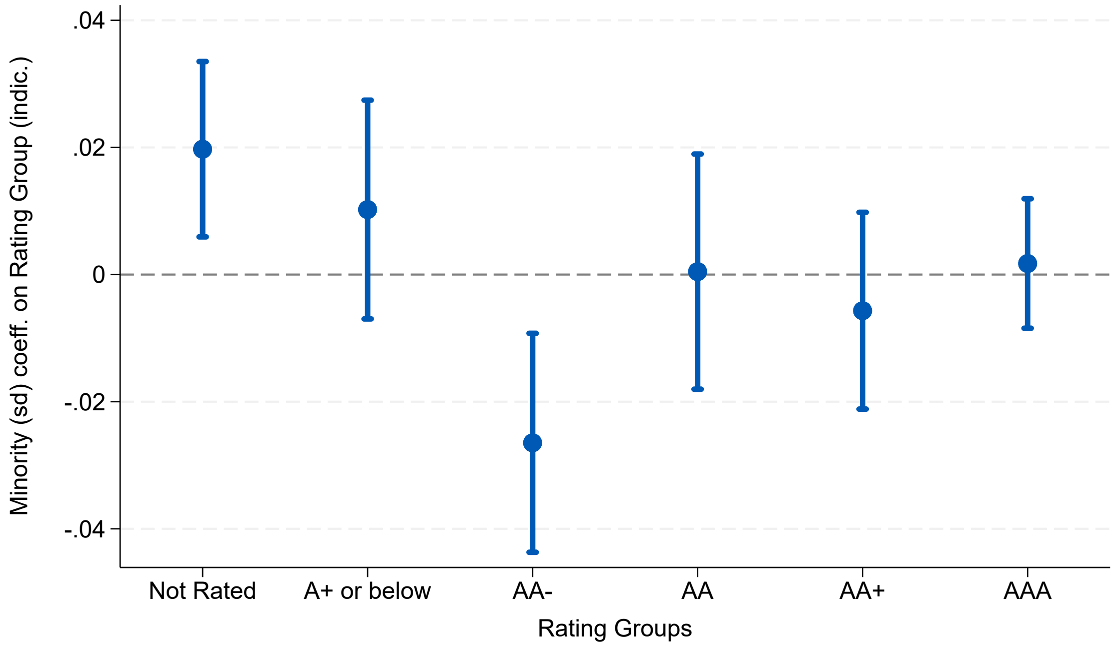
Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. Values deflated to 2010 dollars. Simple means balance test between municipalities issuing and not issuing bonds during my sample period 2004-2019. Having removed outliers, the universe of potential issuers is 6,106 municipalities. Almost 60% of those, or 3,514 are issuers in the data used throughout the paper. This is a result of an extensive data cleaning, including probabilistic name matching (95% match-rate) and trimming of outliers. This is therefore a lower-bound number of issuers, with some not being included most likely due to imperfections of the raw data.

Figure A3: Ratings



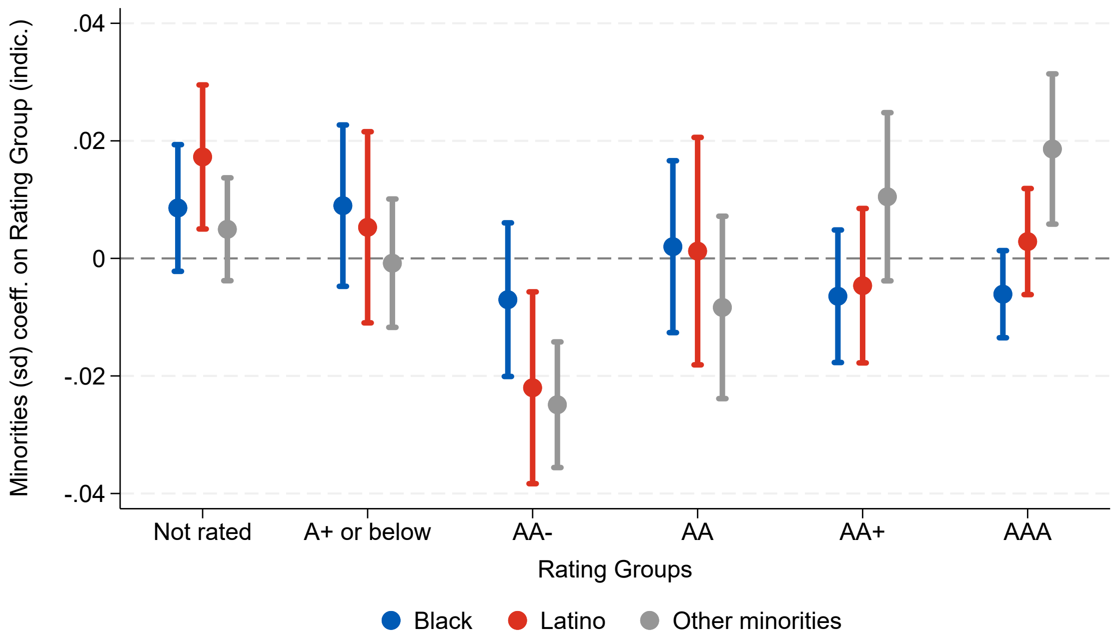
Share of bonds in the sample assigned to each rating category group.

Figure A4: Rating Probabilities (OLS)



C.I. 95%, standard errors clustered at the municipality level. Linear Probability Model estimates, plotting the coefficients of Minority population shares. The observations are at the bond level. The dependent variables are indicators for each bond being assigned a specific rating category. The Minority fraction is the share of non-White voting age population, standardized to mean 0 and standard deviation 1. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. Including state and year fixed effects.

Figure A5: Rating Probabilities (OLS)



C.I. 95%, standard errors clustered at the municipality level. Linear Probability Model estimates, plotting the coefficients of Black and Latino population shares. The observations are at the bond level. The dependent variables are indicators for each bond being assigned a specific rating category. The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. Other minorities are the residual non-White, non-Black and non-Latino minorities. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. Including state and year fixed effects.

Table A3: Minority and Yield-Spread, Census Controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)
Population (log)		3.222***			-2.745**	-2.962***
		(0.431)			(1.102)	(0.987)
Median Household Income (log)		0.922			10.140***	7.955***
		(2.367)			(2.781)	(2.368)
Over 65 (frac.)		-11.110			-13.025	-6.808
		(11.770)			(12.276)	(10.385)
Unemployment (rate)		103.889***			75.157***	80.526***
		(24.133)			(23.173)	(20.548)
College Educ. (frac.)		17.029			17.880*	17.010*
		(10.670)			(10.513)	(9.454)
Graduate Educ. (frac.)		-32.974***			-20.105**	-25.478***
		(9.549)			(10.058)	(9.282)
Pop. Growth (10y)		-0.124			-0.163	-1.258
		(1.850)			(1.829)	(1.389)
Census Controls	-	X	-	-	X	X
Accounts Controls	-	-	X	-	X	X
Financial Controls	-	-	-	X	-	X
Mean Dep. Var.	172.871	172.871	172.871	172.871	172.871	172.871
SD Dep. Var.	86.054	86.054	86.054	86.054	86.054	86.054
Obs.	256,185	256,185	256,185	256,185	256,185	256,185
Municipalities	3,514	3,514	3,514	3,514	3,514	3,514

Reporting only the coefficients on Census controls. Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimates. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Minority fraction is the share of non-White voting age population, and it is standardized to mean 0 and standard deviation 1. All columns include state, year×maturity, and rating fixed effects. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The financial controls are bond level and include: (log) amount of the bond, (log) amount of the issue, and indicators for callable, GO, competitively issued, new money, credit enhanced, bank qualified, and sink fund bonds.

Table A4: Minority and Yield-Spread, Accounts Controls

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)	(4) Spread (bp)	(5) Spread (bp)	(6) Spread (bp)
Revenues (log)			-2.485		-0.284	-0.464
			(2.429)		(2.444)	(2.266)
Expenditures (log)			2.860		3.315	2.741
			(2.344)		(2.304)	(2.130)
Outstanding Debt (log)			2.609***		2.353***	0.879
			(0.584)		(0.602)	(0.538)
Mid-tier House Value (log)			-8.331***		-11.599***	-8.926***
			(1.180)		(1.728)	(1.599)
Mid-tier House Value (growth 1y)			-26.000***		-21.919**	-20.602**
			(9.179)		(9.133)	(8.923)
Census Controls	-	X	-	-	X	X
Accounts Controls	-	-	X	-	X	X
Financial Controls	-	-	-	X	-	X
Mean Dep. Var.	172.871	172.871	172.871	172.871	172.871	172.871
SD Dep. Var.	86.054	86.054	86.054	86.054	86.054	86.054
Obs.	256,185	256,185	256,185	256,185	256,185	256,185
Municipalities	3,514	3,514	3,514	3,514	3,514	3,514

Reporting only the coefficients on Accounts controls. Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimates. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Minority fraction is the share of non-White voting age population, and it is standardized to mean 0 and standard deviation 1. All columns include state, year×maturity, and rating fixed effects. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The financial controls are bond level and include: (log) amount of the bond, (log) amount of the issue, and indicators for callable, GO, competitively issued, new money, credit enhanced, bank qualified, and sink fund bonds.

Table A5: Minority and Yield-Spread, Financial Controls

	(1)	(2)	(3)	(4)	(5)	(6)
	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)
Amount (log)				-1.312***		-1.422***
				(0.351)		(0.344)
Issue Amount (log)				-3.161***		-3.087***
				(0.439)		(0.472)
Callable (indic.)				3.928***		4.031***
				(0.687)		(0.684)
GO (indic.)				-8.358***		-8.079***
				(1.011)		(1.037)
Competitive (indic.)				-21.368***		-20.980***
				(0.959)		(0.976)
New Money (indic.)				4.083***		4.244***
				(0.750)		(0.748)
Credit Enhanced (indic.)				-11.205***		-12.219***
				(1.182)		(1.179)
Bank Qualified (indic.)				-25.106***		-23.919***
				(0.953)		(1.008)
Sinking Fund (indic.)				4.433***		4.718***
				(0.708)		(0.707)
Census Controls	-	X	-	-	X	X
Accounts Controls	-	-	X	-	X	X
Financial Controls	-	-	-	X	-	X
Mean Dep. Var.	172.871	172.871	172.871	172.871	172.871	172.871
SD Dep. Var.	86.054	86.054	86.054	86.054	86.054	86.054
Obs.	256,185	256,185	256,185	256,185	256,185	256,185
Municipalities	3,514	3,514	3,514	3,514	3,514	3,514

Reporting only the coefficients on Financial controls. Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimates. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Minority fraction is the share of non-White voting age population, and it is standardized to mean 0 and standard deviation 1. All columns include state, year×maturity, and rating fixed effects. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The financial controls are bond level and include: (log) amount of the bond, (log) amount of the issue, and indicators for callable, GO, competitively issued, new money, credit enhanced, bank qualified, and sink fund bonds.

Table A6: Blacks, Latinos and Yield-Spread

	(1)	(2)	(3)	(4)	(5)	(6)
	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)
Black (sd)	4.555***	1.370**	1.528***	2.717***	1.166**	1.009*
	(0.564)	(0.600)	(0.533)	(0.527)	(0.582)	(0.572)
Latino (sd)	3.994***	1.243*	1.542***	1.995***	2.190***	1.555***
	(0.623)	(0.687)	(0.598)	(0.489)	(0.672)	(0.584)
Other Minorities (sd)	1.292**	0.149	0.633	0.549	0.616	1.369***
	(0.609)	(0.615)	(0.587)	(0.530)	(0.576)	(0.510)
Census Controls	-	X	-	-	X	X
Accounts Controls	-	-	X	-	X	X
Financial Controls	-	-	-	X	-	X
Mean Dep. Var.	172.871	172.871	172.871	172.871	172.871	172.871
SD Dep. Var.	86.054	86.054	86.054	86.054	86.054	86.054
Obs.	256,185	256,185	256,185	256,185	256,185	256,185
Municipalities	3,514	3,514	3,514	3,514	3,514	3,514

Reporting only the coefficients on Census controls. Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimates. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. Other minorities are the residual non-White, non-Black and non-Latino minorities. All columns include state, year×maturity, and rating fixed effects. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The financial controls are bond level and include: (log) amount of the bond, (log) amount of the issue, and indicators for callable, GO, competitively issued, new money, credit enhanced, bank qualified, and sink fund bonds.

Table A7: Shift-Share IV Results, Black (non-South)

	(1)	(2)	(3)	(4)
	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)
Second Stage:				
Black (sd)	2.179***	3.931***	11.460**	11.460***
	(0.755)	(1.394)	(5.434)	(3.019)
First Stage:				
Black IV (sd)			0.343***	0.065**
			(0.085)	(0.030)
Method	OLS	Reduced	2SLS	Shift lvl.
F-stat			16.110	4.699
Mean Dep. Var.	172.664	172.664	172.664	
SD Dep. Var.	87.325	87.325	87.325	
Obs.	175,345	175,345	175,345	16
Cluster Level	County	County	County	Shift
Clusters	840	840	840	16

Estimates using only bonds from non-Southern (Census definition) municipalities. Standard errors clustered at the county level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. Column (2) is a reduced form specification using the instruments as regressors. Column (3) is recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023). The reported F-stats are for the Black and Latino IVs first-stages respectively. Column (4) reports the shift-level equivalent estimates based on Borusyak et al. (2022). The effective sample sizes, computed as the inverse of the Herfindahl index of the squared shares, is 12.7.

Table A8: Shift-Share IV Results, Latino (South)

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)	(4) Spread (bp)
Second Stage:				
Latino (sd)	2.398*	11.541***	31.178***	31.178***
	(1.419)	(3.105)	(10.621)	(4.430)
First Stage:				
Latino IV (sd)			0.370***	0.044***
			(0.087)	(0.005)
Method	OLS	Reduced	2SLS	Shift lvl.
F-stat			17.954	70.456
Mean Dep. Var.	173.320	173.320	173.320	
SD Dep. Var.	83.230	83.230	83.230	
Obs.	80,840	80,840	80,840	5
Cluster Level	County	County	County	Shift
Clusters	484	484	484	5

Estimates using only bonds from Southern (Census definition) municipalities. Standard errors clustered at the county level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. Column (2) is a reduced form specification using the instruments as regressors. Column (3) is recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023). The reported F-stats are for the Black and Latino IVs first-stages respectively. Column (4) reports the shift-level equivalent estimates based on Borusyak et al. (2022). The effective sample sizes, computed as the inverse of the Herfindahl index of the squared shares, is 4.4.

Table A9: Property Crime Robustness

	(1)	(2)	(3)	(4)	(5)	(6)
	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)
Minority (sd)	2.844**	2.837**				
	(1.126)	(1.134)				
Black (sd)			1.405	1.505	4.685	3.943
			(1.059)	(1.089)	(6.366)	(6.101)
Latino (sd)			2.378**	2.187**	3.837	3.197
			(0.934)	(0.957)	(3.083)	(3.022)
Crime control	-	X	-	X	-	X
Method	OLS	OLS	OLS	OLS	2SLS	2SLS
F-stat					5.082 / 12.909	5.139 / 13.591
Obs.	82,072	82,072	82,072	82,072	82,072	82,072
Cluster Level	Municipality	Municipality	Municipality	Municipality	County	County
Clusters	1,161	1,161	1,161	1,161	606	606

Clustered standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. Data at the bond level. The dependent variable is *Spread* (yield-spread in (4)), measured in basis points (0.01%). The Minority, Black, and Latino fractions are share of non-White voting age population, and it are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The crime control is property crimes per 1000 people. Crime data from NIBRS (2024). The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. The 2SLS specifications are recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023).

Table A10: Pension Liabilities Robustness

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)	(4) Spread (bp)	(5) Spread (bp)	(6) Spread (bp)
Minority (sd)	5.049***	5.043***				
	(1.457)	(1.452)				
Black (sd)			2.239*	2.240*	15.785	15.594
			(1.221)	(1.221)	(18.498)	(18.440)
Latino (sd)			4.496***	4.490***	11.085	11.019
			(1.283)	(1.282)	(7.575)	(7.539)
Pensions control	-	X	-	X	-	X
Method	OLS	OLS	OLS	OLS	2SLS	2SLS
F-stat					4.939 / 4.956	5.026 / 5.037
Obs.	67,031	67,031	67,031	67,031	67,031	67,031
Cluster Level	Municipality	Municipality	Municipality	Municipality	County	County
Clusters	862	862	862	862	416	416

Clustered standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. Data at the bond level. The dependent variable is *Spread* (yield-spread in (4)), measured in basis points (0.01%). The Minority, Black, and Latino fractions are share of non-White voting age population, and it are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include state, year×maturity, and rating fixed effects. The pension control is total benefits/total gains and contributions. Pensions data from ASPP (2024). The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. The 2SLS specifications are recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023).

Table A11: Alternative Mechanisms Robustness

	(1) Spread (bp)	(2) Spread (bp)	(3) Spread (bp)
Minority (sd)	13.549***	2.511***	2.842**
	(4.209)	(0.727)	(1.320)
Council Minority (sd)			-0.024
			(0.838)
Municipality FE	X	-	-
State × Year FE	-	X	-
Mean Dep. Var.	172.871	172.870	169.846
SD Dep. Var.	86.054	86.053	83.396
Obs.	256,185	256,183	102,699
Municipalities	3,514	3,514	2,006

Standard errors clustered at the municipality level in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. OLS estimates. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Minority fraction is the share of non-White voting age population, and it is standardized to mean 0 and standard deviation 1. All columns include state, year×maturity, and rating fixed effects. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include year×maturity and rating fixed effects. Column (3) includes state fixed effects. *Council minority* is measured as the share of council members belonging to a non-White Minority, and standardized to mean 0 and standard deviation 1.

Table A12: Black and Latino Shares, Alternative Mechanisms Robustness

	(1)	(2)	(3)	(4)	(5)
	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)	Spread (bp)
Black (sd)	6.214	1.473**	10.335**	1.050	27.797**
	(4.568)	(0.572)	(4.153)	(1.157)	(12.367)
Latino (sd)	17.482***	1.848***	5.205**	1.956	6.474
	(4.873)	(0.659)	(2.418)	(1.427)	(7.230)
Municipality FE	X	-	-	-	-
State × Year FE	-	X	X	-	-
Council shares	-	-	-	X	X
Method	OLS	OLS	2SLS	OLS	2SLS
F-stat			20.644 / 42.039		15.828 / 33.333
Obs.	256,185	256,183	256,183	102,699	102,699
Cluster Level	Municipality	Municipality	County	Municipality	County
Clusters	3,514	3,514	1,324	2,006	908

Clustered standard errors in parentheses. * Significant at 10%, ** significant at 5%, *** significant at 1%. The observations are at the bond level. *Spread* (yield-spread in (4)) is measured in basis points (0.01%). The Black and Latino fractions are shares of non-White voting age population, and are standardized to mean 0 and standard deviation 1. All columns include census and accounts controls. The census controls are city-level and include: (log) population, (log) median household income, share of over-65 population, shares of college and graduate educated, unemployment rate, population growth rate over 10 years. The accounts controls are city-level and include: (log) revenues, (log) expenditures, (log) outstanding debt at the time of issuance, (log) mid-tier house values, mid-tier house values growth rate over 1 year. All columns include year×maturity and rating fixed effects. Columns (4) and (5) include state fixed effects. The shift share instruments are constructed according to (6) and standardized to mean 0 and standard deviation 1. Shifts are defined in Section 5. Columns (3) and (5) are recentered adding the sum of shares $\sum_j s_{jc}/p_c$ as control (Borusyak and Hull, 2023). The reported F-stats are for the Black and Latino IVs first-stages respectively. *Council shares* are measured as the shares of Black and Latino council members, and standardized to mean 0 and standard deviation 1.

B Effective Tax Rate

I follow Schwert (2017) and Garrett et al. (2023) to compute state-specific and time-varying tax advantages and the corresponding tax-adjusted yields. State taxes are always deductible from federal taxes. Deductibility of federal taxes from state taxes varies by state. Let T_f and T_s be the amount of taxes paid on an income I, and τ_f and τ_s be the federal and state income tax rates. In states without deduction of federal taxes:

$$\begin{aligned} T_f &= \tau_f(I - T_s) \\ &= \tau_f(I - \tau_s I) \\ &= \tau_f(1 - \tau_s)I, \end{aligned} \tag{B1}$$

while simply $T_s = \tau_s I$. It follows that the effective tax rate is:

$$\tau = \tau_f(1 - \tau_s) + \tau_s. \tag{B2}$$

In states with deduction of federal taxes from state taxes:

$$\begin{aligned} T_s &= \tau_s \left[I - \tau_f(I - T_s)\right] \\ &= \tau_s(1 - \tau_f)I + \tau_s \tau_f T_s \\ &= \frac{\tau_s(1 - \tau_f)}{1 - \tau_s \tau_f} I. \end{aligned} \tag{B3}$$

Using (B3):

$$\begin{aligned} T_f &= \tau_f \left[I - T_s\right] \\ &= \tau_f \left[I - \frac{\tau_s(1 - \tau_f)}{1 - \tau_s \tau_f} I\right] \\ &= \frac{\tau_f(1 - \tau_s)}{1 - \tau_s \tau_f} I, \end{aligned} \tag{B4}$$

and the effective tax rate is:

$$\tau = \frac{\tau_f(1 - \tau_s) + \tau_s(1 - \tau_f)}{1 - \tau_f \tau_s}. \tag{B5}$$

C ML Prediction of Yield and Spread

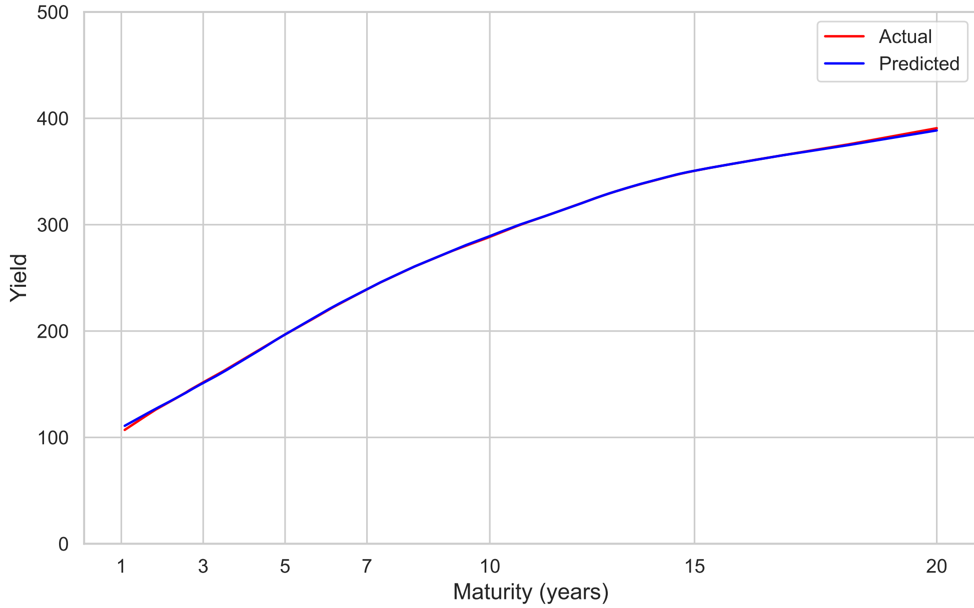
This section shows the results of a Python-based Machine Learning model trained to predict yields and spreads. Crucially, the goal is to predict yields and spreads of municipalities that do not issue bonds during my sample period, using the sample of issuers for training. This is not about forecasting.

A simple LightGBM boosted random forest framework performs exceptionally well in predicting the yield of municipal bonds. The model is cross-trained and -predicted over 5 folds of the data. For each fold, 80% of observations are used to train the model, which then predicts the remaining 20%. This framework is customized for the problem at hand, but perfectly compatible with scikit-learn preprocessing pipelines. The model is trained on a set of readily and publicly available features: the effective tax rate in the state of the issuer, the sale date, the maturity of the bond, the state of the issuer, the underlying rating of the issuer, the (log) population of the issuer, its (log) median household income, the fraction of the population over 65, the fraction of the population unemployed, the fraction of the population with college education, the fraction of the population with graduate education, the population growth rate over 10 years, the (log) revenues of the issuer, the (log) expenditures of the issuer, the (log) issuer's debt outstanding at the time, the (log) mid-tier house values in the municipality and its growth rate over 1 year, and the fraction of non-White population in the municipality.

Even with default hyperparameters, the model achieves a Root Mean Squared Error (RMSE) of 0.20 for the standardized yield used as target variable, and a 96% R^2. The model will be automatically optimized using the Optuna framework to achieve ever greater performance, and explore its forecasting potential.

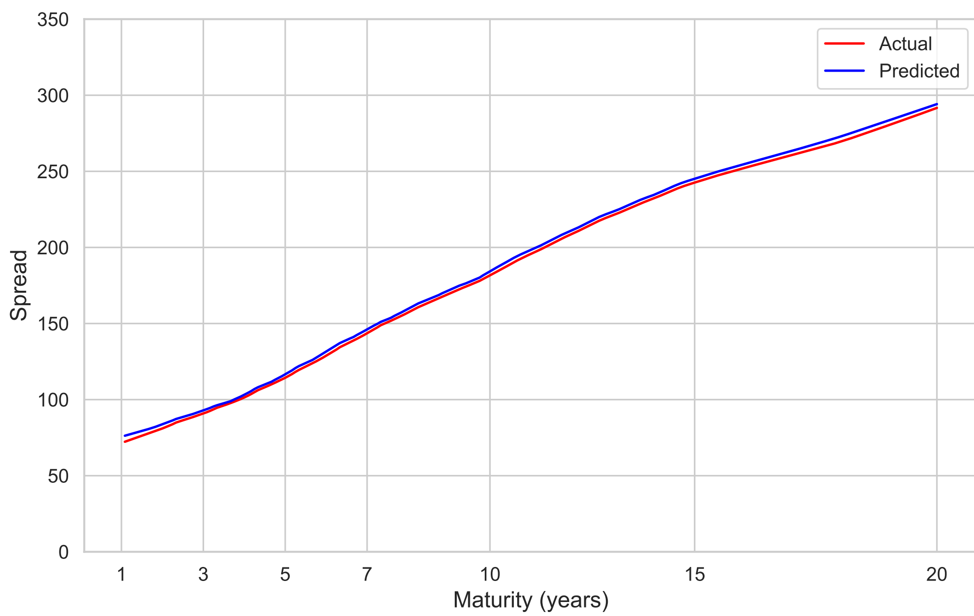
The following figures plot actual and predicted yields and spreads for a graphical comparison in accuracy. Figure C1 and Figure C2 show the actual and predicted yield and spread curves smoothed over maturities from 1 to 20 years. These are based on the entire 2004-2019 sample of bonds. Figure C3 and Figure C4 show the actual and predicted yields and spreads by date of issuance, for maturities of 1, 3, 5, 7, 10, and 15 years.

Figure C1: Actual and Predicted Yield Curves, 2004-2019



Standardized RMSE: 0.20; R2: 0.96. Cross-predictions over 5 folds stratified by issues. LOWESS smoothing.

Figure C2: Actual and Predicted Spread Curves, 2004-2019



Standardized RMSE: 0.40; R2: 0.84. Cross-predictions over 5 folds stratified by issues. LOWESS smoothing.

Figure C3: Actual and Predicted Yields by Maturity

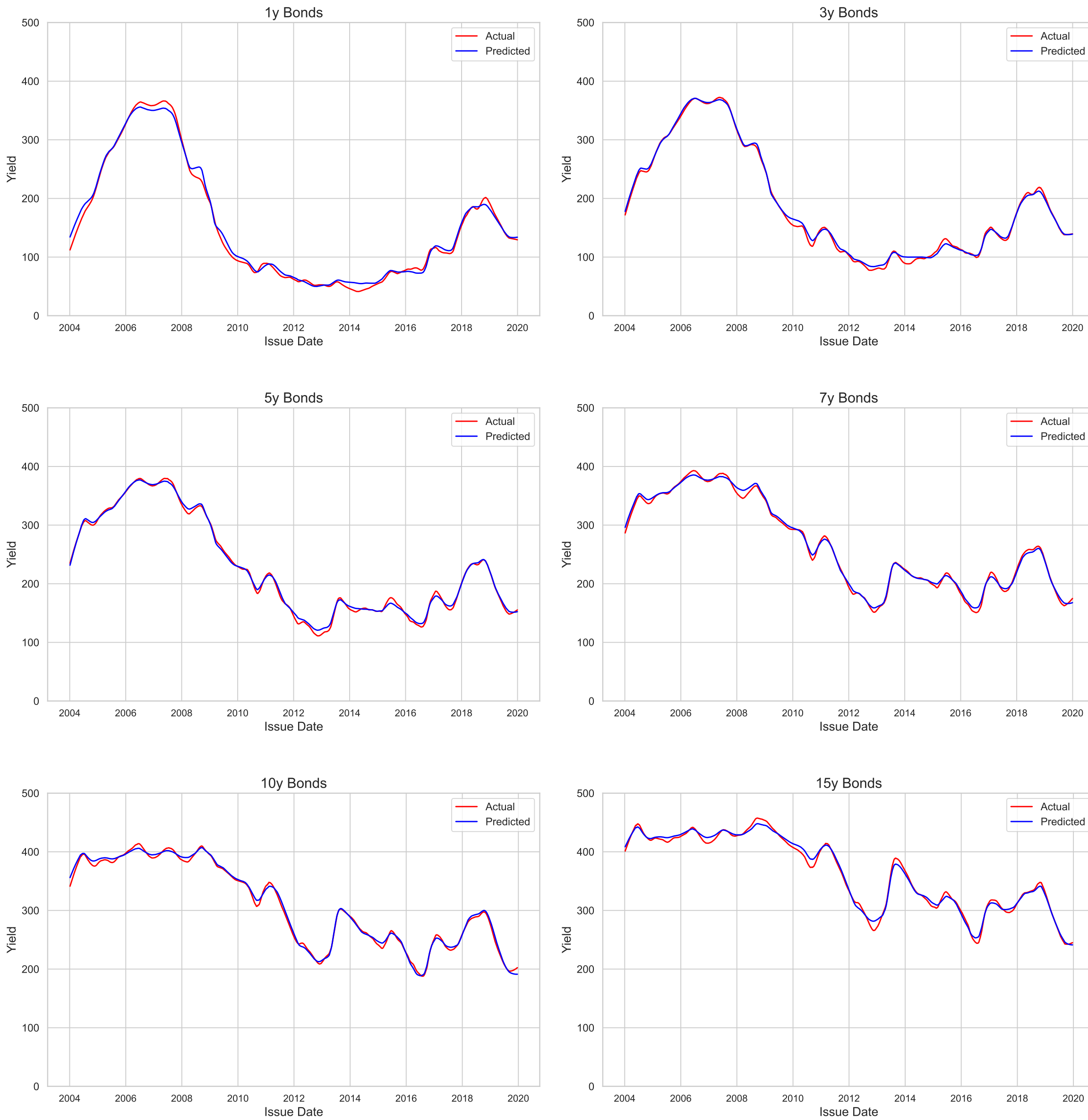


Figure C4: Actual and Predicted Spreads by Maturity