

Tax-Driven Illiquidity, Portfolio Constraints, and Municipal Borrowing Costs*

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Abstract

We study how the market discount rule in the U.S. tax code affects investor behavior and municipal borrowing costs. When a tax-exempt municipal bond is purchased below a bond-specific de minimis threshold, its pull-to-par appreciation is taxed as ordinary income, rendering such bonds unattractive to tax-sensitive municipal bond funds. As their portfolio holdings approach the threshold—due to rising interest rates or credit spreads—muni funds anticipate illiquidity and hoard cash, reducing their willingness to deploy capital in new bond offerings. We show that when existing investors of a municipal issuer are collectively closer to the threshold, they participate less in the issuer’s new offerings, raising the offering yield and reducing financing capacity—even for issuers whose bonds are not themselves subject to the tax penalty.

JEL classification: G12, G23, G28, H74

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Taxes are a first-order determinant of investors’ portfolio choices and investment decisions (Bergstresser and Poterba, 2002; Ivković, Poterba, and Weisbenner, 2005; Sialm and Starks, 2012; Babina, Jotikasthira, Lundblad, and Ramadorai, 2021). Because investors differ in their tax status and the tax code treats securities and income streams asymmetrically, tax-sensitive and tax-insensitive investors sort into distinct market segments and hold systematically different portfolios. When such clienteles are segmented and arbitrage is limited, the resulting heterogeneity in tax-induced demand is capitalized into prices and gives rise to compensating differentials in expected returns (Sialm, 2009). In this paper, we argue and provide novel evidence that tax-induced demand—or the lack thereof—also spills over to other bonds held alongside the directly affected securities, shaping portfolio-level capital allocation and, ultimately, the financing costs of issuers who rely on these same investors for capital.

Municipal bonds (munis) in the United States provide a clean laboratory for this mechanism. While the federal tax treatment of coupon income on munis is straightforward—it is exempt—the treatment of price appreciation is not. Under the market discount rule, which applies to all fixed-income securities, the tax rate on a bond’s pull-to-par appreciation depends on how far below par the bond was purchased. For most bonds, this provision has limited bite because their investors are largely tax-insensitive. Munis are different: their primary clientele—high-income households and the mutual funds that serve them—hold these bonds precisely for their tax-exempt income. When a muni’s price falls below a bond-specific *de minimis* threshold, the full pull-to-par appreciation becomes taxable as ordinary income rather than capital gain, dramatically reducing the bond’s appeal to these tax-sensitive investors. Many municipal bond mutual funds therefore deliberately avoid purchasing bonds below the threshold (Ang, Bhansali, and Xing, 2010).

This tax-driven aversion creates a sharp segmentation in the municipal bond market. Bonds that cross below the *de minimis* threshold face a substantially smaller pool of potential buyers, and we show that their transaction costs, measured by dealer markups or

imputed round-trip costs, increase sharply at the threshold, reflecting the contraction in willing buyers. This illiquidity is not just a theoretical concern: as shown in Figure 1, the share of bonds trading below their thresholds rises closely with interest rates, since higher rates push outstanding bond prices toward the predetermined cutoff. During the 2022–2023 hiking cycle, about one-third of BBB-rated municipal bonds and 10–20% of AAA-to-A rated munis fell below the threshold, exposing a significant portion of municipal bond fund portfolios to this liquidity risk. We exploit the resulting time-series and cross-sectional variation in funds’ exposure to below-threshold bonds—driven by interest rate movements interacting with the predetermined, bond-specific thresholds—to identify how this tax-induced portfolio constraint spills over to affect capital allocation and borrowing costs more broadly.

The spillover hinges on mutual funds’ liquidity management ([Chernenko and Sunderam, 2016](#); [Jiang, Li, and Wang, 2021](#); [Jiang, Li, Sun, and Wang, 2022](#); [Ma, Xiao, and Zeng, 2022](#)). When a larger fraction of a fund’s holdings approaches the de minimis boundary, municipal bond funds anticipate liquidity challenges and proactively build up cash buffers by reducing their investments. For a typical muni fund, each dollar of investor flow is associated with 51 cents of net municipal bond purchases, of which 20 cents goes to the primary market. If a fund’s portfolio is one standard deviation closer to the de minimis threshold, however, its investment sensitivity to fund flow is reduced by about a quarter to one-third relative to the baseline, and this reduction falls almost entirely on primary market purchases rather than secondary market trading.

This pullback transmits directly to municipal issuers because the investor base of a given issuer tends to be stable over time: existing bondholders serve as the natural buyers of subsequent debt offerings, collectively purchasing more than 22% of new issuance in our sample. When incumbent holders have a larger share of their portfolios near or below the de minimis threshold, their willingness to absorb new supply declines sharply: A holder whose portfolio falls into the lowest quintile of distance to threshold is about one-third less likely to participate in a new issue than other existing bondholders. The resulting contraction in

demand leads to higher offering yields: a one standard deviation increase in the share of the average holder’s portfolio that is below the threshold is associated with an 8.7 (13.5) basis point increase in (tax-adjusted) yield spreads, representing 13% of the sample standard deviation. At an average annual new issuance volume of \$190 billion and an average bond duration of 8 years, this yield increase translates to approximately \$1.3 billion in additional aggregate financing costs per year—a meaningful burden on local governments.

The magnitude of this effect varies with issuance characteristics. The effect is stronger in negotiated sales, where existing holders play a more significant role than in competitive sales. In addition, the effect is stronger for issuers that cannot afford to structure their bonds as premium bonds—that is, bonds with higher coupons that trade above par and are therefore less likely to fall into market discount territory going forward. For these issuers, the tax-induced contraction in the investor base raises issuance costs more.

We address two endogeneity concerns. The first is endogenous matching: risk-tolerant, yield-seeking funds may preferentially hold bonds of financially weaker issuers, which are more likely to fall below the *de minimis* threshold at the same period when investors demand higher yields on their new bonds. To address this, we instrument for fund-holders’ below-threshold exposure using their average portfolio maturity, excluding each issuer’s own bonds. Longer-maturity portfolios generate greater below-threshold exposure because higher duration amplifies price declines when rates rise and slower pull-to-par keeps affected bonds below the threshold longer. Since a fund’s maturity profile reflects its investment mandate rather than its appetite for issuer risk, the instrument is unlikely to directly affect offering yields beyond its effect on *de minimis* exposure. Our IV estimates confirm the baseline results. The second concern is that portfolio maturity may independently drive offering yields through channels unrelated to *de minimis* exposure—for instance, funds with longer portfolios suffer worse outflows when rates rise, precisely when issuers of longer-maturity debt must offer higher yields to attract capital. We address this by controlling for the new bond’s maturity, the average original and remaining maturities of the issuer’s outstanding bonds,

and the average Treasury yield prevailing at their issuance dates. Our results are also robust to the inclusion of issuer fixed effects.

Finally, the spillover from investors' tax-driven considerations also affects the extensive margin of municipal financing. A one standard deviation increase in current holders' below-threshold portfolio share is associated with a \$15.9 (or 3% of the sample mean) decline in per-capita issuance, suggesting that *de minimis* exposure among incumbent investors meaningfully constrains municipal financing capacity. The effect concentrates in refunding issuance, consistent with refunding being a discretionary activity that issuers can postpone when market conditions are unfavorable. Since refunding allows municipalities to reduce debt service costs and free up fiscal capacity for public expenditures, the tax-induced contraction in investor demand delays it and adversely affects the ability of local governments to finance and provide public services.

Taken together, our findings reveal an important but previously underexplored channel through which tax policy affects municipal financing costs: by shaping the portfolio liquidity constraints of mutual funds, the *de minimis* rule indirectly determines the supply of capital available to municipal issuers and, ultimately, their borrowing costs and financing capacity.

Our study contributes to several strands of the literature. First, we add to the debate on whether tax policy affects asset prices and firms' cost of capital. [Miller \(1977\)](#) argues that while tax policy can shape ownership clienteles, asset supply adjusts such that in equilibrium the marginal tax rate is equalized across assets and the after-tax risk-adjusted cost of capital is the same for all issuers.¹ The recent literature on limits to arbitrage and market segmentation casts doubt on this view. [Sialm \(2009\)](#) shows that equity values are reduced by the capitalized tax burden of marginal investors, and [Babina, Jotikasthira, Lundblad, and Ramadorai \(2021\)](#) show that local clientele constraints and preferences affect municipal bond prices. We complement this work by documenting that tax-induced demand distortions

¹ [Poterba and Samwick \(2003\)](#), [Bergstresser and Poterba \(2004\)](#), and others confirm that tax policy indeed affects households' portfolio choice.

propagate beyond the directly affected securities: the withdrawal of capital from bonds near or below the de minimis threshold spills over through investors’ portfolios to raise financing costs for other issuers whose bonds happen to be held alongside the affected ones.

Second, we contribute to the municipal bond literature (Bergstresser, 2023) by uncovering a new determinant of municipal financing costs that operates through the portfolio constraints of tax-clientele investors rather than through bond-level fundamentals. Green (1993) and Poterba (1989) argue that retail investors and their marginal tax rates dominate the pricing of municipal bonds, a view later confirmed by Ang et al. (2010), who use the market discount rule to infer that muni investors face a marginal tax rate of almost 100%. Li (2006) shows that the tax burden below the de minimis threshold implies that transactions just below it should rarely be observed. We extend this line of work by showing that the de minimis rule shapes not only the pricing of the bonds directly crossing the threshold, but also the primary market outcomes of other municipal issuers through the portfolio liquidity channel, adding to the rich set of determinants of municipal financing costs (Chalmers, 1998; Longstaff, 2011; Cornaggia, Cornaggia, and Israelsen, 2018; Fleckenstein and Longstaff, 2025) that extends beyond credit risk (Schwert, 2017).^{2,3}

Finally, our findings highlight a novel mechanism through which the growing mutual fund industry, with its open-end structure, impacts bond primary market outcomes. While the existing literature shows that mutual funds’ *flow-driven* capital supply lowers borrowing costs and increases issuance for corporate bonds (Zhu, 2021) and municipal bonds (Adelino, Cheong, Choi, and Oh, 2026),⁴ the mechanism in our setting is fundamentally different: capital supply is driven by funds’ *existing portfolio constraints* arising from their exposure to the differential tax treatment around the de minimis threshold. This distinguishes our paper

² A related literature explores the real effects of municipal financing. See, for example, Adelino, Cunha, and Ferreira (2017).

³ Griffin, Hirschey, and Kruger (2025) argue that market fragmentation results in various inefficiencies, such as high transaction costs, high underwriting costs, etc., in the municipal bond market.

⁴ Other papers (Doan, 2026; Doan and Gulen, 2026) document the role of mutual funds in the muni market via the channels of information asymmetry and the fragile structure of their liability base.

from the broader literature on how open-end funds’ portfolio management affects asset prices (Manconi, Massa, and Yasuda, 2012; Falato, Hortaçsu, Li, and Shin, 2021; Jiang, Li, Sun, and Wang, 2022; Ma, Xiao, and Zeng, 2022), where the constraints stem from the desire to minimize price impact or avoid selling underpriced securities to manage current performance. In our setting, the constraint is forward-looking: funds pull back from the primary market to preserve liquidity in anticipation of future redemption pressure, even before any outflows materialize.

1 Institutional Background and Data

1.1 The Market Discount Rule and the De Minimis Threshold

Interest paid on most U.S. municipal bonds is exempt from federal income tax, and for residents of the issuing state typically also from state income tax. The exemption applies to coupon payments and to original issue discount (OID)—when a bond is first sold, the issuer can trade off offering price and coupon rate in various combinations to produce a given yield, and the Internal Revenue Code treats the accretion of any OID as interest income that inherits the bond’s tax-exempt status. Secondary market price movements do not receive the same treatment. If an investor purchases a tax-exempt municipal bond below its face value, the difference between purchase price and face value, known as *market discount*, is generally taxable upon sale or redemption, and the applicable rate depends on the size of that discount.

Under Section 1278 of the Internal Revenue Code, a market discount is deemed *de minimis* and taxed at long-term capital gains rates if and only if it is smaller than one-quarter of one percent of the bond’s stated redemption price at maturity, multiplied by the number of complete years remaining until maturity at the time of purchase. For a par bond with N complete years remaining to maturity and face value of \$100, the de minimis threshold is

therefore

$$DM = 100 - 0.25 \times N. \tag{1}$$

A bond purchased at or below DM falls outside the de minimis exception: the full accrued market discount realized at maturity (or upon sale, for bonds sold before maturity) is instead taxed as ordinary income (Ang et al., 2010; Bagley et al., 2023).⁵

Ordinary income is taxed at substantially higher federal rates than long-term capital gains: the top marginal federal rate on ordinary income stands at 37 percent versus a top rate of 20 percent on long-term capital gains. The de minimis rule introduces a sharp, discontinuous tax penalty at a precisely identified price point. Consider a par bond with ten complete years remaining to maturity. Equation (1) gives $DM = \$97.50$. Price appreciation on bonds purchased at or above par is not taxed at all. Appreciation on bonds purchased between \$97.50 and par is taxed at long-term capital gains rates. Appreciation on bonds purchased below \$97.50 is taxed as ordinary income on the full accrued discount. The no-tax, capital-gains, and ordinary-income regions are deterministic and bond-specific, which is what allows us to study investor behavior across a clean, prespecified discontinuity in the cross-section of bonds and within the same bond over time.

Both the de minimis exception and the ordinary-income treatment of market discount are codified in Internal Revenue Code §§ 1276 and 1278, and apply to all fixed-income securities. However, these provisions fall with particular force on tax-exempt municipal bonds, whose investors hold them precisely for their tax-exempt income and are therefore especially sensitive to any tax liability on price appreciation. The de minimis rule was introduced by the Omnibus Budget Reconciliation Act of 1993 (OBRA); prior to OBRA, appreciation from market discount was taxed as capital gain regardless of its size. Our sample period begins

⁵ Equation (1) applies to par and premium bonds. For a bond originally issued at a discount, the de minimis threshold is defined relative to the *revised issue price*—the original issue price plus accreted OID through the measurement date—rather than relative to par (Ang et al., 2010; Internal Revenue Service, 2024). Our empirical construction uses the bond-specific threshold computed from the original issue price, coupon, yield, and remaining maturity for each bond-month in our sample.

in 2010, so the current rules apply throughout. The de minimis boundary is widely tracked by municipal bond market participants: dealer systems, fund compliance tools, and industry commentaries compute it explicitly, and the Municipal Securities Rulemaking Board has issued investor-education guidance warning of the tax and liquidity implications of crossing it ([Municipal Securities Rulemaking Board, 2024](#)).

Many municipal bond investors invest indirectly through pass-through investment vehicles ([Ang, Bhansali, and Xing, 2010](#)), combining direct holdings with indirect holdings through mutual funds, closed-end funds, and separately managed accounts. Among institutional intermediaries, open-end mutual funds are the single largest holder: as of 2025, U.S. municipal bond mutual funds held approximately \$836 billion in municipal securities, or 19.5% of the aggregate municipal market value, making them the second-most significant holder of the asset class after households.⁶

As discussed, most municipal bond investors—both direct holders such as high-income households and indirect holders through mutual funds—are tax-sensitive. As a result, the disdain for below-threshold bonds is market-wide, especially among investment-grade muni investors: crossing the de minimis threshold substantially reduces a bond’s pool of willing buyers, likely generating the secondary market illiquidity. This market-wide aversion is less pronounced for high-yield muni investors, who already hold bonds trading at deep discounts to par regardless of the interest rate environment and cannot credibly promise shareholders purely tax-exempt income.⁷

While the tax-induced illiquidity of below-threshold bonds is a concern shared broadly by investment-grade muni market participants, it creates a particular challenge for open-end mutual funds, whose open-ended structure exposes them to redemption risk and may force

⁶ See <https://www.federalreserve.gov/releases/z1/>.

⁷ [Ang, Bhansali, and Xing \(2010\)](#) tabulate 2006 distributions for the 100 largest tax-exempt bond funds and find that 82 paid no taxable dividends. Among the largest 20 tax-exempt bond funds, only three passed through ordinary income to shareholders. The three exceptions—Franklin High Yield Tax-Free Income Fund, Eaton Vance National Municipal Fund, and RiverSource Tax Exempt High Income Fund—are all high-yield funds whose prospectuses disclose that a portion of distributions will be taxable.

liquidation of illiquid assets on short notice. In addition, municipal bond funds typically pursue an investment mandate that constrains them from investing in a way that generates taxable income—PIMCO’s municipal bond funds, for example, state that they seek high income exempt from federal taxes” with capital appreciation [as] a secondary objective”—and in practice avoid purchasing market discount bonds altogether. In a later section, we make a distinction between high-yield muni funds that operate without the de minimis constraint and the much larger universe of tax-exempt-income-only funds that operate under it.

1.2 Data Sources, Sample Construction, and Summary Statistics

The data sample covers the U.S. municipal bond market from 2010 to 2024. Municipal bond data come from Mergent Municipal Bond Securities and Municipal Securities Rulemaking Board (MSRB) municipal bond transaction data. We identify issuers using Mergent’s *issuer_long_name* and obtain location information of the 6-character CUSIP from Bloomberg. Mutual fund holdings and other fund characteristics are sourced from Morningstar Direct. County-level characteristics are drawn from the Annual Survey of State and Local Government Finances and other sources, including the U.S. Census Bureau, the Bureau of Economic Analysis, and the Bureau of Labor Statistics. Our analysis excludes taxable bonds, variable-rate bonds, and U.S.-territory bonds. Our final sample includes 662 open-end municipal bond mutual funds and 609,460 bond issues.

1.2.1 De Minimis Threshold

We define the de minimis price as follows:

$$DM_t = \begin{cases} 100 - 0.25 \times N & \text{if } P^0 \geq 100, \\ P_t^0 - 0.25 \times N & \text{if } P^0 < 100, \end{cases} \quad (2)$$

where P^0 is the bond’s offering price and N is the number of full remaining years to the bond’s contractual maturity. For original issue discount bonds, the de minimis threshold is based on the adjusted offering price, P_t^0 :

$$P_t^0 = P_{t-1}^0 \times (1 + y^0) - C, \quad (3)$$

where y^0 is the bond’s offering yield and C is the dollar coupon.

At the bond level, *Below threshold* equals 1 if the bond’s price (either the trade price or the price inferred from fund holdings) is below its de minimis threshold, and 0 otherwise. *Distance to threshold* is the difference between the bond’s price and its de minimis threshold.

We take weighted averages, where the weight is the value of the position, across all bonds held by a fund in a given month to derive the measures at the fund level. Finally, in the sample of bond issues, we compute par-weighted averages across all funds holding the issuer’s outstanding bonds as of the previous month to construct the holders’ *Below-threshold share* and *Distance to threshold*. Other holding funds’ characteristics, such as flows and returns, are averaged in a similar manner.

1.2.2 Summary Statistics

Table 1 reports the statistics for the municipal bond sample. The sample is restricted to bonds whose issuers have at least one outstanding municipal bond held by open-end municipal bond funds as of the month preceding issuance, so that we can measure, for each bond, its current holders’ exposure to the de minimis rule and evaluate the effects of such exposure on the bond issuer’s ability to raise funds.

For the median bond, current holders (i.e., funds holding the issuer’s outstanding bonds) have 1.48% of their portfolios below the de minimis threshold, and the distance to threshold is \$12.54. Most funds are well insulated from de minimis risk: the 75th percentile of the below-threshold share is only 4.46%. The median monthly net flows and returns of the current

holders—averaged over the previous three months—are 0.53% and 0.31%, respectively.

The median issuer has a total outstanding amount of \$184 million, of which 7.00% is held by open-end municipal bond funds. The issuer monthly return, estimated using the repeated sales approach (Auh et al., 2022) and averaged over the previous three months, is -0.04% .

The median bond has an offering yield of 238 basis points. Yield spread—the difference between offering yield and the maturity-matched Treasury rate on the issuance date—has a mean (median) of 17.83 (16.80) basis points. Adjusted for federal and state taxes, the mean (median) yield spread is 184 (167) basis points. Most bonds in the sample are issued as premium bonds, with an interquartile range of \$101.40–\$115.51. The median bond has an offering amount of \$1.36 million, a maturity of 9.49 years, and a rating of AA. Forty-eight percent of the bond issues are offered in negotiated sales (as opposed to competitive sales). Callable bonds, general obligation bonds, insured bonds, credit-enhanced bonds, and bank-qualified bonds account for 49%, 52%, 13%, 20%, and 13%, respectively, of the sample.

2 The De Minimis Threshold, Bond Trading, and Liquidity

Before examining how the de minimis rule shapes fund-level portfolio management and issuer borrowing costs, we first establish that the de minimis threshold has important implications for the liquidity and trading of municipal bonds. This section documents three facts about trading activity around the threshold: (i) the share of outstanding bonds that fall below their thresholds is highly cyclical with interest rates; (ii) municipal bond funds whose investors demand tax-exempt income sharply bunch their purchases above the threshold and largely avoid below-threshold bonds, while high-yield muni funds do not; and (iii) the liquidity of municipal bonds deteriorates sharply below the de minimis threshold, consistent with a sharp contraction in the pool of willing buyers.

2.1 Time-Series Evidence

Figure 1 plots the monthly time series of the share of outstanding tax-exempt municipal bonds whose prices fall below their bond-specific de minimis thresholds, overlaid with ten-year Treasury yield. For municipal bonds rated higher than B, the share of outstanding bonds with price under the de minimis threshold is highly cyclical and correlates positively with the interest rate environment. During the low-interest period of 2015–2020, a very small portion of municipal bonds are traded below the de minimis threshold. During the taper tantrum period and, most notably, the post-Covid interest rate hiking cycle, the share of below-threshold municipal bonds rises significantly. This cyclical pattern reflects a mechanical relationship: because de minimis thresholds are deterministic and fixed-coupon municipal bond prices move predictably with interest rates, the share of below-threshold bonds traces the interest-rate cycle closely.

While high-yield muni bonds fall below the de minimis threshold more frequently, investment-grade bonds do as well, particularly when interest rates are elevated. During the most recent hiking cycle, for example, about one-third of BBB-rated muni bonds and 10–20% of AAA-to-A rated bonds fell below the threshold. This cyclical increase in below-threshold exposure poses a challenge for muni funds mandated to avoid purchasing such bonds to preserve their tax-exempt income distributions. Compounding this challenge, below-threshold bonds are illiquid—as we later document—making them difficult to sell to rebalance portfolios or meet redemptions.

2.2 Muni Fund Trades around the Threshold

Whether a tax-exempt municipal bond crosses the de minimis threshold significantly affects the propensity of tax-sensitive investors, such as muni funds, to trade it. In Figure 2, we plot the distribution of municipal bond trades by muni funds at varying distances to the de minimis (DM) threshold during our sample period of 2010–2024. We utilize the

methodology developed by [Chernenko and Doan \(2024\)](#) to identify trades made by muni funds. For each observed bond transaction in the MSRB dataset, we define the *Distance to threshold* as the transaction price minus the de minimis threshold (DM) as in Equation (1).

Panel A shows the histogram of observed municipal bond transactions by all muni funds as a function of their distance to DM threshold. Clearly, there is a discrete drop in the number of observed trades right below the threshold. This reduction in trading activities is consistent with the argument that tax-sensitive investors avoid purchasing muni bonds below the de minimis threshold as their pull-to-par appreciation would be taxed as ordinary income. We also note that the discrete drop in trading propensity is present for both muni purchases and sales: sales of below-threshold muni bonds dry up as the pool of potential buyers shrinks.

As a point of comparison, we also plot the distribution of trades at varying distances to DM threshold for high-yield muni funds. Panel B of Figure 2 shows that there is no clear discontinuity around the de minimis threshold for the high-yield fund sample. Trades are distributed smoothly across the threshold, with meaningful mass on both sides. High-yield funds do not promise shareholders purely tax-exempt income, and the market discount rule is not a binding constraint on their portfolio decisions.

We further estimate the probability that a muni bond b held by fund f at month $m - 1$ is sold at month m as a function of whether the bond's price falls below the de minimis threshold. In particular, we estimate the following equation:

$$Sale_{b,f,m} = \alpha_{f,m} + \alpha_b + \beta \times Below\ threshold_{b,f,m-1} + \eta' \mathbf{X}_{b,m-1} + \varepsilon_{b,f,m},$$

where the control vector X includes a polynomial function of the bond's price distance to DM threshold as well as bond characteristics such as coupon rate, offering amount, bond maturity, bond age, and indicators for callable bonds, general obligation bonds, insured bonds, credit-enhanced bonds, and bank-qualified bonds.

Table 2 shows that funds holding bonds that fall below the de minimis threshold are much less likely to sell those bonds. In the sample of fund-bond-month observations for fixed-coupon tax-exempt municipal bonds held by open-end muni funds between 2010 and 2024, once bond b 's implied month-end price lies below its de minimis threshold, the probability that fund f will sell any of its holdings in that bond in the following month falls by 0.59 percentage points. This is not only statistically significant but also economically meaningful, given that the unconditional average selling probability is just 1.68 percentage points. Column 2 adds the continuous distance to threshold and its square, the bond price, the full set of bond characteristics, and credit-rating fixed effects; the coefficient on below-threshold grows slightly to (minus) 0.68 percentage points. Column 3 further absorbs bond fixed effects, identifying the coefficient from within-bond variation in the threshold status driven by price movements over time: the coefficient on below-threshold rises to (minus) 0.73 percentage points, or roughly 43 percent of the unconditional selling probability.

The regression results confirm what we observe in the distribution of fund muni trades: the de minimis threshold is a significant constraint that affects the investment decisions of muni bond funds. Tax-sensitive investors intentionally avoid purchasing muni bonds below the de minimis threshold, which in turn makes the buy-side of the market thinner, making it harder for current holders to sell the bonds.

2.3 Bond Liquidity

If tax-sensitive investors withdraw from the below-threshold market, potential sellers of a bond that falls across the threshold face a thinner pool of buyers and worse market liquidity. We quantify this liquidity deterioration using several measures. Our primary measure of transaction cost is the dealer markup measure as in [Hendershott and Madhavan \(2015\)](#), computed as the relative difference between a customer-facing price and the contemporaneous par-weighted interdealer price for the same bond on the same day. We express markups in percent of price, so a coefficient of 0.10 corresponds to 10 basis points of the par-weighted

interdealer price. In addition, we use imputed round-trip cost, measured based on offsetting trades within an interval of 15 minutes (Feldhütter, 2012), to measure bond liquidity.

Figure 3 presents the average markup by bin of distance to threshold. Markups are low and roughly flat above the threshold, but step up discretely at the de minimis threshold. This reflects the significant shrinkage of investor base driven by aversion to taxable income.

Table 3 confirms these patterns in regression form using a bond-month panel. The dependent variable is the par-weighted customer markup on trades of that bond during the month. The regressor of interest is *Below threshold*, an indicator equal to one if the bond’s implied price at the prior month-end lies below its de minimis threshold. For each bond-month, we use the median implied price across all funds reporting holdings of that bond in that month. We include the continuous distance to threshold and its squared term to absorb smooth variation, along with the bond price, a full set of bond characteristics (coupon, offering amount, callability, general-obligation status, insurance, credit enhancement, bank-qualified status, bond age, and remaining maturity), credit-rating fixed effects, and year-month fixed effects. Column 2 additionally absorbs bond (CUSIP) fixed effects, so the estimates are identified from within-bond, over-time price movements that push the same bond across its threshold. Standard errors are clustered by CUSIP.

The step-up at the threshold is economically large and highly significant. The markup rises by 14.9 basis points as a bond crosses below the de minimis threshold (column 1), or by 9.5 basis points, relative to the bond’s own average (column 2). The more conservative estimate of 9.5 basis points is equivalent to 21.6% (16.8%) of the sample mean (standard deviation) of markups. We document very similar results on imputed round-trip costs, which are higher by 7.3–9.1 basis points, on average, when a bond falls below the threshold.

Taken together, the evidence in this section establishes the de minimis threshold as a sharp, clientele-driven trading barrier. Tax-sensitive investors avoid purchasing municipal bonds below the threshold, bond liquidity deteriorates as a result, and sellers who already

own below-threshold bonds are trapped into holding them. These investment frictions affect the portfolio management of muni bond funds, and our next section examines how funds respond to the prospect of their portfolios drifting toward the threshold by managing their liquidity proactively.

3 Fund-Level Portfolio Management around the De Minimis Threshold

The evidence in the previous section establishes that crossing the de minimis threshold sharply contracts the pool of willing buyers, raises transaction costs, and leaves current holders effectively trapped in illiquid positions. A muni fund manager whose portfolio contains below-threshold bonds, or bonds whose prices are drifting in that direction, should anticipate these frictions well before they bind and manage portfolio liquidity proactively. Following [Chernenko and Sunderam \(2016\)](#) and [Chernenko and Sunderam \(2020\)](#), we examine two margins of liquidity management: cash buffer accumulation and the sensitivity of bond purchases to fund flows. We find that both margins are active: funds closer to the threshold hold larger cash buffers, and deploy a smaller fraction of each dollar of inflow toward primary market purchases.

3.1 Cash and Cash-Equivalent Buffers

We first examine municipal bond funds’ cash holdings in relation to their portfolio-weighted average distance to the de minimis threshold. For each bond held in a portfolio, we calculate its distance to threshold as the difference between its holdings-implied price (i.e., $100 \times \text{market value} / \text{par value}$) and its de minimis threshold from Equation 2. We then aggregate *distance to threshold* to the portfolio level for each fund-month using dollar value weights. Figure 4 plots a fund’s total cash-and-cash-equivalents holdings, scaled by total net assets, against this distance measure. *Cash* includes holdings of cash and money market funds. *Cash equivalents* include variable-rate demand notes (VRDNs) and other cash-like

instruments such as commercial paper and Treasury bills. The relationship is strongly and steadily negative: funds whose portfolios sit closer to the threshold hold visibly more cash. For example, funds with a portfolio-average distance between 0 and 2 on average holds 5% more of its TNA in cash and cash equivalent than funds with a distance between 8 and 10.

We formalize the analysis by regressing fund cash holdings on portfolio distance to threshold:

$$Cash (\%)_{f,m} = \alpha_{family,m} + \beta \times Distance\ to\ threshold_{f,m-1} + \eta' \mathbf{X}_{f,m-1} + \varepsilon_{f,m}.$$

where controls include the fund’s 6-month average net flow, 6-month average return, log of TNA, fund age, retail share, fund-type indicators (short-term, single-state, high-yield, index), the expense ratio, portfolio concentration, and other average portfolio characteristics, with family-by-month fixed effects, to absorb common shocks within fund family, and fund-level clustered standard errors. For ease of interpretation, *Distance to threshold* is standardized to have mean zero and unit standard deviation. A lower value indicates that a larger share of the fund’s portfolio sits at or near the threshold.

Table 4 reports the results, which are generally consistent with Figure 4. In column 1, the dependent variable is the fund’s total cash-and-cash-equivalents holding as a share of TNA. The coefficient on distance to threshold is -4.646 and statistically significant at the 1% level, indicating that a standard-deviation decrease in a fund’s portfolio distance to threshold is associated with an additional 4.6 percentage points of TNA held in cash and cash equivalents. Given that funds in our sample unconditionally hold 6.7 percent of TNA in cash and equivalents, the effect is economically material, suggesting that muni bond funds proactively build cash buffers in anticipation of the portfolio adjustment difficulties that arise as their holdings become illiquid near or below the de minimis threshold.

Columns 2 and 3 decompose total cash into its two constituent parts: cash and cash-equivalents. The entire cash response is concentrated in cash equivalents, which for municipal

bond funds consist principally of variable-rate demand notes—par-stable municipal instruments whose coupons reset frequently and whose principal is redeemable at short notice. Managers respond to threshold exposure not by parking assets in taxable money-market funds but by substituting into tax-exempt cash-like assets that preserve the fund’s exempt-interest dividend posture while still providing the liquidity needed to meet redemptions.

3.2 Trading Sensitivity to Fund Flows

Having established that funds closer to the de minimis threshold hold larger cash buffers, we now examine the mechanism through which these buffers are built up. When perceived portfolio liquidity is poor, fund managers accommodate inflows and outflows using cash rather than transacting in the underlying portfolio (Chernenko and Sunderam, 2016)—that is, they deploy a smaller fraction of each dollar of inflow into bond purchases and retain more as cash. They also absorb outflows by drawing down cash rather than selling illiquid securities at poor prices. Past studies show that mutual funds normally scale their holdings up and down in response to fund flows (e.g., Pollet and Wilson, 2008; Lou, 2012), so this liquidity management motive should manifest as a weakening of funds’ trading sensitivity to flows as their portfolio holdings approach the de minimis threshold and become increasingly difficult to trade.⁸

To empirically assess this conjecture, we perform the following regression at the fund-month level:

$$Trading_{f,m} = \alpha_{family,m} + \beta \times Net\ flows_{f,m-5 \rightarrow m} \times Distance\ to\ threshold_{f,m-1} + \eta' \mathbf{X}_{f,m-1} + \varepsilon_{f,m},$$

where $Trading_{f,m}$ is defined as the dollar value of a fund’s total purchases or sales in a given month, scaled by the fund’s total net assets as of the previous month.⁹ We use the average

⁸ Jiang et al. (2021), Jiang et al. (2022), and Ma et al. (2022) show that the sensitivity of fund trading to flows is greater among more liquid holdings.

⁹ We identify mutual fund trades in MSRB transactions data following Chernenko and Doan (2024), whose algorithm explains approximately 90% of changes in open-end municipal bond fund holdings. This allows

of net fund flows over months $t - 5$ to t and control for fund returns, measured over the same period as flows, average portfolio characteristics, as well as family-month fixed effects. Standard errors are clustered by fund.

Table 5 reports the regression results. In column 1, we examine the net purchases (purchases minus sales) for each fund-month, and the coefficient on fund flows is 0.507. This indicates that, for each dollar of flow, a muni fund invests on average 51 cents in municipal bonds. The coefficient on the interaction of fund flows and portfolio distance to threshold is 0.059, significant at 1%, suggesting that, when a larger proportion of fund holdings are near the de minimis threshold (i.e., lower distance to threshold) and a fund is more concerned about poor portfolio liquidity, its investment response to fund flows is more muted.

Columns 2 and 3 decompose net purchases into sales and gross purchases. The portfolio distance to threshold affects the sensitivity of purchases—but not sales—to fund flows: when a larger share of a fund’s holdings is close to the threshold, a smaller fraction of each dollar of inflow is deployed into municipal bond purchases.

In columns 4 and 5, we further separate primary market purchases (new issuances) from secondary market purchases. Unconditionally, inflows raise both: the flow coefficient is 0.204 for primary purchases and 0.162 for secondary purchases. The difference lies in the interaction: the flow-times-distance coefficient is positive and significant only primary purchases but indistinguishable from zero for secondary purchases. The +0.053 coefficient indicates that a fund with a standard deviation lower distance to threshold deploys roughly 26 percent less of each dollar of inflow into the primary market.

We visualize the differential responsiveness of funds’ purchases to flows in Figure 5. We discretize the distance to de minimis threshold for each fund-month into 11 bins, and modify the specifications in Table 5 by replacing the continuous *Distance to threshold* variables with

us to precisely track the timing, dollar value, and venue (primary versus secondary market) of each fund’s purchases. Our results are similar if we instead measure monthly trading using aggregate changes in fund holdings, excluding those associated with bond events or fund mergers.

the bin indicators and interacting them with fund flows. The figure shows that mutual funds’ purchases of newly-issued municipal bonds become monotonically less responsive to inflows as the fund’s portfolio gets closer to the de minimis threshold. By contrast, the corresponding slope on secondary-market purchases is roughly flat across the range of distances.

Our analyses show that as portfolio holdings approach the de minimis threshold, muni funds respond to the anticipated liquidity deterioration by hoarding cash—specifically, by deploying a smaller fraction of capital flows into primary market purchases. This tax-driven portfolio constraint systematically weakens the capital supply available to municipal issuers, with implications for the pricing and volume of new bond offerings, which we examine in the next section.

4 Municipal Issuance Costs and Capacity

In this section, we investigate how the tax-driven portfolio constraints documented above affects the financing costs and capacity of municipal issuers. The key link is that a municipal issuer’s existing bondholders are typically the most reliable source of demand for its new offerings. Similarly to what [Zhu \(2021\)](#) documents for the corporate bond market, we find that a municipality’s existing bondholders are significantly more likely to acquire its new issuance than observationally similar non-holders. As a result, when incumbent holders are themselves constrained by de minimis exposures, the issuer faces a systematic contraction in capital supply that should manifest in both the pricing and quantity of its new issues.

4.1 Current-Holder Participation in New Issues

We first show that mutual funds currently holding a muni issuer’s outstanding bonds are significantly more likely to participate in that issuer’s next offering relative to non-holder funds. We estimate the following equation:

$$Purchase_{b,f} = \alpha_{f,m} + \alpha_b + \beta \times Current\ holder_{i,f,m-1} \times Below\ threshold\ share_{f,m-1} + \eta' \mathbf{X}_{f,m-1} + \varepsilon_{b,f,m},$$

where $Purchase = 100$ if the bond is purchased by the fund in the primary market and 0 otherwise. The unit of observation is all pairs of new muni issuance and its potential purchasers. For a given bond issue, we identify potential purchasers open-end municipal bond funds that have purchased any bond issue with the same rating band (i.e., AAA, AA, A, BBB, etc.) and from the same state within the previous six months. Unconditionally, the probability that any given muni fund buys any given new issue in the month of offering is 0.25 percent.

Column 1 of Panel A, Table 6 shows that being a current holder of the issuer raises the probability that the fund would purchase some amount of the municipality’s new issues by 0.97 percentage points. Current holders are therefore approximately four times more likely to acquire an issuer’s new bonds than non-holders. This mirrors the pattern documented for corporate bond funds in [Zhu \(2021\)](#). The specification absorbs bond issue fixed effects and fund-by-month fixed effects, so the differential participation propensity reflects within-issue variation across funds that cannot be attributed to issues that are simply more attractive in the aggregate or to generic differences across funds in how aggressively they buy in the primary market.

This sticky relationship between muni bond investors and issuers is what allows a fund-level portfolio shock to translate into an issuer-level capital-supply shock. If current holders are disproportionately the marginal buyers of an issuer’s new issues, then a contraction in their willingness to invest may meaningfully reduce the aggregate demand for an issuer’s new bond issuance.¹⁰ As we argued earlier, we use the muni funds’ consideration of their portfolio being close to or below the de minimis threshold as variation of their willingness to participate in new muni bond issuance.

To capture this variation, we calculate the distance to the de minimis threshold for

¹⁰ Internet Appendix Table IA1 shows that, among bonds with positive purchase by mutual funds in the primary market, current holders (funds only) purchase 22.35% of the bond’s offering amount on average. Conditional on the bond being purchased by at least one current holder, the mean (median) current holders’ purchase amount, scaled by offering amount, is 45.04% (37.30%).

the portfolio of each fund-month. When we interact the current holder indicator with the distance to threshold of an issuer’s current investors, we find that a shorter distance to the de minimis threshold reduces current holders’ propensity to participate in new primary-market issuance. Since we standardize the portfolio distance to threshold, column 2 of Panel A, Table 6 indicates that a current holder whose portfolio sits one standard deviation further closer to the threshold reduces its propensity to participate in new issues by 0.14 percentage points. Column 3 replaces the continuous distance measure with an indicator for current holders whose portfolios sit in the bottom tercile group, which likely exposes funds to poor liquidity below the de minimis threshold. The interaction coefficient of -0.322 suggests a reduction of approximately one-third in the current-holder participation differentials.

In columns 4 and 5, we repeat the same analysis in a subsample of negotiated municipal bond sales. Similar to bookbuilding in equity IPOs, negotiated sales involves a selected underwriter (or group of underwriters) selling the bond to its investor customers. In contrast, competitive sales involve public bidding in an auction process. Consistent with the idea that current holders are likely clients of the underwriter and hence play an important role in the offering process, we document a stronger effect of current holders’ distance to threshold on negotiated sales. The coefficients on the interactions are 0.167 and -0.390 , respectively, or about 20% larger in magnitude than those in the full sample.

Panel B of Table 6 repeats the analysis using the fund’s below-threshold share as the exposure measure. For each fund-month, we calculate *Below-threshold share*—the share of portfolio bonds whose holdings-implied price falls below the de minimis threshold. This captures the fund’s exposure to de minimis risk at the tail, in contrast to *Distance to threshold*, which is a more continuous measure. Consistent with what we find with the continuous distance-to-threshold measure, we find that, when a municipal issuer’s current investors have a larger portion of their portfolio holdings below the de minimis threshold, these current investors reduce their propensity to participate in the new issue. This undermines the most reliable capital supply of municipal issuers. This reduced participation is most pronounced

in negotiated deals where current-holder relationships are most central.

4.2 Municipal Offering Yields

If threshold-exposed current holders reduces the amount of capital available to affected issuers, we expect that those issuers should pay higher yields to place their new bonds. We test this at the issue level by regressing the offering yield spread on the below-threshold share of the issuer’s current mutual fund-holders:

$$Yield\ spread\ (bps)_b = \alpha_{c,m} + \beta \times Below\text{-}threshold\ share_{i,m-1} + \eta' \mathbf{X}_b + \varepsilon_{b,m}.$$

We control for current holders’ net flows, returns, and their aggregate ownership share of the issuer’s outstanding bonds. The issuer-level controls are the issuer’s past bond return, log amount outstanding, the weighted average maturity of outstanding bonds (both original and as of month $m - 1$), and the weighted average 10-year Treasury rate on the issuance dates of outstanding bonds. The bond-level controls are the coupon, offering type (negotiated versus competitive), log offering amount, callable status, general-obligation status, insurance, credit enhancement, bank-qualified status, and log maturity. All specifications include county-by-month and credit-rating fixed effects. Standard errors are clustered by county and by month. Table 7 and Figure 6 report the results.

We report estimates separately for the offering yield spread (columns 1–3 of Table 7) and the tax-adjusted yield spread (columns 4–6). The yield spread of a municipal bond is the difference between its offering yield and the maturity-matched Treasury rate as of the issuance date. The tax-adjusted yield spread is defined as follows:

$$\frac{y_{b,t}}{(1 - \tau_t^{fed})(1 - \tau_{s,t}^{state})} - r_{b,t}, \quad (4)$$

where the offering yield, $y_{b,t}$, is adjusted for the federal tax rate (τ_t^{fed}) and state tax rates

$(\tau_{s,t}^{state})$ in the year of the issuance.

Table 7 shows that a one-standard-deviation increase in current holders' below-threshold share is associated with an offering yield spread that is 8.7 basis points higher (column 1), and a tax-adjusted spread that is 13.5 basis points higher (column 4). These estimates represent 13% (11%) of the sample standard deviation of the yield spread (tax-adjusted yield spread). In perspective, AA-rated issues carry average yield spreads (tax-adjusted yield spreads) roughly 17 (31) basis points above AAA-rated issues.

Similarly, a one-standard-deviation reduction in the distance to threshold of an issuer's current holders is associated with a tax-adjusted yield spread that is 6.0 basis points higher (column 2) and a tax-adjusted spread that is 10.7 basis points higher. Finally, when both the below-threshold share and the distance measure are included simultaneously (columns 3 and 6), both are statistically significant, but the below-threshold share captures most of the explanatory power.

The results in Table 7 may be driven by unobservable issuer characteristics. For instance, funds with greater exposure to de minimis risk might persistently invest in riskier issuers that must offer higher yields to attract investors. In Internet Appendix Table IA2, we show that our results are robust to the inclusion of issuer fixed effects, although the magnitudes of the point estimates become smaller.

The higher yield spread associated with mutual fund-holders' *Below-threshold share* suggests considerable additional financing costs. During the sample period, the sample aggregate issuance amount is \$2.85 trillion, or \$190 billion per year. The sample average and median of bond duration at issuance are both approximately 8 years. An increase of 8.7 basis points in the yield spread, which corresponds to a one-standard-deviation increase of 6.1% in *Below-threshold share*, translates to a higher aggregate annual financing cost of \$1.3 billion ($8 \times \$190 \text{ billion} \times 8.7/10,000$). This back-of-the-envelope calculation relies on bond issuance by issuers whose outstanding bonds are held by mutual funds. The transmission

mechanism—whereby current holders tend to continue investing in new issues, but less so if they hold many existing bonds falling below the de minimis threshold—likely applies to non-fund investors as well. During 2010–2024, the aggregate muni issuance amount was nearly \$5.0 trillion, or 75% larger than the sample aggregate amount, implying that the actual annual cost burden is significantly higher than the \$1.3 billion estimate.

The joint observation that stronger below-threshold exposure among current holders is associated with both lower primary-market participation and higher offering yields suggests that tax considerations related to de minimis threshold significantly affect muni bond funds’ investment decisions in the primary muni market and shift the capital supply curve for affected municipal issuers.

4.3 Instrumental Variable Analysis

While controlling for issuer fixed effects (Internet Appendix Table [IA2](#)) absorbs time-invariant issuer-level unobservables, the baseline results may still reflect endogenous matching between issuers and their mutual fund holders rather than the cash-hoarding channel we propose. For instance, risk-tolerant, yield-seeking mutual funds may be more willing to hold bonds of financially weaker issuers, which offer higher yields and are therefore more likely to trade near or below the de minimis threshold. At the same time, because these issuers are financially weak, they find it more difficult to issue new bonds, and their new bonds carry higher yield spreads. To address this endogenous matching concern, we employ an instrumental variable (IV) strategy that uses the average portfolio maturity of a bond’s mutual fund holders as an instrument for holders’ proximity to the de minimis threshold.

Ceteris paribus, longer-maturity bonds are more likely to be observed below the de minimis threshold, for two reasons that offset a mechanical effect working in the opposite direction. Because the threshold itself declines linearly with a bond’s remaining maturity, longer-maturity bonds are mechanically less likely to fall below it. However, longer maturities also imply higher duration, and hence larger price declines when interest rates rise.

In addition, bond prices naturally pull toward par as time passes (holding yields constant), and this pull-to-par effect accelerates as a bond approaches maturity. As a result, a longer-maturity bond that has fallen below the threshold pulls back toward par more slowly, taking longer to rise back above it, and so spends more time in the below-threshold region. In our setting, these duration and pull-to-par effects are expected to dominate the mechanical threshold effect, so that longer-maturity bonds are, on net, more likely to be observed near or below the *de minimis* threshold.

We instrument for mutual fund-holders’ average below-threshold share using their average portfolio maturity, reported in Table 8. For a given new bond issue, we compute the par-weighted average portfolio maturity across all mutual funds holding the issuer’s outstanding bonds as of month $m - 1$, where each fund’s portfolio maturity is measured as of month $m - 13$. Lagging the measure by thirteen months mitigates the concern that a fund’s contemporaneous portfolio maturity might itself reflect its concurrent demand for long-maturity new issues, which carry higher offering yields due to interest rate risk. When constructing the instrument, we exclude each issuer’s own bonds from the calculation of its fund-holders’ portfolio maturity, so that the instrument does not directly capture the issuer’s own endogenous maturity choice, which could independently drive its new bonds’ offering yields. To further isolate variation in *de minimis* exposure that is driven by general market conditions rather than issuer-specific financial health, Panel B of Table 8 restricts the analysis to the recent rate-hiking cycle (March 2022 to August 2024). In this panel, we further guard against funds’ strategic maturity adjustments by fixing the instrument at each fund’s portfolio maturity as of year-end 2021, prior to the onset of the rate-hiking cycle.

We argue that this instrument satisfies the *exclusion restriction*, since a fund’s portfolio maturity is largely determined by its investment mandate rather than by the risk tolerance or yield-seeking behavior that matches funds with financially strong or weak issuers. The maturity of a fund-holder’s *other-issuer* bonds is unlikely to directly affect, or be jointly determined with, the pricing of the issuer’s new bond. A remaining concern, however, is that

fund-holders’ portfolio maturities may be correlated with the offering yields of the issuer’s new bonds through channels other than de minimis exposure. First, funds with longer portfolio maturities are naturally matched with issuers that tend to issue longer-term bonds. When interest rates rise, investors shy away from long-maturity bonds: funds with longer portfolios face outflows and underperform, while issuers with longer-maturity debt must offer higher yields to attract investors. Second, funds with longer portfolio maturities typically experience inflows when interest rates fall. As a result, they tend to buy bonds issued during low-rate periods, naturally matching them with issuers that either issue predominantly in such periods or whose fundamentals improve when rates are low. These issuers, in turn, find it more difficult to issue new bonds when rates rise – precisely the periods in which their fund-holders face outflows. To address these problems, as in our baseline specification, we control for the maturity of the new bond issue, the average original and remaining maturities of the issuer’s outstanding bonds, and the average 10-year Treasury yield prevailing on their issuance dates.

The IV estimates in Table 8 are in line with the baseline OLS results in Table 7. The first-stage results confirm that, at the fund level, longer portfolio maturity predicts a higher share of bonds trading below the de minimis threshold; aggregating this relationship across each issuer’s fund-holders produces a strong first stage, with F -statistics exceeding 69 in Panel A and 54 in Panel B—well above conventional thresholds for weak-instrument concerns. Internet Appendix Figure IA1 confirms a near-monotonic relation between the below-threshold share and portfolio maturity, particularly for longer maturities and during the recent rate-hiking cycle.

In the second stage, the coefficient on the instrumented *Below-threshold share* remains positive and highly significant, consistent with the OLS findings. In the full sample, the IV estimates are slightly larger in magnitude than the OLS estimates, perhaps because factors that endogenously match funds and issuers attenuate the cash-hoarding effect.¹¹ When

¹¹ For example, funds that hold longer-maturity bonds—and therefore have larger shares of bonds below

we restrict the sample to the recent rate-hiking cycle, however, the IV estimates are more than twice as large as the OLS estimates. This pattern likely reflects a large local average treatment effect: our instrument primarily shifts behavior among the most vulnerable funds amid rising interest rates, whose trading—or lack thereof—has an outsized price impact.

4.4 Current Holders’ Exposure to Liquidity Risk

To further isolate the tax-driven portfolio constraint channel and establish that the resulting cash hoarding is motivated by liquidity management, we show in Table 9 that the effects on offering yields are stronger when current holders face greater liquidity risk from their below-threshold holdings.

First, we compare mutual fund holders with insurance company holders, constructing an analogous *Below-threshold share* measure for insurers using NAIC Schedule D holdings. We expect the effect on offering yields to be weaker for insurers than for mutual funds. Open-end mutual funds face daily redemption risk and may be forced to liquidate assets on short notice, a pressure that becomes particularly acute when portfolios contain below-threshold bonds that suffer from tax-induced secondary market illiquidity (Section 2.3). Moreover, the illiquidity of below-threshold bonds amplifies strategic complementarities among fund investors: knowing that liquidating these assets is costly, investors have stronger incentives to redeem early, inducing fund managers to hoard additional cash as a buffer against tax-driven portfolio constraints (Chen et al., 2010; Goldstein et al., 2017). Insurance companies, by contrast, are relatively insulated from sudden outflows thanks to their long-term, predictable contractual liabilities, and their stable investor base makes them natural “asset insulators” that absorb rather than amplify price pressure (Chodorow-Reich et al., 2021; Coppola, 2025; O’Hara et al., 2026).¹² Consequently, while tax-driven portfolio constraints and the resulting

the de minimis threshold—also tend to choose safer bonds. The resulting financial strength of these issuers partially offsets the cash-hoarding effect of clientele investors, biasing the OLS estimate downward.

¹² Insurance companies are subject to the same corporate tax rate on both capital gains and ordinary income, so the de minimis threshold does not create the same tax-driven portfolio constraint that it does for mutual funds and their high-income investors. Insurers may still face secondary market illiquidity when selling

cash hoarding distort the primary market investment decisions of mutual funds, they should have a considerably weaker effect on those of insurance companies.

Columns 1 and 3 of Table 9 confirm this prediction: the effect of mutual fund holders' *Below-threshold share* on offering yields is several times larger than that of insurer holders, with coefficients of 9.5 versus 1.6 for yield spreads and 15.4 versus 3.2 for tax-adjusted yield spreads. This contrast supports the interpretation that our baseline effect is driven by tax-driven portfolio constraints and the associated liquidity management of open-end mutual funds, rather than a general institutional preference for holding low-priced bonds. Moreover, since we control separately for mutual fund and insurance ownership levels, the effects we attribute to below-threshold exposure are distinct from the asset insulation channel (Chodorow-Reich et al., 2021; Coppola, 2025), whereby higher insurer ownership stabilizes the secondary market prices of existing bonds and thereby lowers the yields at which new bonds are benchmarked.

Second, turning to within-sample variation among mutual fund holders, we exploit differences in their client composition. Funds with a larger retail investor base exhibit greater fragility: retail share-class flows are significantly more sensitive to underperformance than institutional flows (Bergstresser and Poterba, 2002; Doan and Gulen, 2026), resulting in a more volatile redemption profile. Such funds therefore face stronger incentives to hoard cash when their portfolios are exposed to the tax-induced illiquidity of below-threshold bonds, and we expect the impact of *Below-threshold share* on offering yields to be more pronounced when issuers rely more heavily on retail-oriented fund holders for capital.

We test this conjecture by augmenting our yield spread regressions with *Retail class share*—defined as the par-weighted average ratio of retail share class TNA to total fund TNA across all muni fund holders of the issuer's outstanding bonds—and its interaction with *Below-threshold share*. The positive and significant interaction coefficients in columns 2

below-threshold bonds, but their predictable liability structure reduces the urgency of doing so.

and 4 of Table 9 confirm that the positive effect of *Below-threshold share* on offering yields is amplified when fund holders are more retail-oriented. A one standard deviation increase in *Retail class share* raises the incremental effect of a one standard deviation increase in *Below-threshold share* by 1.3 (1.9) basis points on yield spreads (tax-adjusted yield spreads), representing approximately 15% of the unconditional effect.

4.5 Cross-Sectional Heterogeneity in Bond Characteristics

The effect of tax-related shift in capital supply varies across bonds. In particular, when investors’ current portfolio holdings are more exposed to the liquidity consideration below the de minimis threshold, these investors would be more reluctant to invest in new issues if the newly purchased bond could itself drift below the de minimis threshold at some point in the future. Accordingly, bonds whose structure makes them more vulnerable to crossing the threshold should show a larger yield-spread response to current holders’ threshold exposure. In particular, we examine four bond characteristics which we hypothesize would affect bonds’ sensitivities.

First, bonds issued at lower offering prices start closer to par or below, so a smaller future rate increase would push them below their de minimis threshold.¹³ Current holders already exposed to below-threshold bonds are therefore particularly reluctant to add new issues whose threshold buffer is small to begin with, and the yield concession required to place such a bond should be larger. Second, bonds with longer remaining maturity have higher duration and greater price sensitivity to future rate changes. Conditional on future interest rate hike, long-maturity bonds are mechanically more likely to cross the threshold, making them less attractive to investors already exposed to the liquidity trap below the threshold. Third, lower-rated bonds trade at wider spreads and exhibit greater price volatility, making them structurally closer to threshold territory and more likely to cross it under adverse conditions.

¹³ Most municipal issuers set bond coupon rate to issue at a premium to give the issues more “room” from market discount (Landoni, 2018).

Fourth, in negotiated sales the underwriter depends disproportionately on existing-holder relationships to place the issue, so a reduction in incumbent-holder capacity translates more directly into higher offering yields than in competitive sales, where the winning bidder can call on a broader distribution network.

We test these hypotheses by estimating the offering yield spread regressions with the interaction between current holders' *Below-threshold share* and different bond characteristics. The results in Table 10 show that the yield-spread effect of current holders' below-threshold share is significantly larger for bonds with lower offering prices, longer maturities, lower credit ratings, and for bonds sold in negotiated deals. These cross-sectional patterns reinforce the capital-supply interpretation by localizing the effect where the tax-motivated investment constraints should be more binding.

4.6 Extensive Margin: County-Year Issuance Volume

We find in the previous sections that tax-induced investment constraints reduce the capital supply provided by past mutual fund investors to new bond issuance and raises the financing cost for some municipal issuers. A logical response by affected municipalities would be to moderate the *quantity* of new debt they bring to market. In this section, we evaluate the impact of de minimis threshold exposure on the extensive margin by examining the amount of bond issuance at the county-year level.

To this end, we aggregate issuance to the county-year panel using the location of the 6-character issuer CUSIP, and regress county-year issuance amount on the below-threshold share of the current mutual fund-holders of the county's outstanding bonds:

$$Issuance\ amount_{c,y} = \alpha_{s,y} + \beta \times Below\text{-}threshold\ share_{c,y-1} + \eta' \mathbf{X}_{c,y} + \varepsilon_{c,y}.$$

The dependent variable, *Issuance amount*, is normalized by either county population or county GDP. We include state-by-year fixed effects and a full set of county-level economic

and demographic controls to absorb the socioeconomic difference across municipalities. We include both county-years with and without issuance activity, provided that the county has some outstanding bonds held by mutual funds as of the end of the previous year, based on which we can measure *Below-threshold share*. State-by-year fixed effects are included, effectively facilitating comparisons between counties within the same state and year.

Table 11 reports the results. A one-standard-deviation increase in current holders' below-threshold share is associated with a decline in total per-capita issuance of \$15.9 (column 1) against a baseline of \$517 per capita, or over 3 percent. The decline is entirely driven by refunding activity: per-capita refunding issuance falls by \$13.0 (column 3), while new-money issuance is statistically unchanged (column 2).¹⁴ The same pattern repeats when we scale by county GDP rather than population (columns 4–6). This differential response is precisely what a capital-supply interpretation would predict. Refunding is a discretionary activity in which issuers choose when to refinance outstanding debt based on prevailing market conditions and can postpone refunding when those conditions are unfavorable. In contrast, new-money issuance reflects capital needs tied to investment and operations that cannot easily be deferred. When current holders are constrained by threshold exposure, issuers face higher offering yields (Section 4.2), and the affected issuers respond by scaling back the portion of their issuance activity they can postpone.¹⁵

Both this quantity rationing and rising borrowing costs can impose significant constraints on local governments.¹⁶ Reduced access to the municipal bond market not only stifles local economic activity, including expenditures and employment (Adelino et al., 2017; Dagostino, 2025), but also degrades public service quality, leading to issues such as water contamination (Agrawal and Kim, 2021) and power outages (Yi, 2021).

¹⁴ The coefficients do not add up due to winsorization.

¹⁵ Internet Appendix Table IA3 reports similar results with respect to bond maturity. Specifically, a higher current fund-holders' below-threshold share is associated with shorter refunding issue maturities, whereas no such relationship exists for new-money issues.

¹⁶ Internet Appendix Table IA4 shows that counties associated with a higher current fund-holders' below-threshold share tend to have lower expenditures and smaller reserves of cash and securities.

5 Conclusion

We study how tax policy shapes the portfolio constraints of mutual funds and, through them, the financing costs of municipal issuers. Our setting exploits the market discount rule in the U.S. tax code, which governs the tax rate on price appreciation for bonds purchased below a bond-specific “de minimis” threshold: appreciation on bonds purchased above the threshold is taxed at capital gains rates, while appreciation on bonds purchased below it is taxed as ordinary income. For the tax-sensitive investors who dominate the municipal bond market, this distinction is significant, rendering below-threshold bonds unattractive and illiquid. Rising interest rates and credit spreads push an increasing share of outstanding bonds below the threshold, and open-end mutual funds holding these bonds address the resulting liquidity risk by hoarding cash and curtailing their participation in new bond offerings. Issuers who rely on these funds for capital face higher offering yields, and some are effectively priced out of the market.

Our findings highlight open-end mutual funds as an important conduit through which a localized tax-induced shock propagates across the broader municipal bond market, ultimately shaping the financing costs and capacity of local governments. Because bond prices and the likelihood of them falling below the de minimis threshold are systematically driven by interest rates and credit conditions, our mechanism may amplify monetary policy and credit market shocks, transmitting them to the state and local government sector. This complements the “flow” mechanisms highlighted by [Fang \(2025\)](#), [Fang and Nini \(2026\)](#), and [Kuong et al. \(2024\)](#) for corporate bonds and loans, with the distinction that our channel operates through liquidity management in anticipation of future flows rather than through realized fund outflows. Whether such amplification and transmission have quantitatively important macroeconomic consequences is an interesting question for future research.

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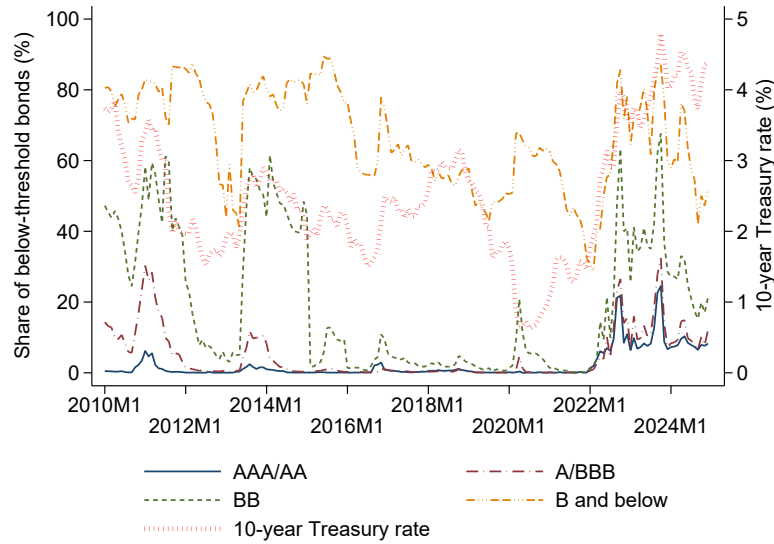
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Figure 1
Share of bonds below the de minimis threshold by bond rating

This figure plots the time series of the monthly share of bonds whose holdings-implied price is below the de minimis threshold and the monthly average distance to threshold, weighted by the bond's offering amount, by bond rating. The share of below-threshold bonds rises during periods marked by market stress, including concerns about potential municipal defaults in 2010–2011, the Taper Tantrum and subsequent defaults in Detroit and Puerto Rico in 2013–2014, the onset of the COVID-19 pandemic in 2020, and the 2022–2023 rate-hiking cycle. The sample includes all fixed-rate, tax-exempt bonds held by at least one open-end municipal bond funds between 2010 and 2024.

(a) Share of below-threshold bonds



(b) Average distance to threshold

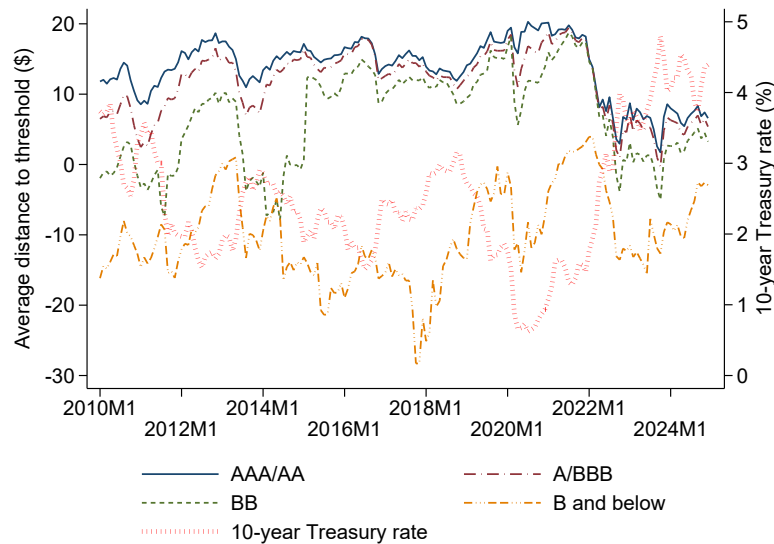


Figure 2
Distance to threshold

This figure plots the distribution of the distance to de minimis threshold for trades by open-end municipal bond funds. We identify mutual fund trades by matching MSRB transactions with holdings-implied trades from Morningstar, defined as changes in holdings between adjacent reporting snapshots., following the algorithm in [Chernenko and Doan \(2024\)](#). The unit of observation is a transaction. The sample period is 2010–2024.

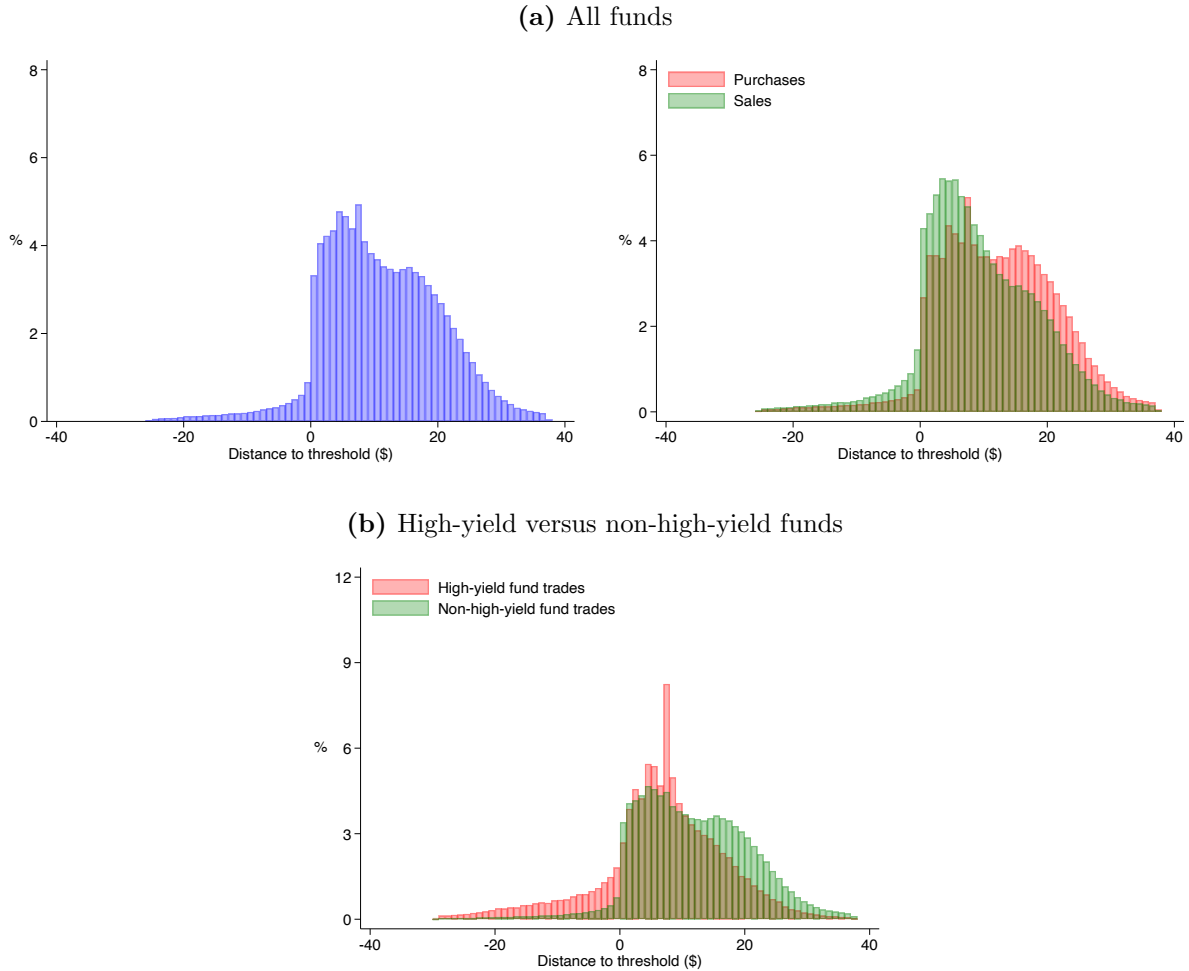


Figure 3
Bond markups

This figure plots the average markup for each bin of the distance to de minimis threshold among all bonds held by open-end municipal bond funds. For each bond-month, we use the median holdings-implied price across all funds reporting in that month. Trade-level markup is the signed relative difference between the trade price and the average interdealer trade price of the same bond on the same day. Monthly markup is the median markup across all trades on a bond in a given month. The unit of observation is a bond-month. The sample period is 2010–2024.

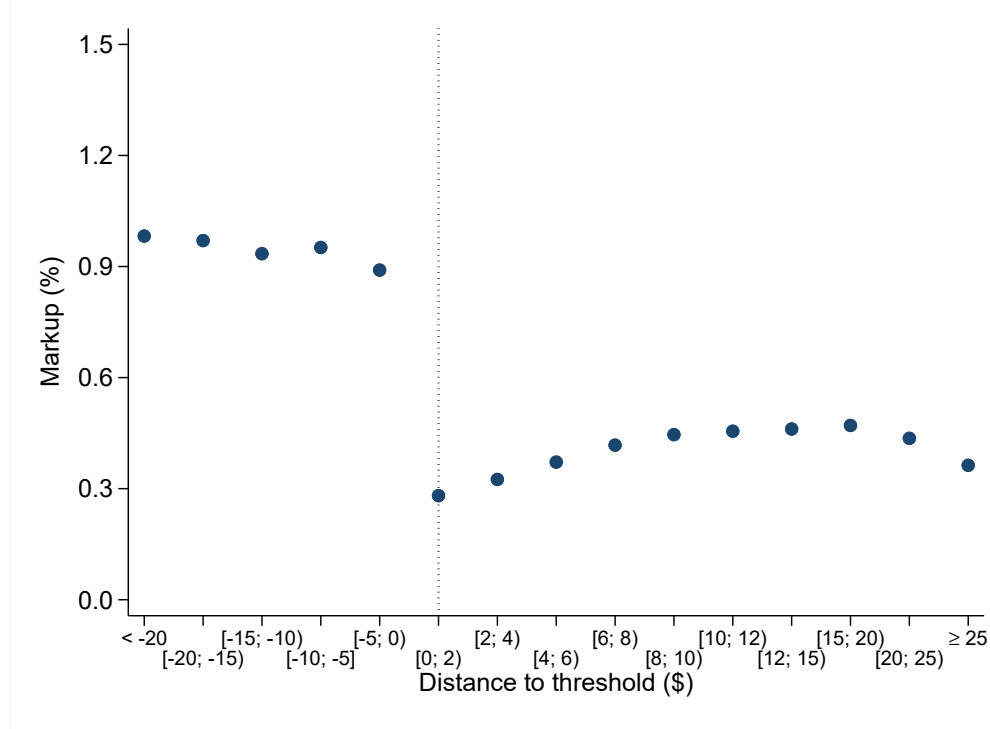


Figure 4
Distance to threshold and cash buffers

This figure plots the relation between a fund's cash buffers on the fund's average distance to de minimis threshold, estimated from specifications in Table 4. Funds are grouped into 11 bins based on their distance to de minimis threshold: $(-\infty; 0)$, $[0; 2)$, $[2; 4)$, $[4; 6)$, $[6; 8)$, $[8; 10)$, $[10; 12)$, $[12; 14)$, $[14; 17)$, $[17; 20)$, and $[20; +\infty)$. The coefficients are relative to the base bin $[8; 10)$. The unit of observation is a fund-month. The sample period is 2010–2024. Standard errors are adjusted for clustering by fund.

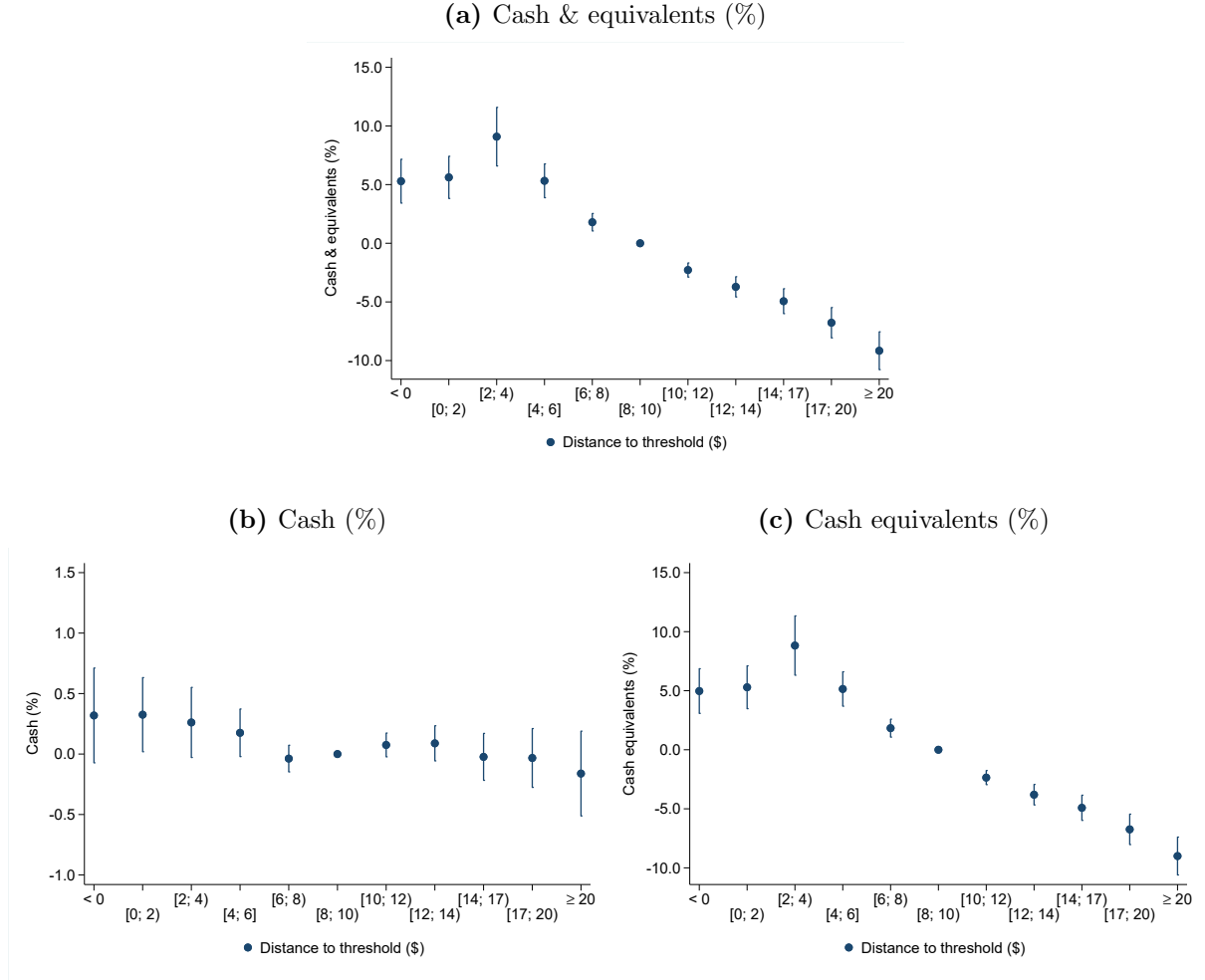


Figure 5
Distance to threshold and the sensitivity of fund purchases to fund flows

This figure plots the response of monthly fund purchases to the fund's net flows, estimated from specifications in Table 5. Trading amounts and flows are scaled by fund size as of the previous month. We take the 6-month average of fund flows over months $m - 5$ to m . Funds are grouped into 11 bins based on their distance to de minimis threshold: $(-\infty; 0)$, $[0; 2)$, $[2; 4)$, $[4; 6)$, $[6; 8)$, $[8; 10)$, $[10; 12)$, $[12; 14)$, $[14; 17)$, $[17; 20)$, and $[20; +\infty)$. The unit of observation is a fund-month. The sample period is 2010–2024. Standard errors are adjusted for clustering by fund.

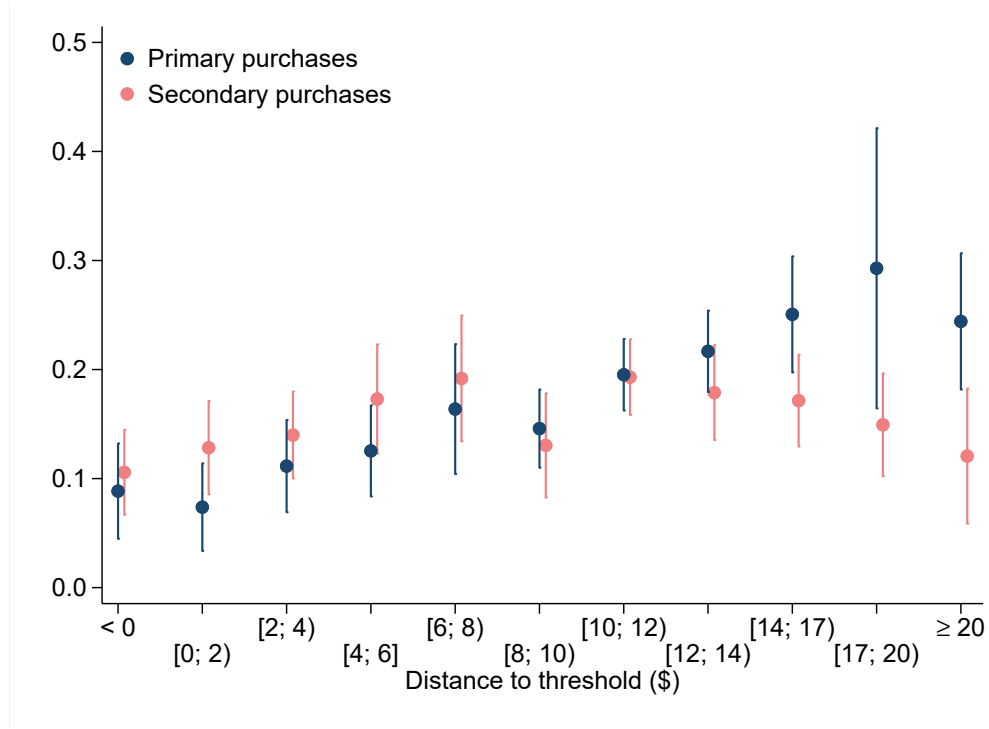


Figure 6
Distance to threshold and issuance costs

This figure plots the relation between a bond's offering yield spread and the average below-threshold share (average distance to de minimis threshold) across all open-end funds holding the issuer's outstanding bonds, estimated from specifications in Table 7. In subfigures (a) and (c), bond issues are grouped into 11 bins based on the holding funds' average below-threshold share: 0, (0; 0.5), [0.5; 1), [1; 2), [2; 3), [3; 4), [4; 5), [5; 7), [7; 10), [10; 15), and [15; $+\infty$). The coefficients are relative to the base bin [3; 4). In subfigures (b) and (d), bond issues are grouped into 11 bins based on the holding funds' average distance to de minimis threshold: $(-\infty; 0)$, [0; 2), [2; 4), [4; 6), [6; 8), [8; 10), [10; 12), [12; 14), [14; 17), [17; 20), and [20; $+\infty$). The coefficients are relative to the base bin [8; 10). The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month.

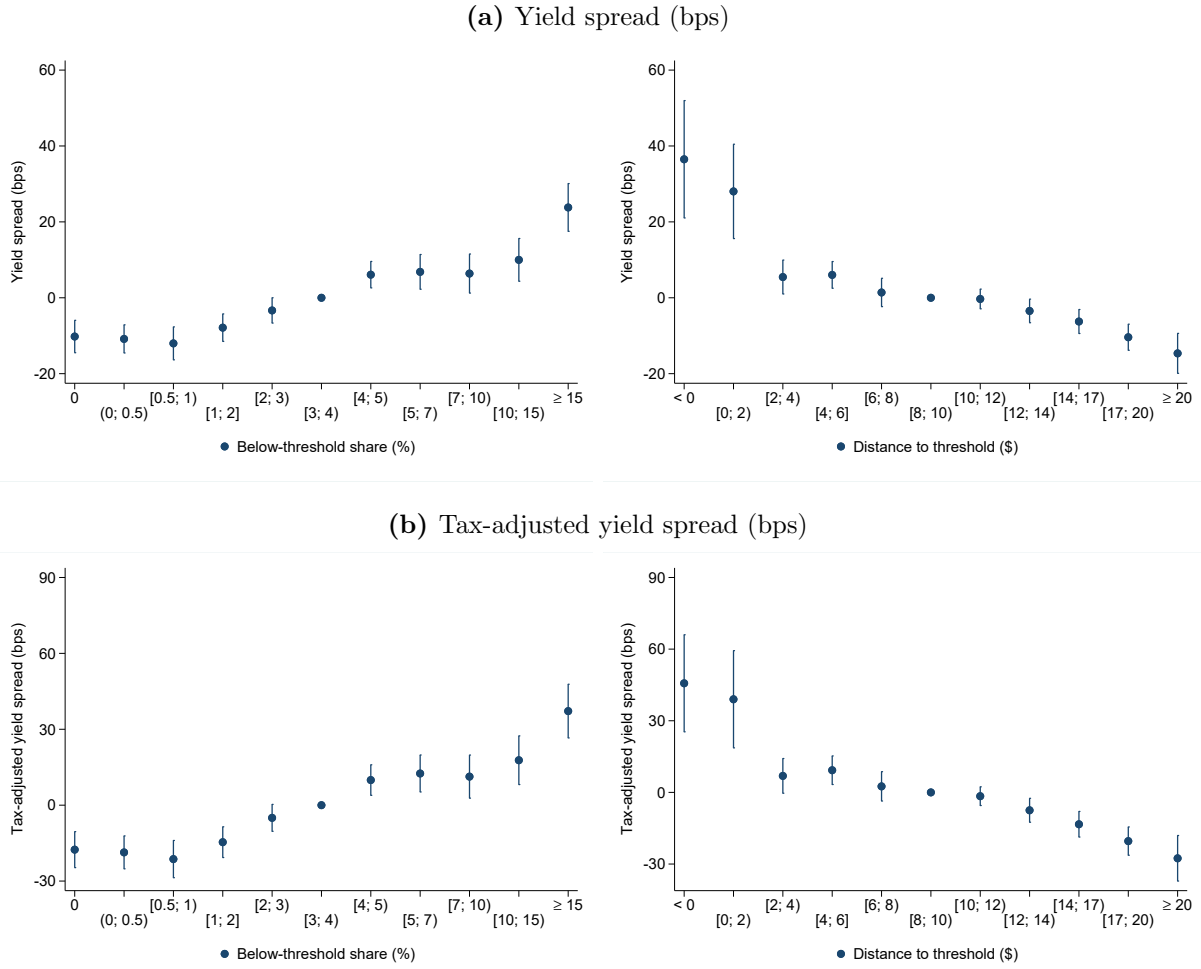


Table 1
Summary statistics

This table reports summary statistics for the sample of municipal bond issues. Taxable bonds, variable-rate bonds, and U.S.-territory bonds are excluded. The sample is limited to bond issues from issuers with at least one outstanding bond, based on which we can measure *Below-threshold share* and *Distance to threshold* of the issuer’s mutual fund-holders. Bond ratings are encoded so that AAA = 0, AA+ = 1, ..., BB+ = 10, ..., C = 20. Other variable definitions are in Appendix Table A1. The sample period is 2010–2024.

				Percentile		
	<i>N</i>	Mean	SD	25th	50th	75th
Mutual fund-holder characteristics						
Holders' below-threshold share (%)	609,460	3.81	6.07	0.48	1.48	4.46
Holders' distance to threshold (\$)	609,460	12.14	4.54	8.97	12.54	15.41
Holders' net flows (%)	609,460	0.76	2.49	-0.14	0.53	1.18
Holders' return (%)	609,460	0.25	0.67	-0.04	0.31	0.61
Issuer characteristics						
Mutual fund holding (%)	609,460	12.13	14.92	2.51	7.00	16.04
Issuer return (%)	609,460	-0.06	0.95	-0.40	-0.04	0.32
Amount outstanding (\$m)	609,460	2,058.02	8,223.81	72.00	184.41	656.71
Outstanding bond maturity (years)	609,460	10.26	4.48	6.92	9.51	13.06
Outstanding bond maturity at issuance (years)	609,460	15.68	4.89	12.16	15.16	18.93
10-year Treasury rate at issuance (%)	609,460	3.07	0.96	2.32	2.85	3.79
Bond issue characteristics						
Offering yield (bps)	609,460	237.46	109.65	153.00	238.00	315.00
Yield spread (bps)	609,460	17.83	68.95	-21.46	16.80	58.07
Tax-adjusted yield spread (bps)	609,460	184.48	119.80	89.70	167.17	259.68
Offering price (\$)	609,460	109.03	8.61	101.40	107.74	115.51
Bond coupon (%)	609,460	3.89	1.20	3.00	4.00	5.00
Negotiated sale	609,460	0.48	0.50	0.00	0.00	1.00
Offering amount (\$m)	609,460	4.68	16.88	0.51	1.36	3.66
Callable bond	609,460	0.49	0.50	0.00	0.00	1.00
General obligation bond	609,460	0.52	0.50	0.00	1.00	1.00
Insured bond	609,460	0.13	0.34	0.00	0.00	0.00
Credit-enhanced bond	609,460	0.20	0.40	0.00	0.00	0.00
Bank-qualified bond	609,460	0.13	0.33	0.00	0.00	0.00
Bond maturity (years)	609,460	10.54	6.62	5.22	9.49	14.82
Bond rating	564,250	2.31	1.93	1.00	2.00	3.00

Table 2
De minimis threshold and propensity to sell

This table reports results of regressions of a bond's propensity to sell on the indicator that the bond's price is below the de minimis threshold:

$$Sale_{b,f,m} = \alpha_{f,m} + \alpha_b + \beta \times Below\ threshold_{b,f,m-1} + \eta' \mathbf{X}_{b,m-1} + \varepsilon_{b,f,m},$$

where b indexes bonds, f funds, and m year-months. For a given holdings snapshot, $Sale = 100$ if the bond is sold anytime before the next reporting date and 0 otherwise. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a fund-bond-month. The sample period is 2010–2024. Standard errors are adjusted for clustering by bond. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	(1)	(2)	(3)
Below threshold $_{b,f,m-1}$	−0.594*** (0.020)	−0.681*** (0.022)	−0.726*** (0.023)
Distance to threshold $_{b,f,m-1}$		−0.387*** (0.010)	−0.897*** (0.022)
Distance to threshold $^2_{b,f,m-1}$		−0.014*** (0.003)	−0.104*** (0.004)
Bond price $_{b,f,m-1}$		0.202*** (0.010)	0.120*** (0.024)
Coupon $_b$		−0.163*** (0.006)	
Ln(Offering amount) $_b$		0.391*** (0.006)	
Callable bond $_b$		−0.200*** (0.013)	
General obligation bond $_b$		0.436*** (0.013)	
Insured bond $_b$		−0.038*** (0.013)	
Credit-enhanced bond $_b$		−0.100*** (0.019)	
Bank-qualified bond $_b$		−0.191*** (0.026)	
Ln(Bond age) $_{b,m-1}$		−0.387*** (0.005)	−0.015* (0.008)
Ln(Bond maturity) $_{b,m-1}$		−0.121*** (0.006)	−0.261*** (0.009)
N	22,829,477	22,824,011	22,820,245
Adjusted R^2	0.03	0.04	0.06
Dependent variable mean	1.680	1.680	1.672
Fund×Year-month FEs	✓	✓	✓
Bond FEs			✓
Rating FEs		✓	✓

Table 3
De minimis threshold and bond markups

This table reports results of regressions of a bond's monthly average markup on the indicator that the bond's price is below the de minimis threshold:

$$Markup (\%)_{b,m} = \alpha_{f,m} + \alpha_b + \beta \times Below\ threshold_{b,m-1} + \eta' \mathbf{X}_{b,m-1} + \varepsilon_{b,m},$$

where b indexes bonds and m year-months. For each bond-month, we use the median holdings-implied price across all funds reporting in that month. Trade-level markup is the signed relative difference between the trade price and the average interdealer trade price of the same bond on the same day (Hendershott and Madhavan, 2015). Imputed round-trip cost (IRC) is the price difference measured based on round-trip trades that occur within a 15-minute interval (Feldhütter, 2012). Monthly markup and IRC are the medians across all trades on a bond in a given month. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond-month. The sample period is 2010–2024. Standard errors are adjusted for clustering by bond. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	Markup (%)		IRC (%)	
	(1)	(2)	(3)	(4)
Below threshold $_{b,m-1}$	0.149*** (0.004)	0.095*** (0.004)	0.091*** (0.008)	0.073*** (0.008)
Distance to threshold $_{b,m-1}$	-0.008*** (0.002)	-0.016*** (0.003)	-0.001 (0.004)	0.066*** (0.007)
Distance to threshold $^2_{b,m-1}$	0.003*** (0.001)	-0.010*** (0.001)	0.002* (0.001)	-0.010*** (0.001)
Bond price $_{b,m-1}$	-0.118*** (0.002)	-0.046*** (0.004)	-0.188*** (0.005)	-0.136*** (0.009)
Coupon $_b$	0.013*** (0.001)		0.033*** (0.003)	
Ln(Offering amount) $_b$	0.007*** (0.001)		0.012*** (0.002)	
Callable bond $_b$	0.050*** (0.002)		0.028*** (0.004)	
General obligation bond $_b$	-0.024*** (0.001)		-0.021*** (0.003)	
Insured bond $_b$	0.013*** (0.002)		0.037*** (0.005)	
Credit-enhanced bond $_b$	0.026*** (0.003)		0.048*** (0.006)	
Bank-qualified bond $_b$	0.035*** (0.007)		0.128*** (0.017)	
Ln(Bond age) $_{b,m-1}$	-0.052*** (0.001)	0.012*** (0.001)	0.032*** (0.001)	0.130*** (0.002)
Ln(Bond maturity) $_{b,m-1}$	0.184*** (0.001)	-0.076*** (0.001)	0.269*** (0.003)	-0.080*** (0.003)
N	2,471,270	2,427,548	1,243,091	1,189,649
Adjusted R^2	0.27	0.36	0.31	0.50
Dependent variable mean	0.438	0.439	0.546	0.552
Dependent variable SD	0.566	0.566	0.784	0.789
Bond FEs		✓		✓
Year-month FEs	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓

Table 4
Distance to threshold and cash buffers

This table reports results of regressions of a fund's cash buffers on the fund's average distance to de minimis threshold:

$$Cash (\%)_{f,m} = \alpha_{family,m} + \beta \times Distance\ to\ threshold_{f,m-1} + \eta' \mathbf{X}_{f,m-1} + \varepsilon_{f,m},$$

where f indexes funds and m year-months. We take the 6-month average of fund flows and returns over months $m - 5$ to m . Portfolio average characteristics, namely offering amount, bond age, bond maturity, callability, general obligation, insurance, credit enhancement, bank qualification, bond rating, and indicator for unrated bonds, are included but omitted for brevity. All continuous explanatory variables, except fund flows and returns, are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a fund-month. The sample period is 2010–2024. Standard errors are adjusted for clustering by fund. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Cash & equivalents (1)	Cash (2)	Cash equivalents (3)
Distance to threshold $_{f,m-1}$	−4.646*** (0.454)	−0.092 (0.076)	−4.554*** (0.456)
Net flows $_{f,m-5 \rightarrow m}$	0.495*** (0.070)	0.123*** (0.014)	0.373*** (0.071)
Fund return $_{f,m-5 \rightarrow m}$	1.117*** (0.279)	0.188** (0.079)	0.929*** (0.285)
Ln(Fund TNA) $_{f,m-1}$	0.978*** (0.296)	−0.119** (0.055)	1.097*** (0.294)
Fund age $_{f,m-1}$	−0.870*** (0.301)	−0.089* (0.050)	−0.781*** (0.295)
Retail share $_{f,m-1}$	−0.286 (0.383)	0.063 (0.050)	−0.349 (0.379)
Short-term fund $_f$	9.940*** (1.226)	−0.200 (0.140)	10.140*** (1.259)
Single-state fund $_f$	−2.761*** (0.502)	−0.293*** (0.088)	−2.468*** (0.502)
High-yield fund $_f$	−4.568*** (0.891)	−0.006 (0.172)	−4.562*** (0.896)
Index fund $_f$	−8.729*** (1.820)	−1.937*** (0.599)	−6.792*** (2.209)
Net expense ratio $_{f,m-1}$	−0.024 (0.235)	0.022 (0.039)	−0.046 (0.243)
Portfolio HHI $_{f,m-1}$	1.118*** (0.273)	−0.029* (0.017)	1.147*** (0.272)
N	83,432	83,432	83,432
Adjusted R^2	0.72	0.51	0.71
Dependent variable mean	6.743	1.242	5.502
Dependent variable SD	9.775	2.208	9.497
Portfolio characteristic controls	✓	✓	✓
Family×Year-month FEs	✓	✓	✓

Table 5
Distance to threshold and trading sensitivity to fund flows

This table reports results of regressions of a fund's trading amounts on the fund's net flows interacted with its average distance to de minimis threshold:

$$Trading_{f,m} = \alpha_{family,m} + \beta \times Net\ flows_{f,m-5 \rightarrow m} \times Distance\ to\ threshold_{f,m-1} + \eta' \mathbf{X}_{f,m-1} + \varepsilon_{f,m},$$

where f indexes funds and m year-months. Trading amounts and flows are scaled by fund size as of the previous month. We take the 6-month average of fund flows and returns over months $m - 5$ to m . Portfolio average characteristics, namely offering amount, bond age, bond maturity, callability, general obligation, insurance, credit enhancement, bank qualification, bond rating, and indicator for unrated bonds, are included but omitted for brevity. All continuous explanatory variables, except fund flows and returns, are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a fund-month. The sample period is 2010–2024. Standard errors are adjusted for clustering by fund. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Net purchases (1)	Sales (2)	Purchases (3)	Primary purchases (4)	Secondary purchases (5)
Net flows $_{f,m-5 \rightarrow m}$	0.507*** (0.024)	-0.141*** (0.015)	0.366*** (0.023)	0.204*** (0.016)	0.162*** (0.014)
Net flows $_{f,m-5 \rightarrow m} \times$ Distance to threshold $_{f,m-1}$	0.059*** (0.017)	-0.005 (0.011)	0.054*** (0.016)	0.053*** (0.012)	0.001 (0.009)
Distance to threshold $_{f,m-1}$	-0.102** (0.044)	-0.038 (0.048)	-0.141** (0.056)	-0.017 (0.040)	-0.123*** (0.031)
Fund return $_{f,m-5 \rightarrow m}$	0.599*** (0.067)	-0.293*** (0.070)	0.307*** (0.076)	0.213*** (0.059)	0.094** (0.044)
Ln(Fund TNA) $_{f,m-1}$	0.050* (0.029)	-0.141*** (0.044)	-0.091* (0.049)	-0.058* (0.032)	-0.032 (0.026)
Fund age $_{f,m-1}$	-0.057** (0.026)	-0.005 (0.032)	-0.062* (0.036)	0.025 (0.022)	-0.087*** (0.023)
Retail share $_{f,m-1}$	0.070** (0.034)	-0.067 (0.055)	0.004 (0.058)	0.017 (0.036)	-0.014 (0.032)
Short-term fund $_f$	0.383*** (0.111)	-0.262* (0.140)	0.122 (0.165)	-0.043 (0.090)	0.165* (0.100)
Single-state fund $_f$	-0.023 (0.053)	-0.265*** (0.094)	-0.288*** (0.102)	-0.192*** (0.062)	-0.096* (0.056)
High-yield fund $_f$	-0.323*** (0.103)	0.036 (0.159)	-0.287 (0.175)	-0.225** (0.114)	-0.062 (0.092)
Index fund $_f$	0.189 (0.250)	-0.830 (0.540)	-0.641 (0.723)	-0.897*** (0.179)	0.256 (0.594)
Cash/TNA $_{f,m-1}$	0.174*** (0.044)	-0.138*** (0.044)	0.036 (0.051)	0.055 (0.034)	-0.019 (0.028)
Net expense ratio $_{f,m-1}$	-0.004 (0.022)	-0.044 (0.040)	-0.048 (0.041)	-0.035 (0.026)	-0.014 (0.022)
Portfolio HHI $_{f,m-1}$	-0.050*** (0.012)	-0.022 (0.037)	-0.072 (0.044)	-0.048 (0.038)	-0.024*** (0.009)
<i>N</i>	83,432	83,432	83,432	83,432	83,432
Adjusted R^2	0.35	0.32	0.33	0.30	0.28
Dependent variable mean	0.666	1.345	2.011	1.292	0.719
Dependent variable SD	2.695	2.225	2.552	1.796	1.485
Portfolio characteristic controls	✓	✓	✓	✓	✓
Family $\times$ Year-month FEs	✓	✓	✓	✓	✓

Table 6
Below-threshold share, distance to threshold, and current holders' propensity to buy

This table reports results of regressions of a fund's propensity to purchase the new issue on the indicator that the fund holds any of the issuer's outstanding bonds:

$$Purchase_{b,f} = \alpha_{f,m} + \alpha_b + \beta \times Current\ holder_{i,f,m-1} \times Below\ threshold\ share_{f,m-1} + \eta' \mathbf{X}_{f,m-1} + \varepsilon_{b,f,m},$$

where b indexes bonds, i issuers, f funds, and m year-months. For a given bond issue, we identify potential purchasers open-end municipal bond funds that have purchased any bond issue with the same rating band and from the same state within the previous six months. $Purchase = 100$ if the bond is purchased by the fund in the primary market and 0 otherwise. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by issuer and year-month. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

Panel A: Distance to threshold					
	Negotiated sales only				
	(1)	(2)	(3)	(4)	(5)
Current holder $_{i,f,m-1}$	0.975*** (0.048)	0.971*** (0.047)	1.079*** (0.052)	1.007*** (0.044)	1.136*** (0.049)
Current holder $_{i,f,m-1} \times$ Distance to threshold $_{f,m-1}$		0.140*** (0.027)		0.167*** (0.027)	
Current holder $_{i,f,m-1} \times$ Low distance to threshold $_{f,m-1}$			−0.322*** (0.030)		−0.390*** (0.037)
N	90,750,996	90,750,996	90,750,996	41,611,556	41,611,556
Adjusted R^2	0.05	0.05	0.05	0.06	0.06
Dependent variable mean	0.249	0.249	0.249	0.398	0.398
Fund $\times$ Year-month FEs	✓	✓	✓	✓	✓
Bond issue FEs	✓	✓	✓	✓	✓

Panel B: Below-threshold share					
	Negotiated sales only				
	(1)	(2)	(3)	(4)	(5)
Current holder $_{i,f,m-1}$	0.975*** (0.048)	0.975*** (0.049)	1.021*** (0.046)	1.012*** (0.045)	1.109*** (0.048)
Current holder $_{i,f,m-1} \times$ Below-threshold share $_{f,m-1}$		−0.000 (0.021)		−0.101*** (0.019)	
Current holder $_{i,f,m-1} \times$ High below-threshold share $_{f,m-1}$			−0.155*** (0.032)		−0.319*** (0.034)
N	90,750,996	90,750,996	90,750,996	41,611,556	41,611,556
Adjusted R^2	0.05	0.05	0.05	0.06	0.06
Dependent variable mean	0.249	0.249	0.249	0.398	0.398
Fund $\times$ Year-month FEs	✓	✓	✓	✓	✓
Bond issue FEs	✓	✓	✓	✓	✓

Table 7
Below-threshold share, distance to threshold, and issuance costs

This table reports results of regressions of a bond's offering yield spread on the average below-threshold share (distance to de minimis threshold) of mutual funds holding the issuer's outstanding bonds:

$$Yield\ spread\ (bps)_b = \alpha_{c,m} + \beta \times Below\text{-}threshold\ share_{i,m-1} + \eta' \mathbf{X}_b + \varepsilon_{b,m},$$

where b indexes bonds, i issuers, c counties, and m year-months. *Below-threshold share* and *Distance to threshold* are the par-weighted averages across all open-end municipal bond funds holding the issuer's outstanding bonds as of the previous month. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Yield spread			Tax-adjusted yield spread		
	(1)	(2)	(3)	(4)	(5)	(6)
MF holders' below-threshold share $_{i,m-1}$	8.698*** (0.947)		7.739*** (1.014)	13.505*** (1.556)		11.394*** (1.676)
MF holders' distance to threshold $_{i,m-1}$		−5.977*** (0.768)	−2.555*** (0.671)		−10.664*** (1.253)	−5.627*** (1.194)
MF holders' net flows $_{i,m-3 \rightarrow m-1}$	0.695** (0.324)	0.284 (0.348)	0.583* (0.331)	0.896* (0.526)	0.208 (0.578)	0.648 (0.539)
MF holders' return $_{i,m-3 \rightarrow m-1}$	1.092 (1.287)	2.821* (1.705)	1.733 (1.451)	2.569 (2.485)	5.582* (3.195)	3.979 (2.838)
Mutual fund holding $_{i,m-1}$	5.545*** (1.092)	6.070*** (1.126)	5.573*** (1.076)	9.102*** (1.717)	9.896*** (1.752)	9.165*** (1.684)
Issuer return $_{i,m-3 \rightarrow m-1}$	0.503 (0.363)	0.418 (0.403)	0.488 (0.367)	1.276** (0.644)	1.139 (0.709)	1.241* (0.649)
Ln(Amount outstanding) $_{i,m-1}$	−7.474*** (1.408)	−8.117*** (1.397)	−7.334*** (1.405)	−12.933*** (2.311)	−13.778*** (2.318)	−12.626*** (2.315)
Ln(Out. bond maturity) $_{i,m-1}$	4.403*** (0.891)	5.091*** (0.866)	4.527*** (0.879)	8.068*** (1.643)	9.172*** (1.578)	8.341*** (1.602)
Ln(Out. bond maturity at issuance) $_{i,m-1}$	1.380 (1.303)	2.554* (1.378)	1.667 (1.316)	1.293 (2.176)	3.231 (2.256)	1.924 (2.191)
10-year Treasury rate at issuance $_{i,m-1}$	0.348 (1.106)	0.564 (1.124)	0.388 (1.094)	1.321 (1.847)	1.668 (1.842)	1.409 (1.811)
Coupon $_b$	−8.863*** (1.254)	−8.745*** (1.268)	−8.838*** (1.260)	−7.354*** (2.131)	−7.160*** (2.152)	−7.297*** (2.144)
Negotiated sale $_b$	1.205 (1.790)	1.037 (1.816)	1.239 (1.784)	1.734 (2.653)	1.513 (2.686)	1.810 (2.639)
Ln(Offering amount) $_b$	1.467*** (0.431)	1.376*** (0.419)	1.474*** (0.424)	0.298 (0.836)	0.171 (0.808)	0.315 (0.819)
Callable bond $_b$	22.709*** (1.099)	22.761*** (1.089)	22.705*** (1.097)	44.682*** (1.626)	44.756*** (1.605)	44.674*** (1.623)
General obligation bond $_b$	−3.563** (1.429)	−3.826*** (1.420)	−3.605** (1.408)	−6.123*** (2.316)	−6.542*** (2.290)	−6.216*** (2.277)
Insured bond $_b$	1.579 (1.549)	1.257 (1.556)	1.344 (1.487)	2.834 (2.585)	2.188 (2.572)	2.315 (2.464)
Credit-enhanced bond $_b$	0.540 (1.266)	0.599 (1.247)	0.554 (1.263)	1.294 (2.114)	1.392 (2.084)	1.325 (2.106)
Bank-qualified bond $_b$	−13.916*** (1.517)	−14.668*** (1.505)	−14.088*** (1.486)	−22.746*** (2.483)	−23.979*** (2.456)	−23.125*** (2.429)
Ln(Bond maturity) $_b$	15.672*** (1.062)	15.671*** (1.060)	15.675*** (1.061)	58.395*** (2.188)	58.395*** (2.181)	58.401*** (2.185)
N	609,460	609,460	609,460	609,460	609,460	609,460
Adjusted R^2	0.85	0.85	0.85	0.85	0.85	0.85
Dependent variable mean	17.834	17.834	17.834	184.485	184.485	184.485
Dependent variable SD	68.951	68.951	68.951	119.798	119.798	119.798
County $\times$ Year-month FEs	✓	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓	✓

Table 8
Instrumental variable analysis

This table reports results of regressions of a bond's offering yield spread on the instrumented average below-threshold share of mutual funds holding the issuer's outstanding bonds:

$$Yield\ spread\ (bps)_b = \alpha_{c,m} + \beta \times Below\text{-}threshold\ share_{i,m-1} + \eta' \mathbf{X}_b + \varepsilon_{b,m},$$

where b indexes bonds, i issuers, c counties, and m year-months. In Panel A (Panel B), *Below-threshold share* is instrumented with the average portfolio bond maturity, measured as of month $m - 13$ (as of the end of 2021), of mutual funds holding the issuer's outstanding bonds as of month $m - 1$. We exclude issuer i 's bonds held by a fund when calculating the fund's portfolio maturity. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

Dependent variable =	Panel A: Full sample		
	First-stage	Second-stage	
	Below-threshold share	Yield spread	Tax-adjusted yield spread
	(1)	(2)	(3)
MF holders' average maturity $_{i,m-13}$	0.208*** (0.025)		
MF holders' $\widehat{\text{below-threshold share}}_{i,m-1}$		10.733*** (3.881)	17.747*** (6.502)
MF holders' net flows $_{i,m-3 \rightarrow m-1}$	−0.015 (0.009)	0.669* (0.380)	0.936 (0.593)
MF holders' return $_{i,m-3 \rightarrow m-1}$	−0.045 (0.086)	1.286 (1.826)	2.952 (3.423)
Mutual fund holding $_{i,m-1}$	0.042*** (0.011)	5.317*** (1.161)	8.553*** (1.826)
N	551,406	551,406	551,406
Adjusted R^2	0.91	0.49	0.72
Dependent variable mean	−0.000	18.480	185.785
Dependent variable SD	1.000	69.016	120.650
Underidentification LM statistic		23.655	23.655
Weak identification F statistic		67.049	67.049
Panel B: March 2022–August 2024			
Dependent variable =	First-stage	Second-stage	
	Below-threshold share	Yield spread	Tax-adjusted yield spread
	(1)	(2)	(3)
MF holders' average maturity $_{i,2021}$	0.310*** (0.040)		
MF holders' $\widehat{\text{below-threshold share}}_{i,m-1}$		16.608*** (4.655)	29.185*** (7.157)
MF holders' net flows $_{i,m-3 \rightarrow m-1}$	−0.014 (0.028)	−1.009 (0.926)	−2.616* (1.513)
MF holders' return $_{i,m-3 \rightarrow m-1}$	−0.268 (0.278)	7.390 (6.522)	12.582 (11.270)
Mutual fund holding $_{i,m-1}$	0.063** (0.026)	5.877** (2.272)	9.576** (3.878)
N	69,320	69,320	69,320
Adjusted R^2	0.92	0.67	0.68
Dependent variable mean	−0.000	−57.960	165.841
Dependent variable SD	1.000	73.561	110.511
Underidentification LM statistic		14.193	14.193
Weak identification F statistic		60.251	60.251
Additional bond controls	✓	✓	✓
County × Year-month FEs	✓	✓	✓
Rating FEs	✓	✓	✓

Table 9
Holders' exposure to liquidity risk

This table demonstrates that 1) the effect on offering yield spread of mutual funds' below-threshold share is stronger than that of insurance companies and 2) the effect of mutual funds' below-threshold share is stronger when these funds have a larger share of retail share classes:

$$Yield\ spread\ (bps)_b = \alpha_{c,m} + \alpha_i + \beta \times Below\text{-}threshold\ share_{i,m-1} \times Retail\ class\ share_{i,m-1} + \eta' \mathbf{X}_b + \varepsilon_{b,m},$$

where b indexes bonds, i issuers, c counties, and m year-months. Holders' (Insurer-holders') *Below-threshold share* and *Distance to threshold* are the par-weighted averages across all open-end municipal bond funds (insurance companies) holding the issuer's outstanding bonds as of the previous month. *Retail class share* is the par-weighted average share of retail share classes across all open-end municipal bond funds holding the issuer's outstanding bonds as of the previous month. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Yield spread		Tax-adjusted yield spread	
	(1)	(2)	(3)	(4)
Insurer-holders' below-threshold share _{<i>i,m-1</i>}	1.553** (0.702)		3.174*** (1.132)	
MF holders' below-threshold share _{<i>i,m-1</i>}	9.476*** (1.413)	8.662*** (0.912)	15.400*** (2.366)	13.447*** (1.490)
MF holders' below-threshold share _{<i>i,m-1</i>} × Retail class share _{<i>i,m-1</i>}		1.300*** (0.450)		1.900** (0.754)
MF holders' retail class share _{<i>i,m-1</i>}		−1.370*** (0.379)		−2.421*** (0.578)
Insurer holding _{<i>i,m-1</i>}	−3.237*** (0.596)		−5.189*** (0.986)	
Mutual fund holding _{<i>i,m-1</i>}	6.300*** (1.143)	5.670*** (1.091)	10.214*** (1.758)	9.318*** (1.712)
<i>N</i>	480,833	609,460	480,833	609,460
Adjusted <i>R</i> ²	0.80	0.85	0.86	0.85
Dependent variable mean	26.862	17.834	184.368	184.485
Dependent variable SD	57.283	68.951	116.575	119.798
Additional bond controls	✓	✓	✓	✓
County × Year-month FEs	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓

Table 10
Below-threshold share, bond characteristics, and issuance costs

This table reports results of regressions of a bond's offering yield spread on the average below-threshold share of mutual funds holding the issuer's outstanding bonds interacted with bond characteristics:

$$Yield\ spread\ (bps)_b = \alpha_{c,m} + \alpha_i + \beta \times Below\text{-}threshold\ share_{i,m-1} \times Bond\ characteristics_b + \eta' \mathbf{X}_b + \varepsilon_{b,m},$$

where b indexes bonds, i issuers, c counties, m year-months, and t trading days. *Below-threshold share* is the par-weighted average across all open-end municipal bond funds holding the issuer's outstanding bonds as of the previous month. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)
MF holders' below-threshold share $_{i,m-1}$	4.011*** (0.677)	3.094*** (0.602)	6.977*** (0.725)	7.015*** (1.141)	−0.023 (0.666)
MF holders' below-threshold share $_{i,m-1} \times$ Offering price $_b$	−4.826*** (0.468)				−3.797*** (0.446)
MF holders' below-threshold share $_{i,m-1} \times$ Bond rating $_b$		1.270*** (0.436)			0.589 (0.363)
MF holders' below-threshold share $_{i,m-1} \times$ Ln(Bond maturity) $_b$			2.639*** (0.655)		2.316*** (0.668)
MF holders' below-threshold share $_{i,m-1} \times$ Negotiated sale $_b$				0.373 (1.261)	2.508*** (0.873)
Offering price $_b$	−20.836*** (1.050)	−16.822*** (0.926)	−19.566*** (1.036)	−19.942*** (1.052)	−17.324*** (0.910)
Negotiated sale $_b$	3.524** (1.512)	6.756*** (0.916)	3.472** (1.556)	3.394** (1.563)	6.818*** (0.907)
Ln(Bond maturity) $_b$	18.503*** (1.068)	18.756*** (1.001)	18.453*** (1.024)	18.585*** (1.069)	18.669*** (0.976)
N	609,460	564,121	609,460	609,460	564,121
Adjusted R^2	0.88	0.89	0.88	0.88	0.89
Dependent variable mean	17.834	15.037	17.834	17.834	15.037
Dependent variable SD	68.951	65.845	68.951	68.951	65.845
Additional bond controls	✓	✓	✓	✓	✓
County $\times$ Year-month FEs	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓

Table 11
County-level issuance

This table reports results of regressions of a county's yearly issuance amount on its holding funds' average below-threshold share:

$$Issuance\ amount_{c,y} = \alpha_{s,y} + \beta \times Below\text{-}threshold\ share_{c,y-1} + \eta' \mathbf{X}_{c,y} + \varepsilon_{c,y},$$

where c indexes counties, s states, and y years. *Below-threshold share* is the par-weighted average across all open-end municipal bond funds holding outstanding bonds in the county as of the end of the previous year. Issuance amount is scaled by either the county's population or GDP as of the previous year. We further decompose issuance amount into new issuance amount and refunding issuance amount. The sample is limited to county-years that have at least one outstanding bond held by open-end municipal bond funds as of the previous year. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a county-year. Standard errors are adjusted for clustering by state. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Issuance amount per capita (\$)			Issuance amount/GDP (\$ per \$1,000 GDP)		
	All (1)	New (2)	Refunding (3)	All (4)	New (5)	Refunding (6)
MF holders' below-threshold share _{c,y-1}	-15.857** (7.067)	4.238 (4.575)	-13.017*** (3.948)	-0.393*** (0.141)	0.030 (0.091)	-0.310*** (0.092)
MF holders' net flows _{c,y-1}	4.991 (4.189)	5.243* (2.771)	0.749 (2.148)	0.037 (0.091)	0.073 (0.062)	-0.030 (0.052)
MF holders' return _{c,y-1}	6.966 (10.169)	6.866 (6.208)	1.769 (5.597)	0.156 (0.214)	0.183 (0.124)	0.011 (0.144)
Mutual fund holding _{c,y-1}	30.789*** (10.514)	6.864 (6.788)	13.557*** (4.898)	0.588*** (0.179)	0.182 (0.118)	0.272*** (0.102)
County return _{c,y-1}	8.302* (4.545)	6.570** (3.104)	0.855 (2.617)	0.170 (0.110)	0.125* (0.072)	0.025 (0.067)
Ln(Amount outstanding) _{c,y-1}	693.013*** (52.133)	320.552*** (40.141)	335.384*** (23.740)	13.109*** (0.906)	5.896*** (0.723)	7.155*** (0.516)
Ln(Out. bond maturity) _{c,y-1}	-32.946* (19.386)	-17.620 (10.988)	-15.655 (9.624)	-0.541 (0.364)	-0.341* (0.207)	-0.254 (0.210)
Ln(Out. bond maturity at issuance) _{c,y-1}	-43.737* (22.834)	-31.916** (14.403)	-11.254 (10.567)	-0.915** (0.389)	-0.564** (0.234)	-0.499** (0.226)
10-year Treasury rate at issuance _{c,y-1}	-30.601 (21.570)	-32.318** (13.553)	-1.736 (10.465)	-0.345 (0.396)	-0.636** (0.247)	0.210 (0.230)
Ln(GDP) _{c,y-1}	66.765 (58.456)	67.191* (40.407)	-59.896** (23.565)	-11.096*** (0.771)	-4.994*** (0.543)	-5.596*** (0.445)
Ln(Population) _{c,y-1}	-549.975*** (58.510)	-267.348*** (40.083)	-178.711*** (24.028)	0.624 (0.715)	0.711 (0.483)	-0.232 (0.415)
Ln(Average wage) _{c,y-1}	49.668** (22.219)	11.594 (14.313)	33.553*** (11.317)	-0.005 (0.325)	-0.217 (0.201)	0.035 (0.212)
Ln(House value) _{c,y-1}	12.558 (21.602)	26.909* (14.410)	0.597 (12.270)	0.296 (0.290)	0.426** (0.166)	-0.113 (0.216)
Unemployment rate _{c,y-1}	-13.513 (16.942)	-13.334 (11.194)	0.146 (9.031)	-0.211 (0.295)	-0.267 (0.188)	-0.022 (0.188)
Median age _{c,y-1}	1.377 (12.126)	5.317 (7.103)	-5.482 (6.069)	-0.408* (0.235)	-0.106 (0.149)	-0.308** (0.124)
High school graduate _{c,y-1}	-8.576 (13.550)	-16.577 (10.537)	4.909 (6.755)	0.649*** (0.213)	0.194 (0.159)	0.406*** (0.133)
<i>N</i>	21,675	21,675	21,675	21,675	21,675	21,675
Adjusted R^2	0.33	0.24	0.30	0.27	0.17	0.26
Dependent variable mean	516.714	256.812	242.739	10.849	5.191	5.441
Dependent variable SD	749.583	454.049	417.498	14.527	8.695	9.344
State×Year FEs	✓	✓	✓	✓	✓	✓

Appendix A: Variable Definitions

Table A1
Variable definitions

Variable	Definition
De minimis measures	
De minimis threshold	Equal to 100 (or the adjusted offering price for original issue discount bonds) minus the number of full remaining years until maturity multiplied by 0.25.
Below threshold	Equal to 1 if the bond's price is below its de minimis threshold and 0 otherwise.
Distance to threshold	The difference between the bond's price and its de minimis threshold, in \$.
Below-threshold share	The value-weighted average of bond-level <i>Below threshold</i> across all bonds held by the fund in a given month. In the sample of bond issues, <i>Below-threshold share</i> is the weighted average across all open-end municipal bond funds holding the issuer's outstanding bonds as of the previous month, with the weight being the par amount held by funds of the outstanding bonds. <i>Distance to threshold</i> is averaged similarly for the fund-level and bond issue-level analyses.
Bond characteristics	
Bond markup	The monthly median markup of trades of a bond in a given month, in %. Trade-level markup is the signed relative difference between the trade price and the average interdealer price of the same bond on the same day (Hendershott and Madhavan, 2015).
IRC	The monthly median imputed round-trip cost on offsetting trades within a 15-minute interval (Feldhütter, 2012).
Bond price	The price inferred from the position's market value and par value in fund holding, in \$.
Offering yield	The bond's offering yield, in basis points.
Yield spread	The difference between offering yield and the maturity-matched Treasury rate, in basis points. Tax-adjusted yield spread takes into account federal and state taxes as follows: $\frac{y_{b,t}}{(1-\tau_t^{fed})(1-\tau_{s,t}^{state})} - r_{b,t}$.
Offering price	The bond's offering price, in \$.
Coupon	The bond's offering coupon, in \$.
Offering amount	The bond's offering amount, in \$ millions.
Callable bond	Equal to 1 if the bond is callable and 0 otherwise.
General obligation bond	Equal to 1 if the bond is a general obligation bond and 0 otherwise.
Insured bond	Equal to 1 if the bond is insured and 0 otherwise.
Credit-enhanced bond	Equal to 1 if the bond has any credit enhancement and 0 otherwise.
Bank-qualified bond	Equal to 1 if the bond is bank qualified and 0 otherwise.
Bond age	Number of years since the offering date until the holding reporting date.

(Continued)

Table A1—*Continued*

Variable	Definition
Bond maturity	Number of remaining years until maturity (bond holding sample); or the original maturity at issuance (bond issue sample).
Bond rating	The median of Moody's, S&P, and Fitch ratings when all are available, or lower rating otherwise. Bond ratings are encoded so that AAA = 0, AA+ = 1, ..., BB+ = 10, ..., C = 20. Unrated bonds are treated as one separate rating category.
Fund characteristics	
Trading	Monthly trading amount, in \$ millions. We identify mutual fund trades in MSRB muni transactions data using the algorithm from Chernenko and Doan (2024) .
Net flows	Monthly net flows, as a percentage of fund size.
Fund return	Monthly net return, in %.
Fund TNA	The fund's total net assets as of the previous month, in \$ millions.
Fund age	The fund's number of years since its inception date.
Retail share	The fund's share of retail-oriented share classes.
Short-term fund	Equal to 1 if Morningstar category indicates the fund is short-term and 0 otherwise.
Single-state fund	Equal to 1 if Morningstar category indicates the fund invests primarily in a single state and 0 otherwise.
High-yield fund	Equal to 1 if Morningstar category indicates the fund invests primarily in high-yield bonds and 0 otherwise.
Index fund	Equal to 1 if the fund is an index fund.
Cash/TNA	The fund's cash-to-assets ratio, in %.
Net expense ratio	The fund's monthly net expenses, as a percentage of fund size.
Portfolio HHI	The fund's Herfindahl-Hirschman Index, calculated based on its portfolio positions.
Portfolio characteristics	Value-weighted averages across all bonds held by the fund in a given month. The following bond characteristics are averaged: offering amount, bond age, bond maturity, callability, general obligation, insurance, credit enhancement, bank qualification, bond rating, and indicator for unrated bonds.
Issuer characteristics	
MF holders' characteristics	The weighted averages across all open-end municipal bond funds holding the issuer's outstanding bonds as of the previous month, with the weight being of the par amount held by such funds.
Mutual fund holding	The issuer's par amount held by open-end municipal bond funds as of the previous month, scaled by the total outstanding amount, in %.
Issuer return	The three-month average monthly return, estimated using the repeated sales approach (Auh et al., 2022), in %.

(Continued)

Table A1—Continued

Variable	Definition
Amount outstanding	The issuer's total outstanding amount as of the previous month, in \$ millions.
Outstanding bond maturity	The weighted average maturity of the issuer's outstanding bonds as of the previous month, in years.
10-year Treasury rate at issuance	The weighted average 10-year Treasury rate, on the issuance date, of the issuer's outstanding bonds as of the previous month, in %.
County characteristics	
Issuance amount	The county's yearly aggregate issuance amount, in \$ millions.
Average maturity	The county's yearly par-weighted average maturity of new issues, in years.
Government finance measures	The county's yearly measures from the Annual Survey of State and Local Government Finances, in \$ millions.
Holders' characteristics	The weighted averages across all open-end municipal bond funds holding any bond from issuers located in the county as of the end of the previous year, with the weight being of the par amount held by such funds.
Mutual fund holding	The total par amount held by open-end municipal bond funds scaled by the total outstanding amount of bonds from the county as of the end of the previous year, in %.
County return	The average monthly return over the previous year, estimated using the repeated sales approach (Auh et al., 2022), in %.
Amount outstanding	The total outstanding amount of bonds from the county as of the end of the previous year, in \$ millions.
Outstanding bond maturity	The weighted average maturity of bonds from the county as of the end of the previous year, in years.
10-year Treasury rate at issuance	The weighted average 10-year Treasury rate, on the issuance date, of bonds from the county as of the end of the previous year, in %.
GDP	The county's GDP as of the previous year, in \$ billions.
Population	The county's population as of the previous year, in millions.
Average wage	The county's average wage and salaries as of the previous year, in \$000s.
House value	The county's median house value as of the previous year, in \$000s.
Unemployment rate	The county's unemployment rate as of the previous year, in %.
Median age	The county's median age as of the previous year.
High school graduate	The county's population with at least high school diploma as of the previous year, in %.

Internet Appendix for

“Tax-Driven Illiquidity, Portfolio Constraints, and Municipal Borrowing Costs”

Figure IA1
Instrumental variable analysis: First stage

This figure plots the relation between the mutual fund-holders’ average below-threshold share and their average portfolio maturity, estimated from specification 1 in Table 8. Bond issues are grouped into 9 bins based on the holding funds’ average portfolio maturity: $[0; 5)$, $[5; 7)$, $[7; 10)$, $[10; 12)$, $[12; 14)$, $[14; 16)$, $[16; 18)$, $[18; 20)$, and $[20; +\infty)$. The coefficients are relative to the base bin $[12; 14)$. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month.

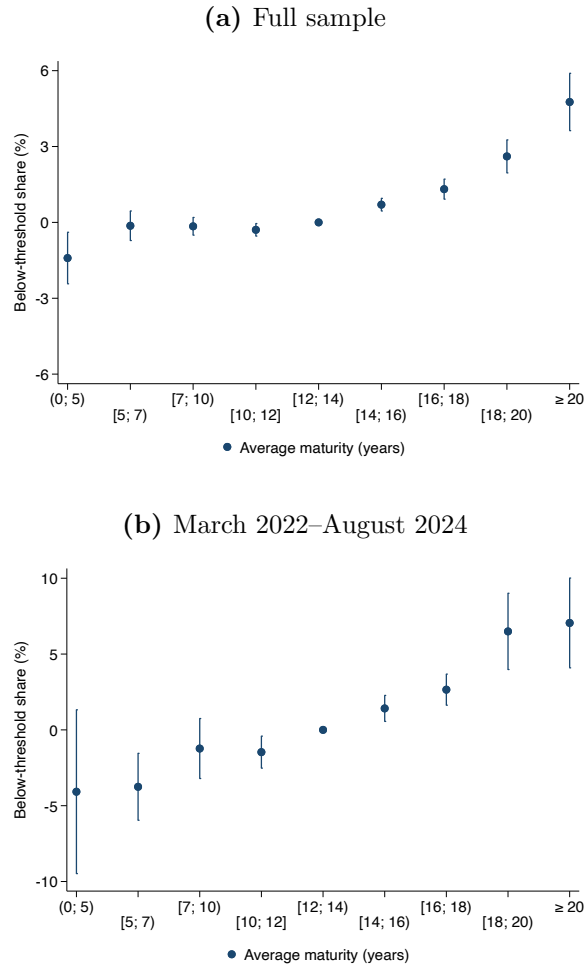


Table IA1
How much is the new issue purchased by mutual funds?

This table reports statistics for an issue's primary market purchase amount, scaled by its offering amount, by either open-end municipal bond funds or funds which are the current holders of the bond issuer. The sample includes all bond issues from issuers with at least one outstanding bond held by municipal bond funds as of the previous month. The unit of observation is a bond. The sample period is 2010–2024.

				Percentile		
	<i>N</i>	Mean	SD	25th	50th	75th
Panel A: All bonds						
Mutual fund purchase (%)	609,460	9.63	24.58	0.00	0.00	0.00
Current holder purchase (%)	609,460	3.90	15.45	0.00	0.00	0.00
Panel B: Bonds with positive purchase by muni funds						
Mutual fund purchase (%)	106,345	55.17	30.83	28.46	50.21	85.25
Current holder purchase (%)	106,345	22.33	30.93	0.00	0.00	36.94
Current holder share	106,345	0.41	0.45	0.00	0.00	1.00
Panel C: Bonds with positive purchase by muni funds which are the current holders						
Mutual fund purchase (%)	52,703	55.85	29.59	30.81	52.55	82.34
Current holder purchase (%)	52,703	45.05	30.10	20.31	37.31	66.01
Current holder share	52,703	0.82	0.27	0.62	1.00	1.00

Table IA2
Below-threshold share, distance to threshold, and issuance costs: Issuer fixed effects

This table reports results of regressions of a bond's offering yield spread on the average below-threshold share (distance to de minimis threshold) of mutual funds holding the issuer's outstanding bonds:

$$Yield\ spread\ (bps)_b = \alpha_{c,m} + \alpha_i + \beta \times Below\text{-}threshold\ share_{i,m-1} + \eta' \mathbf{X}_b + \varepsilon_{b,m},$$

where b indexes bonds, i issuers, c counties, and m year-months. *Below-threshold share* and *Distance to threshold* are the par-weighted averages across all open-end municipal bond funds holding the issuer's outstanding bonds as of the previous month. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a bond. The sample period is 2010–2024. Standard errors are adjusted for clustering by county and year-month. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Yield spread			Tax-adjusted yield spread		
	(1)	(2)	(3)	(4)	(5)	(6)
MF holders' below-threshold share $_{i,m-1}$	4.236*** (0.905)		3.889*** (0.858)	5.028*** (1.491)		3.957*** (1.463)
MF holders' distance to threshold $_{i,m-1}$		−2.903*** (1.045)	−1.081 (0.820)		−5.191*** (1.562)	−3.338** (1.383)
MF holders' net flows $_{i,m-3 \rightarrow m-1}$	0.263 (0.310)	0.100 (0.313)	0.248 (0.311)	0.181 (0.536)	−0.017 (0.547)	0.134 (0.545)
MF holders' return $_{i,m-3 \rightarrow m-1}$	−1.022 (0.860)	−0.700 (0.839)	−0.831 (0.852)	−1.078 (1.634)	−0.356 (1.685)	−0.489 (1.667)
Mutual fund holding $_{i,m-1}$	−0.081 (1.138)	−0.004 (1.130)	−0.104 (1.134)	−0.108 (2.098)	−0.077 (2.071)	−0.178 (2.081)
Issuer return $_{i,m-3 \rightarrow m-1}$	−0.340 (0.606)	−0.439 (0.626)	−0.353 (0.610)	−0.525 (1.060)	−0.652 (1.070)	−0.564 (1.068)
Ln(Amount outstanding) $_{i,m-1}$	1.012 (1.945)	0.850 (1.903)	1.126 (1.907)	−5.440 (3.922)	−5.368 (3.784)	−5.088 (3.825)
Ln(Out. bond maturity) $_{i,m-1}$	1.975 (1.377)	2.200 (1.342)	2.039 (1.385)	5.115** (2.373)	5.478** (2.342)	5.315** (2.395)
Ln(Out. bond maturity at issuance) $_{i,m-1}$	−2.989 (2.085)	−2.511 (1.988)	−2.902 (2.073)	−8.311** (3.877)	−7.644** (3.742)	−8.042** (3.842)
10-year Treasury rate at issuance $_{i,m-1}$	2.528 (1.590)	2.626 (1.606)	2.581 (1.597)	6.610** (2.886)	6.818** (2.876)	6.772** (2.895)
Coupon $_b$	−9.608*** (1.121)	−9.593*** (1.120)	−9.609*** (1.121)	−7.766*** (1.938)	−7.752*** (1.936)	−7.769*** (1.937)
Negotiated sale $_b$	−2.056 (1.519)	−2.215 (1.524)	−2.075 (1.520)	−4.326** (2.010)	−4.526** (2.022)	−4.383** (2.018)
Ln(Offering amount) $_b$	2.532*** (0.448)	2.526*** (0.447)	2.532*** (0.448)	2.117** (0.903)	2.112** (0.901)	2.118** (0.903)
Callable bond $_b$	22.515*** (0.987)	22.530*** (0.984)	22.516*** (0.987)	44.592*** (1.470)	44.610*** (1.466)	44.595*** (1.469)
General obligation bond $_b$	−1.795** (0.720)	−1.826** (0.713)	−1.789** (0.720)	−3.013** (1.191)	−3.031** (1.185)	−2.993** (1.191)
Insured bond $_b$	0.138 (1.118)	0.109 (1.116)	0.135 (1.114)	1.434 (1.919)	1.400 (1.907)	1.427 (1.908)
Credit-enhanced bond $_b$	−5.168 (3.447)	−5.204 (3.470)	−5.185 (3.446)	−8.228 (5.207)	−8.300 (5.229)	−8.280 (5.203)
Bank-qualified bond $_b$	−11.991*** (1.400)	−12.048*** (1.413)	−11.977*** (1.403)	−18.948*** (2.123)	−18.975*** (2.136)	−18.902*** (2.132)
Ln(Bond maturity) $_b$	15.517*** (1.015)	15.513*** (1.014)	15.516*** (1.015)	58.001*** (2.041)	57.995*** (2.038)	57.998*** (2.039)
N	609,333	609,333	609,333	609,333	609,333	609,333
Adjusted R^2	0.88	0.88	0.88	0.88	0.88	0.88
Dependent variable mean	17.834	17.834	17.834	184.480	184.480	184.480
Dependent variable SD	68.937	68.937	68.937	119.781	119.781	119.781
Issuer FEs	✓	✓	✓	✓	✓	✓
County×Year-month FEs	✓	✓	✓	✓	✓	✓
Rating FEs	✓	✓	✓	✓	✓	✓

Table IA3
County-level issuance maturity

This table reports results of regressions of a county's yearly average issuance maturity on its holding funds' average below-threshold share:

$$\text{Average maturity (years)}_{c,y} = \alpha_{s,y} + \beta \times \text{Below-threshold share}_{c,y-1} + \eta' \mathbf{X}_{c,y} + \varepsilon_{c,y},$$

where c indexes counties, s states, and y years. *Below-threshold share* is the par-weighted average across all open-end municipal bond funds holding outstanding bonds in the county as of the end of the previous year. We calculate the par-weighted average maturity of all bonds issued in a county in a given year. The sample is limited to county-years that 1) have at least one issuance in the current year and 2) have at least one outstanding bond held by open-end municipal bond funds as of the previous year. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a county-year. Standard errors are adjusted for clustering by state. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	All issuance (1)	New issuance (2)	Refunding issuance (3)
MF holders' below-threshold share $_{c,y-1}$	-0.059 (0.064)	-0.041 (0.083)	-0.165** (0.068)
MF holders' net flows $_{c,y-1}$	-0.006 (0.039)	-0.043 (0.047)	0.048 (0.042)
MF holders' return $_{c,y-1}$	0.065 (0.091)	0.119 (0.119)	-0.023 (0.112)
Mutual fund holding $_{c,y-1}$	0.189** (0.081)	0.105 (0.096)	0.254** (0.100)
County return $_{c,y-1}$	-0.062 (0.053)	-0.126* (0.072)	0.047 (0.070)
Ln(Amount outstanding) $_{c,y-1}$	0.558*** (0.198)	0.743*** (0.225)	0.435** (0.215)
Ln(Out. bond maturity) $_{c,y-1}$	0.654*** (0.124)	0.412** (0.173)	0.700*** (0.125)
Ln(Out. bond maturity at issuance) $_{c,y-1}$	0.524*** (0.151)	0.592*** (0.196)	0.507*** (0.169)
10-year Treasury rate at issuance $_{c,y-1}$	-0.144 (0.193)	-0.289 (0.263)	-0.105 (0.189)
Ln(GDP) $_{c,y-1}$	-0.892*** (0.290)	-1.186*** (0.372)	-0.406 (0.323)
Ln(Population) $_{c,y-1}$	0.835*** (0.273)	1.006*** (0.356)	0.257 (0.337)
Ln(Average wage) $_{c,y-1}$	0.168 (0.130)	0.215 (0.169)	0.371*** (0.136)
Ln(House value) $_{c,y-1}$	0.156 (0.156)	0.090 (0.186)	0.227 (0.163)
Unemployment rate $_{c,y-1}$	0.083 (0.111)	0.035 (0.149)	0.072 (0.107)
Median age $_{c,y-1}$	-0.141** (0.071)	-0.212** (0.100)	0.028 (0.067)
High school graduate $_{c,y-1}$	0.095 (0.092)	0.215* (0.129)	-0.104 (0.094)
N	16,548	13,750	12,114
Adjusted R^2	0.34	0.39	0.29
Dependent variable mean	10.911	11.347	9.843
Dependent variable SD	5.400	6.409	5.029
State×Year FEs	✓	✓	✓

Table IA4
County-level finance

This table reports results of regressions of a county's yearly finance measures on its holding funds' average below-threshold share:

$$\text{Government finance (\$ per capita)}_{c,y} = \alpha_{s,y} + \beta \times \text{Below-threshold share}_{c,y-1} + \eta' \mathbf{X}_{c,y} + \varepsilon_{c,y},$$

where c indexes counties, s states, and y years. *Below-threshold share* is the par-weighted average across all open-end municipal bond funds holding outstanding bonds in the county as of the end of the previous year. Local government finance measures, originally from the Annual Survey of Local Government Finances, are scaled by the county's population as of the previous year. The sample is limited to county-years that 1) appear in the Annual Survey data and 2) have at least one outstanding bond held by open-end municipal bond funds as of the previous year. All continuous explanatory variables are standardized to have a mean of zero and a standard deviation of one. The unit of observation is a county-year. Standard errors are adjusted for clustering by state. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

<i>Dependent variable =</i>	Total expenditures	Current operations	Capital outlay	Cash & securities holdings
	(1)	(2)	(3)	(4)
MF holders' below-threshold share _{c,y-1}	-51.444*** (17.427)	-41.079*** (14.612)	-3.778 (2.337)	-62.744** (27.637)
MF holders' net flows _{c,y-1}	-11.069 (9.287)	-11.835 (7.745)	-2.448 (1.596)	-10.267 (11.926)
MF holders' return _{c,y-1}	15.803 (17.721)	17.676 (14.534)	2.046 (3.240)	-1.058 (28.195)
Mutual fund holding _{c,y-1}	55.816** (21.815)	35.251* (18.223)	2.730 (3.073)	162.575*** (48.030)
County return _{c,y-1}	-11.584 (8.021)	-11.774* (7.038)	1.127 (1.618)	-8.314 (10.323)
Ln(Amount outstanding) _{c,y-1}	123.355** (50.035)	73.793* (40.354)	21.884*** (7.102)	294.859*** (97.223)
Ln(Out. bond maturity) _{c,y-1}	15.525 (38.030)	12.359 (30.404)	0.349 (6.722)	71.500 (75.274)
Ln(Out. bond maturity at issuance) _{c,y-1}	-45.023 (50.333)	-36.584 (37.458)	-14.913* (8.031)	-126.823 (82.905)
10-year Treasury rate at issuance _{c,y-1}	-0.759 (48.867)	-13.115 (40.428)	-3.947 (8.799)	165.543* (98.320)
Ln(GDP) _{c,y-1}	1,129.471*** (139.213)	762.424*** (100.161)	107.865*** (19.576)	1,154.593*** (231.304)
Ln(Population) _{c,y-1}	-1,513.774*** (135.754)	-1,023.398*** (98.196)	-155.854*** (19.925)	-1,684.717*** (237.021)
Ln(Average wage) _{c,y-1}	36.908 (62.805)	23.715 (50.683)	13.180 (9.352)	317.070*** (106.457)
Ln(House value) _{c,y-1}	150.445*** (46.085)	107.673*** (37.679)	32.079*** (6.237)	132.327 (90.252)
Unemployment rate _{c,y-1}	133.677*** (37.516)	88.743*** (32.118)	9.412* (5.615)	101.706* (57.214)
Median age _{c,y-1}	53.659** (25.082)	42.648** (20.746)	7.122** (3.342)	26.491 (35.531)
High school graduate _{c,y-1}	37.042 (36.709)	30.206 (31.078)	1.649 (4.589)	43.883 (51.340)
N	15,868	15,868	15,868	15,868
Adjusted R^2	0.57	0.55	0.36	0.34
Dependent variable mean	1,500.881	1,165.084	133.759	997.657
Dependent variable SD	1,317.669	1,067.375	182.072	1,704.623
State×Year FEs	✓	✓	✓	✓